

ZAMBIA NURSE AND LIFE SKILLS TRAINING PROJECT (ZNLTP)

**DIPLOMA IN REGISTERED NURSING
E-LEARNING PROGRAM**

COURSE CODE: PPN 025

COURSE TITLE: PAEDIATRICS AND PAEDIATRIC NURSING 1

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ABBREVIATIONS AND ACRONYMS

BCG	Bacillus Calmette Guerrin
ARV	Anti-Retro Viral
DBS	Dry Blood Swab
HIV	Human Immuno Deficiency Virus
PCR	Polymerase Chain Reaction
MI	Magnetic Imaging
PMTCT	Prevention Of Mother To Child Trasmission
EPI	Expanded Programme In Immunisation
MoH	Ministry of Health
CL	Cleft Lip
CP	Cleft Palate
VACTERL Limbs	Vertebral Column,Anorectal,Cardiac,Tracheal,Oesophageal,Renal and Limbs
IVP	Intravenous Pyelogram
IMCI	Integrated Management of Childhood Illnesses
ECG	Electro-Cardiography
CT Scan	Computed Tomography
PEEP	Positive end expiratory pressure
EMLA	Fultic Mixture of Local Anaesthetics

COURSE OVERVIEW

Welcome to the e-learning Course for Paediatrics and Paediatric Nursing. The course will help you gain knowledge and skills on management of well and sick children with medical conditions and congenital abnormalities. The modules will help you achieve this as you study each of these units. First you are going to look at the course aim and objectives.

Course aim

To equip you with knowledge and skills of Paediatric conditions and the management of a well and sick child

Course Objectives

At the end of this course you should be able to;

1. Define common terms used in Paediatrics
2. Describe growth and development of a child
3. Monitor the health of the child
4. Identify deviations from normal growth and development
5. Identify various conditions affecting children's health
6. Apply scientific approaches in the management of children and make appropriate referral
7. Apply the appropriate nursing model in the management of patients/clients
8. Acquire knowledge and skills in Integrated Management of Childhood Illnesses (IMCI)

In this course, you are going to cover diseases and conditions that commonly affect children up to the age of eighteen years. There is a lot of material you will have to cover in Paediatric Nursing. It consists of seven units.

UNIT1: INTRODUCTION TO PAEDIATRICS AND PAEDIATRIC NURSING. The unit provides information on what Paediatrics and Paediatric Nursing is. It takes into account the definition of terms, historical development of paediatric nursing, national health policies and the

rights of the child. It further outlines the concepts and principles of paediatric nursing practice and explains the parental involvement in the care of children..

UNIT 2: THE WELL CHILD.: This unit discusses growth and development of a well-child by looking at the different stages of physical growth and development. It also discusses the 1000 most critical days, the physical assessment and monitoring the health of the child. The -unit sums up with a discussion on the factors related to health promotion.

UNIT 3: MANAGEMENT OF THE NEWBORN. This unit will discuss assessment and the problems of the newborn.

UNIT 4: EXPANDED PROGRAMME IN IMMUNIZATION. This unit begins with a review of immunology, then explains the Expanded Programme in Immunization as well as provide information on Child Immunization. It also discusses cold chain and logistics, evaluation of immunization programme, record keeping and reporting in expanded programme in immunization.

UNIT 5: MANAGEMENT OF THE SICK CHILD: The unit discusses admission and assessment of the child, calculation and administration of medicines including the administration of oxygen, steam inhalation and nebulizing. The unit further discusses the management of different common medical conditions that affect the child.

UNIT 6: DEVIATION FROM NORMAL GROWTH AND DEVELOPMENT. This unit focusses on management of a child with congenital abnormalities and counselling of parents and children on the same. It includes the identification, accessibility and referral to support services in the community.

UNIT 7: INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESSES. The unit discusses assessment, classification and management of the sick child.

Assessment

Your work in this course will be assessed as follows:

- Continuous assessment (**worth 40%**) which comprise 1 test (10%), 1 assignment (10%) and clinical assessment (20%)
- Written final examination set by the institution in which you are enrolled for this diploma program (**worth 60%**) which will comprise theory (40%) and practical (20%)

Learning Tips

It will possibly take a minimum of 90 hours to work through this course. The time allocated should be spent on studying the course and readings, doing the activities and self-help questions as well as completing the assessment tasks. Note that units are not of the same length, so make sure you plan and pace your work to give yourself time to complete all of them.

Activities, self-help questions and case studies

You will find activities, self -help questions and case studies in this course. These are part of a planned distance education programme. They are intended to help you make your learning more active and effective as you process and apply what you read. These will help you to engage with ideas and check your understanding. Make sure you write full answers to the activities, or take notes of the discussions.

Further Readings

There is a list of readings at the end of each unit, the list includes books and articles referred to in the course, and suggestions in case you wish to explore topics further. You are encouraged to read as widely as possible during and after theunit, but you are not expected to read all the books on this list.

UNIT 1: INTRODUCTION TO PEDIATRICS AND PEDIATRIC NURSING

UNIT 1.1: Introduction

Hello dear learner, welcome to unit 1 of Paediatrics and Paediatric nursing Course. This unit presents the foundational material that you need in order to understand how nursing care of the child differs from that of the adult. The unit provides information about introduction to Paediatrics and Paediatric nursing. In this unit you will review definition of different terms that are used in Paediatrics and Paediatric nursing. The unit will take you through the historical development of Paediatric Nursing, the National health policies and the rights of the child. This unit also looks at the concepts of Paediatric Nursing practice, principles of Paediatrics and Paediatric Nursing. Finally, you will learn about the importance of parental involvement in the care of children. Let us start by reviewing our unit objectives.

1.2 Unit Objectives

By the end of this unit, you should be able to:

- 1.1 Define terms that are used in Paediatrics and Paediatric nursing
- 1.2 Explain the historical development of Paediatric nursing.
- 1.3 Outline the National health policies
- 1.4 State the rights of the child.
- 1.5 Describe the concepts of Paediatric nursing practice
- 1.6 Discuss the principles of Paediatrics and Paediatric nursing.
- 1.7 Explain the importance of parental involvement in the care of children.

1.3 Definition of Terms

In this session, you will define key terms used in Paediatrics and Paediatric Nursing. You will also use these terms frequently in this course. Therefore, it is important to refer to them.

Paediatrics: This is the field of medicine concerned with the health of infants, children, and adolescents; their growth and development; and their opportunity to achieve full potential as adults.

Paediatrician: is a medical practitioner who specializes in the medical care of infants, children, and adolescents.

Paediatric Nurse: This is a registered nurse who, as a result of post basic education in paediatrics and child health nursing practice possesses the knowledge and clinical skills necessary to provide paediatric-nursing care.

Paediatric and Child Health Specialist Nurse: This is a registered nurse who, as a result of postgraduate education and in-depth clinical experience in paediatric and child health nursing practice possesses the advanced knowledge and clinical skills necessary to provide specialist-nursing care.

Paediatric Nursing: It is the art and science of giving nursing care to children (birth through adolescent) with emphasis on physical, mental, emotional and psychosocial growth and development.

Child: This is any human being below the age of 18 years according to the Zambian Constitution. It refers to neonate, infant, child, or adolescent/young person from birth to 18 years (Australian Confederation of Paediatric and Child Health Nurses, 2006).

Children's Rights: are the human rights of children with particular attention to the rights of special protection and care afforded to minors.

Policy: A plan of action adopted or pursued by an individual, government, party, or business.

Principles of Paediatric Nursing: These are rules followed, or desirably followed during rendering of care to the child.

Paediatric Nurse Training Curriculum: These are some of the key terms in paediatrics and paediatric nursing.

I now invite you to go to the next sub unit which is looking at historical development of paediatric nursing.

Activity 1.1 - Define the following terms in your own words in your note book

1. Child:
2. Paediatric Nurse:
3. Paediatric and Child Nurse Specialist
4. Paediatric Nursing:

Well done! Compare your answers with what you covered under definition of terms

1.4 Historical Development of Paediatric Nursing

It is important for you to understand the historical development of paediatric nursing.

History of Paediatrics and Paediatric nursing can be traced from the Colonial America. The Colonial American children were born into a world with many hazards to their health and survival. The physicians were few and the midwives were untrained in childcare. The books that provided information on childcare and feeding were scarce. If available, they could only be accessed by minority of literate parents.

The Native American children were treated for diseases according to tradition of each tribe such as mixture of medicine, magic and religion. Epidemic diseases included smallpox, measles,

mumps, chickenpox, Influenza diphtheria, TB, yellow fever, cholera, whooping cough and dysentery. Dysentery surpassed all others as cause of childhood death.

Consequences of childhood illness, injury and effects of child labor, poverty and neglect were widely recognized during the industrial revolution in the 19th Century. Therefore, the end of the 19th Century is regarded as the ‘Dark’ Ages of Paediatrics. The 1st half of the 20th Century is regarded as the ‘Dawn’ of Improved Healthcare for Children (Cone, 1976).

Study of Paediatrics



The study of Paediatrics began in the last half of 1800s under the influence of Prussian born physician - Abraham Jacobi (1830-1919) referred to as The Father of Paediatrics. With other physicians, he pioneered the scientific and clinical investigation of childhood diseases. One outstanding achievement was the establishment of “milk stations”. In these stations, mothers brought sick

Figure 1:1 Abraham Jacobi (1830-1919) Father of Paediatrics

Source (Wilson et al, 1892).

children for treatment and learnt the importance of pure milk and its proper preparation. The crusade helped bring the dairy industry under legal control. Infant mortality declined in 1900 through prevention and health promotion measures because of improved sanitation and pasteurization of milk. Before then, unsanitary milk supply was a chief source of infantile diarrhea and bovine tuberculosis.

Social Welfare of Children

With the investigation findings of Dr. Jacobi, social welfare concerns emerged. The concerns were more on those who were homeless. Madam Lillian Wald (1867-1940) a social reformer founded the Henry Street Settlement in New York City. She is regarded as a founder of

Community Health Nursing (Hockenberry et' al, 2008). Her works had far-reaching effects on child health and nursing. Nursing services, social work and organized programs of social, cultural and educational activities were being provided. From her works, causes of diseases were identified, emphasis on isolation and asepsis was done.

In the 1900s, children with contagious diseases were isolated from adult patients. The parents were prohibited from visiting because they would transmit diseases to and from home. Even toys and personal articles of clothing were kept away from the child.

Effects of Isolation and Asepsis

Spits and Roberson in 1945 in a study of orphanages in South America reveled that separation in early life led to long term ill effects, particularly adversely affecting emotional development. These were identified as effects of isolation and maternal deprivation. This brought a surge of interest in psychological health of children and brought in changes for hospitalized children, such as rooming in, sibling visitation, child life (play) programs such as pre-hospitalization preparation, parent education and hospital schooling.

Improvement of children's living conditions

In 1909, President Roosevelt called the 1st White House conference on children. The conference addressed the deplorable working condition of youngsters under care of dependent children. In 1912, as a result of this conference, the US Children Bureau was established. Studies of economics and social factors i.e. infant mortality, maternal death and maternal and infant care stimulated the creation of better standards of care for mothers and children and led to the 1st maternity and infants Act. The Act provided grants to states to develop a division of maternal department and influenced creation of the American Academy of Paediatrics (AAP).

Evolution of Child Health Nursing in Africa

From the African perspective, major activities in the development and growth of Paediatrics and Paediatric Nurse Specialty were noted in Kenya, Malawi and South Africa.

Children make up approximately half of the total population of southern Africa. The Child Nurse Practice Development Initiative at the University of Cape Town in South Africa had a vision to achieve the best possible outcomes for children by finding local solutions with child nurse teams to shift practice to match research-based evidence. Some of the goals to this vision were to establish a hub of child nurse practice development, research and training in the region; work with families, nurse leaders and learners to improve care of children and train child nurse specialists.

Some of the achievements of the initiative were; in collaboration with the University of Malawi launched the first Clinical Masters in Child Nursing in Africa and establish partnerships with; Red Cross War Memorial Children's Hospital in South Africa; Gertrude's Garden Children Hospital in Nairobi Kenya and Kamuzu College of Nursing, University of Malawi.

Evolution of Child Health Nursing in Zambia

The history of child health in Zambia can be traced from the establishment of the first children hospital called Arthur Davison Children Hospital in Ndola (Locally known as Yengwe) in 1966. It was meant for children up to the age of 14 years. Nurses and midwives were providing the nursing services. The government passed a policy that teaching, central and provincial hospitals should have paediatric wards admitting children up to the age of 12 years.

In the early 1990s, the Zambian Government sent some nurses to train in Child Health Nursing in Britain to practice as Registered Sick Children Nurse (RSCN) in Zambia. However, very few are registered with the General Nursing Council to practice.

In order to reduce morbidity and mortality for children up to 5 years, the MoH adopted the IMCI tool. First IMCI training was conducted from 13th May 1996 to 24th May 1996 in Lusaka. This stimulated some nurses to become registered nurses. The interest in child health grew between 2009 and 2011 making some nurses going to train in Kenya and South Africa as Paediatric Nurses and Paediatric and Child Health Specialist Nurses. By September 2012, there were only 14 Paediatric Nurses and 1 Paediatric and Child Health Specialist Nurse on the GNC Register.

The Government of the Republic of Zambia through the General Nursing Council saw the need to train Paediatric Nurses and Paediatric and Child Health Specialist Nurses locally to reduce costs of sending Nurses to train outside the country. In December 2012, the first draft of Paediatric Nurse Training Curriculum was developed in Kabwe. The curriculum was developed to prepare Registered Nurses for Advanced Paediatric Nurse Diploma. The training started in January 2014 at Lusaka School of Nursing.

Landmarks in development of Paediatric Nursing

In 1771, New York hospital, one of the 1st Teaching Hospitals in USA provided classroom presentations designed for nurses. In 1851-The Hospitals for sick children was founded in London. In 1855 one of the earliest known Paediatric Textbook “**How to Nurse Sick Children**” was published and in the same year the Children’s Hospital of Philadelphia, USA, was founded.

In 1880 – Children Hospital Training School in San Francisco offered formal classes to educate nurses in the care of ill children. During this period the role of the nurse was that of a childcare taker. Nurses were responsible for maintaining nutrition, hygiene and hydration. They played a major role in controlling the spread of communicable diseases by observing sanitary measures.

In the 1970, health became a more comprehensive concept than suggested by the traditional definition, which indicated merely the absence of diseases. Nurses began to view children holistically that is in relation to their biophysical, cognitive, affective and social needs. The nursing process cleave was developed. Nurses developed their roles as child advocates ensuring the highest quality of health care for children.

In 1966, Arthur Davison Children Hospital in Ndola was established. In 2012 Development of the first draft for the Paediatric Nurse Training Curriculum for Zambia and planned to commence training of first cohort in January 2014

Now that you have gained knowledge on the historical development of Paediatric nursing it is now important to consider the National Health Policies that have supported the development of the field of Paediatric nursing.

1.5 National Health Policies

In the history of paediatric nursing, you noticed that research led to the development of paediatric nursing. Policies were developed to uplift the welfare of children. The Government of the Republic of Zambia through the ministry of health, government agencies and line ministries has formulated policies, strategies, and guidelines regarding child's health.

The following are some of the National Health Policies that promote the health of a child in Zambia:

- 1) The National Child Health Policy
- 2) Reproductive Health Policy
- 3) National HIV/AIDS Workplace Policy

Activity 1.2 – *In your note book write short notes on the development of Paediatrics and Paediatric Nursing*

Well done! Discuss this with your facilitator in the next contact session

- 4) Nutritional Policy

The National Child Health policy

A review of the child health situation was done to provide background for formulation of a national child health policy and accelerate efforts to improve child survival in May/June 2004. The well-being of children is critical for the social economic development of Zambia. The policy is aimed at coordination of the implementation of Child Health activities. The policy is also

aimed at addressing promotive, preventive, curative and rehabilitative aspects of Child Health.

The HCHP has the following parts: -

- Introduction
- Situation Analysis
- Vision
- Rationale
- Guiding principles
- Policy objective
- Implementation framework

The Reproductive health policy

The Reproductive Health approach offers opportunities to improve not only the health of childbearing women, but also of the next generation, and to involve men in all aspects of Reproductive Health. In addition, Reproductive Health has multidimensional aspects and hence collaboration with other sectors, is vital. The Reproductive Health also raises issues of human rights, equity, and discrimination, which must be addressed through participatory and inclusive processes that involve communities, families and individuals. The policy sets out to respond to the country's prevailing reproductive health situation so as to improve the standard of living and quality of life of Zambians.

The areas addressed in the reproductive health policy are;

- Safe motherhood, which addresses service delivery for improvement of the health of the mother and the newborn. This means ensuring affordable quality care for the mother and the newborn as close to the family as possible.
- Family planning
- Maternal nutrition
- Adolescent sexuality and reproductive health
- Sexually transmitted diseases including HIV/AIDS
- Abortions
- Infertility
- Other reproductive health issues such as; cervical cancer, breast cancer & menopause

1.6 Rights Of A Child

You are progressing well. You will now look at the rights of a child. As you are aware Zambia is signatory to many conventions. One of such is the convention on the rights of children.

The United Nations Convention on the Rights of a Child

Activity 1.4 – *In your note book mention five (5) rights of a child.*

Well done! Now compare your answer with the rights of children in the following discussion.

According to the United Nations 1989 Convention on the Rights of a Child, the rights of Children include the following:

Activity 1.3 – *Briefly, explain the two policies that have not been discussed and present your work to your facilitator during your next contact session.*

Well done! You will now look at the rights of a child

- The right to life.
- The right from birth to a name,
- The right to know and be cared for by his or her parents.
- The right to association with both parents,
- The right to human identity
- The right to basic needs for food,
- The right to universal state-paid education,
- The right to health care and criminal laws appropriate for the age and development of the child,
- The right to equal protection of the child's civil rights,

The right to freedom from discrimination on the basis of the child's race, gender, sexual orientation, gender identity, national origin, religion, disability, colour, ethnicity, or other characteristics.

Types of Rights

According to Child Rights Information Network the rights of a child may be categorized as follows:

- **Provision rights:** Children have the right to an adequate standard of living, health care, education and services, and to play and recreation. These include a balanced diet, a warm bed to sleep in, and access to schooling.
- **Protection rights:** Children have the right to protection from abuse, neglect, exploitation and discrimination. This includes the right to safe places for children to play; constructive child rearing behavior, and acknowledgment of the evolving capacities of children.
- **Participation rights:** Children have the right to participate in communities and have programs and services for themselves. This includes children's involvement in libraries and community programs, youth voice activities, and involving children as decision-makers. In a similar fashion, the Child Rights Information Network, or CRIN for short, categorizes rights into two groups:
- **Economic, social and cultural rights,** related to the conditions necessary to meet basic human needs such as food, shelter, education, health care, and gainful employment. Included are rights to education, adequate housing, food, water, the highest attainable standard of health, the right to work and rights at work, as well as the cultural rights of minorities and indigenous peoples.

Environmental, cultural and developmental rights, which are sometimes called "third generation rights," and include the right to live in safe and healthy environments and that groups of people have the right to cultural, political, and economic development.

Activity 1.5 – *In your notebook outline the types of rights of a child.*

Well done, compare with what was discussed above

We hope you have enjoyed learning about children's rights. Knowledge of these rights will help you to protect and advocate for children. Now let us turn to the concepts of Paediatric nursing practice.

Activity 1.6 – *In your notebook write down the meaning of concept*

Well done!

1.7 Concepts of Paediatric Nursing Practice

Before you learn about the concepts of Paediatric nursing, let us start by understanding the word 'concept'. What is a concept? Do the following activity. In simple terms, a concept is a general idea or notion that corresponds to some class of entities and that consists of the characteristic or essential features of the class. Concepts are mental representations that allow us to draw appropriate inferences about the type of entities we encounter in our everyday lives. Your understanding of concepts help you understand their importance in paediatric nursing practice. The use of concepts in paediatric nursing is necessary for decision making and they also contribute to the well-being of the child.

Let us now look at the concepts of paediatric nursing practice.

There are several concepts used in paediatric nursing and some of these are as follows:-

- **VISITING HOURS**

This concept is an important entity in paediatric nursing therefore it should be implemented in the nursing care of a child. As a paediatric nurse you need to remember that the extent of visiting by the parents to the sick child should be determined by their need to see the child and more important by the child's need for the parents.

- **ROOMING-IN**

Parents/care takers should never be required to stay at the bed side but neither should they be prohibited from doing this if they desire. Hospitals should provide a comfortable lounge or waiting room where mothers can relax. Mothers of seriously ill children may be encouraged to stay in the ward if need be.

- **PLAY AND SCHOOL IN THE HOSPITAL**

Playing is a child's way of living or as his activities of daily living. Play satisfies the child's physical, emotional, social and mental development. Play also alleviates stress. Research has proved that play and school activities can help a child to comprehend intrusive and surgical procedure and can also express his/her fantasies, fear, and anxieties. Hospitals should have teachers, classrooms and play grounds for children who have recovered from acute illness.

- **CHILD HEALTH AND THE NURSING TEAM**

The nurse, who is a member of the nursing team, works closely with one or more professional nurses. The nurse does not substitute the parents of the child but acts as a father or mother's friend. The nurse plans comprehensive care to the child and works hand in hand with other members of the health team. The nurse therefore should assume the following roles:

- Primary care giver
- Coordinator and collaborator
- Advocate
- Health educator
- Consultant

- Counselor
- Case manager
- Recreationalist
- Social worker
- Researcher

Now let us look at each of these roles and understand how each can be delivered by a Paediatric Nurse.

- **Primary care giver:** A paediatric nurse should provide preventive, promotive, curative and rehabilitative care at all levels of health care. In hospital, care of sick children include; comfort, feeding, bathing, safety and many more. At community set up, basic responsibilities include health assessment, immunization, primary health care and referral and so on.
- **Coordinator and collaborator:** The paediatric nurse plays an extremely important role with the coordination of health care team members. The nurse maintains good interpersonal communication with the child, family and other healthcare team members (physician, social worker, surgeon, physiotherapist, dietician e.t.c.)
- **Nurse Advocate:** The paediatric nurse acts as an advocate to safeguard the child's rights, to assist and to provide best care from the health care team. The nurse acts as a representative for the child, family and other health care providers.
- **Health educator:** The nurse's goal of health teaching is to provide information to the child's parents and significant other about prevention of illness, promotion and maintenance of health. The nurse as an educator should have four (4) characteristics abbreviated as 4 Cs which stands for the following:
 - C ----- Confidence
 - C ----- Competence
 - C ----- Communication
 - C ----- Caring and empathy
- **Nurse Consultant:** The paediatric nurse can act as consultant to guide parents for maintenance and promotion of health for example; guiding parents about breast-feeding practices, accident prevention, etc.

- **Nurse Counselor:** The paediatric nurse can provide guidance to parents in health hazards of children and help them make an informed decision making in different situations.
- **Case manager:** The paediatric nurse should organize care, monitor and evaluate patient treatment for successful outcome. She/he acts as a manager of paediatric care units in the hospital, clinics and community.
- **Recreationalist:** The paediatric nurse plays supportive role for the child to provide play facilities for recreation and diversion. It helps to alleviate stressors of hospitalisation.
- **Social worker:** The paediatric nurse can participate in social services or refer child and family to child welfare agencies for necessary support.
- **Nurse Researcher:** Research is an integral part of professional nursing. Paediatric nurse should participate or perform research activities. It helps to provide basis for changes in nursing practice, improvement in the child health care and evaluate the care.

We hope you have enjoyed learning about roles of a paediatric nurse. Knowledge of these roles will help you to take responsibilities to deliver the services to children. Now let us turn to the settings in which a paediatric nurse may practice.

Settings in which a paediatric nurse may practice

As a paediatric nurse to function properly you must be knowledgeable about a wide range of medical conditions and treatment options. This makes you (a paediatric nurse) to practice in many settlements where children are found. Let us now look at the following settings in which a paediatric nurse may practice:

- Home,
- Hospitals,
- Clinics,
- Long term care facilities such as hospices.
- Schools

It is also important to note that in these settings that a paediatric nurse may practice, his/her roles can be delivered at three different levels which are:

- Primary level,
- Secondary level and
- Tertiary level.

Let us now briefly consider each one of the above mentioned level and see how a paediatric nurse may practice at each level.

- **Primary Level:** At this level the paediatric nurse can maintain the health of the child, can help the child achieve his optimal growth and development and can prevent diseases and complications to the child. A paediatric nurse can deliver her roles at primary level through health education to the child and his parents, providing child's basic needs and immunization.
- **Secondary Level:** The nurse can provide care to the sick children and their families by: assessing children's needs, planning for the care, implementing the plan, evaluating children's condition and providing health teaching to children and their parents.
- **Tertiary Level:** The nurse assists children to return to their maximal level of functioning following illness and/or disabilities.

Now that you have looked at the concepts of paediatric nursing, it is important to learn about the principles that are in paediatric nursing practice. I now invite you to study the next sub unit and learn about the principles of Paediatric Nursing.

1.8 Principles of Paediatrics and Paediatric Nursing

But before we go any further, let us start by understanding the word 'Principle'. Am sure this is not a new word, you must have learnt it in fundamentals of nursing. A principle is a fundamental truth or proposition that serves, as the foundation for a system of belief or behavior or for a chain of reasoning in the way of life of the people.

In this section you will study the principles of Paediatric Nursing. Therefore, it is important that you understand these principles because they are essential characteristics of a paediatric nurse and they also give a good reflection of the designed purpose of paediatric nursing course.

The following are the principles of paediatric nursing:

- i. Nursing a child should be family centered. The parents should be involved in the care of the child and a child should be nursed as a whole. Parents speak for their children and should therefore be included in the assessment and plan of care.

- ii. A nurse taking care of a child should be very observant and knowledgeable to detect acute changes and initiate prompt action. E.g. a child should not only fail to sleep unless there is a problem physically. The nurse should be able to interpret the needs and be able to use initiative in implementing interventions.
- iii. The nurse should be close to the child but never to be possessive because the nurse is only standing-in for the parent/guardian.
- iv. Breastfeeding children should be with their mothers at all times to maintain the bond between them and facilitate feeding on demand. For older children, visiting parents should be allowed to lift and care for their children (unless contraindicated) to maintain family bond.
- v. Young children should be nursed in railed beds/cot beds to prevent injury.

1.9 Parental Involvement in the Care of Children

Let us now look at parental involvement in the care of children. Parental involvement in the care of children has been in existence since time in memorial. Parental involvement is important in the care of children because of the following reasons:

- **It helps to reduce the anxiety in both parents and children.** The presence of the father or the mother of a hospitalized child make them comfortable, it gives them a kind of psychological support and emotional balance. For example when a surgery is involved, it is often the case that the child is very nervous. Anything to reduce the anxiety should be introduced and this is possible when parents are around.
- **It creates room for parents to participate in decisions** about their child's care **Parental participation also improves the quality of the care** for the child.
- **The child is too young to rely on or to be asked about their medical history.** It is important for parents to be with their children when decision making is required or any other specific information is needed. Therefore, the parent or guardian is the best person to make decisions while the child is in a hospital setting.

The new concept of parental involvement is Family Centered Care. This philosophy recognizes the family as the constant in a child's life. Services, systems and personnel must support,

encourage, and enhance the strength and competencies of the family by developing mutuality and partnerships with parents (Newton, 2000).

Family Centered Care involves three elements; **empowerment**, which is an interaction of professionals and families in such a way that families maintain or acquire a sense of control over their family lives, & acknowledge positive changes that result from helping behaviours that foster their own strengths, abilities and actions.

Enabling which is creating opportunities and means for all family members to display their present abilities and competencies and to acquire new ones that are necessary to meet the needs of the child and family.

Finally, **Parent professional partnership**, which is a powerful mechanism for enabling and empowering families as respected equals with professionals and has the rightful role in deciding what is important to themselves and the family. Partners are capable individuals who become more capable by sharing knowledge, skills and resources in a manner that benefits all participants.

Take Note: Nurses need to build a trustworthy relationship with parents based on good communication skills. By allowing and encouraging parental involvement, while addressing problems

1.10 Summary

We have defined the common terms used in Paediatrics and Paediatric nursing. We discussed the national health policies. We have also outlined UN convention on the rights of a child. We further described the concepts of paediatric nursing practice. We also discussed the principles of Paediatrics and Paediatric nursing and finally we have explained the importance of parent involvement in the care of children and outlined elements of family centered care. In the next unit, you will look at the Well Child.

Complete the following self-test in order to check your understanding of unit 1. After you have answered all the questions in the self-test, feel free to go back and revise the sections of this unit which you did not understand.

Self Test

Section a: multiple choice questions. Encircle the most appropriate answer

- 1) Who is referred to as a reformer in the social welfare of children?
 - (a) Lillian ward
 - (b) Florence Nightingale
 - (c) Matron Wardloper
 - (d) Roberson

- 2) When was Arthur Davison Children Hospital established
 - a) 1960
 - b) 1962
 - c) 1964
 - d) 1966

- 3) When was the first draft for the Zambian Curriculum for Paediatric Nurse Training developed?
 - a) 2006
 - b) 2012
 - c) 2008
 - d) 2010

SECTION B: STATE WHETHER THE STATEMENT IS TRUE OR FALSE USING THE SPACES PROVIDED

- 4) Infant mortality rate is an indicator of how healthy the nation is. _____

- 5) Pediatric Nursing is a specialized area of the nursing practice concerning the care of children during illness only. _____

- 6) The first Clinical Masters in Child Nursing in Africa was first launched at University of Malawi by the Child Nurse Practice Development _____

Answers to Assessment

- 1) A
- 2) D
- 3) B
- 4) T
- 5) F
- 6) T

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UNIT 2: THE WELL CHILD

2.1 Introduction

Hello learner congratulations for progressing to this unit, welcome to Unit 2;THE WELL CHILD. In the previous unit, you were introduced to Paediatrics and Paediatric nursing. We are now going to look at growth and development of a child and the process of growth and development. Then we shall look at the physical assessment of the child and how to monitor the health of children. Finally we will look at factors related to health promotion. Let us start by reviewing the unit objectives.

2.2 Unit Objectives

By the end of this unit, you should be able to:

1. Define a well-child
2. Describe growth and development
- 3.
4. Describe the physical assessment of the child
5. Discuss the monitoring of the health of children
6. Outline the factors related to health promotion

2.3 Definition of a Well-Child

This is the realization of a child's rights and the fulfilment of the opportunity for every child to be all she or he can be.

A well child can also be defined as a child who does not need immediate medical, social, psychological or emotional attention.

Now that you have known the definition of a well-child I now invite you to study the process of growth and development

2.4 Growth and Development of a Child

It is important for you to note that the first five years of life of a child are a time of incredible growth and learning. An understanding of the rapid changes in a child's developmental status

prepares parents and caregivers to give active and purposeful attention to the preschool years and to guide and promote early learning that will serve as the foundation for later learning.

Understanding child development is an important part of teaching young children.

Developmental change is a basic fact of human existence and each person is developmentally unique. Although there are universally accepted assumptions or principles of human development, you need to understand that no two children are alike. Children differ in physical, cognitive, social, and emotional growth patterns. They also differ in the way they interact with and respond to their environment as well as play, affection, and other factors.

In our day-to-day living you should have noticed that some children may appear to be happy and energetic all the time while other children may not seem as pleasant in personality. Some children are active while others are typically quiet. You may even find that some children are easier to manage and others are difficult to manage. Therefore having an understanding of the sequence of development prepares you to help and give attention to all of these children as you render the service to them. We will now consider these stages of growth and physical development of a child.

Stages of physical growth and development

Human stages of growth and development are differentiated by age and key stages of scientifically supported psychomotor development. Psychomotor development is progress in mental and motor skill activity. The process of growing and developing begins on the cellular level even before conception in the womb and continues throughout life until death. The period between birth and adolescence is commonly divided into four stages of growth and development. These are as follows:

- **Infancy**
 - Neonate – Birth to 1 month
 - Infancy – 1 month to 12 months
- **Early Childhood**
 - Toddler – 1 year to 3 years

- Preschool – 3 years to 6 years
- **Middle Childhood**
 - School age – 6 years to 12 years
- **Late Childhood**
 - Adolescent – 13 years to 18 years

Every stage of development mentioned above has certain milestones. Let us now look at each stage one by one and see how a child behaves in each stage.

Infancy

At 1 month of age, for instance, a baby's hearing is fully mature, and infants of this stage often respond to loud sounds and familiar voices. A cognitive milestone for a 1-year-old is being able to find missing objects after watching someone hide them. Although every child does not stay within the same time frame in development, parents should note delays in psychomotor development and bring them to the attention of a pediatrician. A baby is considered an infant from birth through the first year of life. During this first year, babies develop skills that will be lifelong resources. As a paediatric nurse you need to look for specific markers of growth and development during this time. The child is learning how to control the head, move by crawling and sit and these are called gross motor skills. Using the thumb and finger to pick up pieces of food and hold a pacifier are called fine motor skills. Sensory skills are measured by observing a baby's ability to see, hear, taste, touch and smell. Language skills are evident in the first year of life when a baby makes sounds, learns some basic words and responds to the spoken word. Finally, social skills include how a baby interacts with family and peers.

We have looked at who an infant is but it is important to know the next stage of child development that is childhood and see what happens in this stage. Let us now look at childhood in the next heading.

Childhood

This stage is divided into:

- Early childhood

- Middle childhood

Let us first look at early childhood. This includes a toddler 1 to 3 year and a preschool child who is 3 to 6 years. This period is characterized by intense activity and discovery. It is a time of marked physical and personality development. The toddler years are more mobile and exploratory and motor development advances steadily. At this stage children acquire language and wider social relationships, learn role standards, gain self-control and mastery, develop increasing awareness of dependence and independence and begin to develop a self-concept.

The second is middle childhood. This period is referred to as school age and it occurs from 6 to 12 years. During this period children have a better sense of right and wrong than. They also tend to become more independent as they begin dressing themselves and spend more time at school and with friends. Cognitive changes include rapid mental growth with a greater ability to talk situations through and focus on the environment around them instead of being self-centered. During this period children might start noticing the physical changes of puberty. A major growth spurt can occur at this time as the body begins sexual development. This also can be a time of stress for children as peer pressure takes its toll. Their body image along with emotional changes often cause children to feel less confident. Children in this stage also start preparing for middle school by taking on more academic responsibilities and focusing on goal-setting and accomplishment.

Now that we have known what is involved in childhood, let us now consider the last stage that is adolescence and learn more from stage.

Adolescence

This is the period from ages 13 to 18 years and can be considered the transitional stage from childhood to adulthood. Adolescence can be a time of both disorientation and discovery. The transitional period can bring up issues of independence and self-identity. Sometimes adolescents may be experimenting with drugs and alcohol or sexuality.

During this time, peer groups and external appearance tend to increase in importance; children experience distinct mental and physical changes. The beginning of a girl's menstrual cycle typically occurs 2 years after the onset of puberty, while boys do not begin puberty with a distinct marker and tend to mature with adult genitalia about age 16 or 17 years. During this time of physical change, adolescents may become more self-centered. In middle to late adolescence,

Activities 2.1 – *In your notebook, explain the following stages of growth and development;*

1. Infancy
2. Early Childhood
3. Middle Childhood
4. Late Childhood

Well done! Now compare your notes with the ones you have studied in the discussion

teen-agers are often characterized as becoming more comfortable with their body sexually and ready to have romantic friendships. Adolescent behavior often includes the teen-agers' need to pull away from parents and authority figures to establish their own self-identity and make decisions on their own.

In the next sub-heading you are going to study 1000 Most Critical Days. Pause a little while and think what this means! Follow me as I discuss this topic and see how important it is in the life of a child.

Congratulations for the knowledge that you have acquired on physical growth and development of a child. I am very confident that you will be able to describe the terms neonate, infant, childhood and adolescent with less difficulties.

1000 most critical days

The 1,000 days between a woman's pregnancy and her child's second birthday offer a unique window of opportunity to shape healthier and more prosperous futures. The right nutrition during this 1,000 day window can have a profound impact on a child's ability to grow, learn, and rise out of poverty. It can also shape a society's long-term health, stability and prosperity.

Under-nutrition is still a leading cause of death of young children throughout the world. For infants and children under the age of two, the consequences of under-nutrition are particularly severe, often irreversible, and reach far into the future. In pregnancy, under-nutrition can have a devastating impact on the healthy growth and development of a child. Babies who are malnourished in the womb have a higher risk of dying in infancy and are more likely to face lifelong cognitive and physical deficits and chronic health problems.

For children under the age of two, under-nutrition can be life-threatening. It can weaken a child's immune system and make him or her more susceptible to dying from common illnesses such as pneumonia, diarrhea and malaria.

The first 1000 days of an infant's life therefore, offer a unique opportunity for optimizing health and nutrition outcomes. Optimal nutrition and health care of the mother and infant during this period are closely linked to growth, learning potential and neurodevelopment and to long-term outcomes. A child with poor brain development is at high risk for cognitive developmental disorders leading to poor school performance, early school dropout, low skilled employment and falls into the vicious cycle of intergenerational sharing of nutritional deficiencies and poverty.

Nutrition and environment in this aspect are very important during the first 1000 days, between conception and the child's second birthday, in determining the health and development of the baby. Nutrient and environmental influences as well as appropriate intervention strategies need to be recognized because they have profound impact on the child's growth and development on long-term consequences and can impact societies' health and economic prosperity. During 1000 days it is important to prevent low birth-weight (LBW) starting with the health of adolescent girls through the pre-pregnancy and pregnancy stages and ending with lactation. It is also important to make up nutritional follow-up and feeding opportunities in relation to dietary requirements of children with a LBW. The nutritional interventions must make the best possible short and long term outcomes possible.

In 1,000 days, you can change the future by focusing on improving nutrition for mothers and children in the 1,000 day window; we can help ensure a child can live a healthy and productive

life. Investing in better nutrition in the 1,000 day window can also help families, communities and countries break the cycle of poverty.

In view of the above, it is important to give a child the right nutrition during the 1,000 day window as it will:

- Save more than one million lives each year;
- Significantly reduce the human and economic burden of diseases such as tuberculosis, malaria and hiv/aids;
- Reduce the risk for developing various non-communicable diseases such as diabetes, and other chronic conditions later in life;
- Improve an individual's educational achievement and earning potential; and,
- Increase a country's GDP by at least 2-3 percent annually.

Improving nutrition during the critical 1,000 day window is one of the best investments we can make to achieve lasting progress in global health and development.

The solutions to improve nutrition in the 1,000 day window are readily available, affordable and cost-effective. They include:

1. Ensuring that mothers and young children get the necessary vitamins and minerals they need;
2. Promoting good nutritional practices, including breastfeeding and appropriate, healthy foods for infants; and
3. Treating malnourished children with special, therapeutic foods.

In the next sub-heading, we shall consider how a child should be assessed when he/she is brought to you at the health Centre. Therefore, I urge you to remember what you have studied in the previous sub- heading on physical growth and development because this will assist you to note some abnormal findings on a child during assessment, which may need attention.

I now invite you to study the next sub unit on physical assessment of a child. I ask you to understand the important issues in this section.

2.5 Physical Assessment of the Child

The physical assessment of a child is distinct in certain areas from that of the adult. There is no definite order to be followed while examining a child. It is important to individualize the examination for every child. Invasive and discomforting examinations should be done at the end.

The child should be allowed to be his/her most comfortable position, and place him/her on the mother's laps. It is important for you to note that every child should receive a complete systematic examination at regular intervals. You should not restrict the examination to those portions of the body considered to be involved on the basis of the presenting complaint. Before we go into the actual assessment let us see how the child should be approached.

Approaching the Child

To approach the child well you need adequate time which should be spent in becoming acquainted with the child and allowing him/her to become acquainted with you as an examiner. You need to treat the child as an individual whose feelings and sensibilities are well developed, and your conduct as an examiner should be appropriate to the age of the child. A friendly manner, quiet voice, and a slow and easy approach will help to facilitate the examination. It is important for you to consider parental involvement as you examine the child depending on the age of the child for you to get full information and have a good examination of the child.

The total evaluation of the child should include impressions obtained from the time the child first enters until the child leaves; it should not be based solely on the period during which the patient is on the examination table. In general, more information is obtained by careful inspection than from any of the other methods of examination. Let us now consider the sequence of the examination.

Sequence of examination

When examining a child you need to have skill, tact and patience to gather an optimal amount of information. There is no routine you can use and each examination should be individualized.

Note: In examining children, the orderly sequence is frequently altered to accommodate child development needs. Some schools of thought encourage toe –to head examination

Get down to the child's level and try to gain his trust. The order of the examination should conform to the age and temperament of the child. For example, many infants under 6 months are easily managed on the examination table, but from 8 months to 3 years you will usually have more success substituting the mother's lap.

Certain parts of the examination can be done more easily with the child in the prone position or held against the mother. With the younger child, start with the lungs, heart, and abdomen before crying starts. Examine the throat and ears last. If part of the examination is uncomfortable or painful, minimize the stress by giving EMLA (Eutectic Mixture of Local Anesthetics) to control the pain or discomfort.

Remember that you must respect modesty in your patients, especially as they approach pubescence. Sometime during the examination, however, every part of the child must have been undressed. It usually works out best to start with those areas which would least likely make the child anxious and interfere with his/her developing confidence in you.

General examination

Before starting general physical examination; analyze the history and based on that look for specific features that you think to be relevant to the history which will help you to give a perfect diagnosis. General examination must be thorough from head to toe (Kumar et' al, 2008).

Vital Signs and Measurements

The general physical examination will start with checking the vital signs of a child. Count respirations **First** (before disturbing the child), then count the pulse or apical heart rate, followed by measuring of blood pressure and finally checking the temperature.

The weight should be recorded at each visit; the height should be determined at monthly intervals during the first year, at 3-month intervals in the second year, and twice a year thereafter. The height, weight, and head circumference of the child should be compared with standard charts and the approximate percentiles recorded.

Multiple measurements at intervals are of much greater value than single ones since they give information regarding the pattern of growth that cannot be determined by single measurements.

Take Note: Count Respirations first before disturbing the child

General Appearance

You need to assess whether the child appears well or ill. It is also important to assess the degree of cooperation; state of comfort, nutrition, and consciousness; abnormalities, gait, posture, and coordination; estimate of intelligence; reaction to parents, physician, and examination; nature of cry and degree of activity, facie's and facial expression.

After you have assessed the general appearance you need to go to the skin. Let us now assess the skin and see the important things to look for.

Skin

To carry out an accurate and effective skin assessment you need to be able to recognize normal skin function that you learnt in first year in Anatomy and Physiology. This will help you to identify the abnormalities on the child's skin as you do the assessment.

The skin of the child should be assessed for color (for color check whether the child has cyanosis, jaundice, pallor, erythema), texture, eruptions, hydration, edema, hemorrhagic manifestations, scars, dilated vessels and direction of blood flow, hemangiomas, nevi, Mongolian (blue-black) spots, pigmentation, turgor, elasticity, and subcutaneous nodules.

Striae and wrinkling may indicate rapid weight gain or loss. Assess the skin sensitivity, hair distribution and character, and desquamation. As you examine the skin you need to take note of the following:

- i. If the child has loss of skin turgor, especially of the calf muscles and skin over abdomen, is evidence of dehydration.

- ii. The soles and palms are often bluish and cold in early infancy; this is of no significance.
- iii. The degree of anemia cannot be determined reliably by inspection, since pallor (even in the newborn) may be normal and not due to anemia.
- iv. If you want to demonstrate pitting edema in a child it may be necessary to exert prolonged pressure.
- v. A few small pigmented nevi are commonly found, particularly in older children.
- vi. "Mongolian spots" (large, flat black or blue-black areas) are frequently present over the lower back and buttocks; they have no pathologic significance.
- vii. Pallor will not be evident unless at least 5 gm of reduced hemoglobin are present; therefore, it develops less easily in an anemic child.
- viii. Carotenemic pigmentation is usually most prominent over the palms and soles and around the nose, and spares the conjunctivas.

Let us now examine the lymph nodes, please pay attention and learn more.

Lymph Nodes

When examining the lymph nodes you need to take note of the location, size, sensitivity, mobility and consistency. You should attempt to palpate suboccipital, pre-auricular, anterior cervical, posterior cervical, submaxillary, sublingual, axillary, epitrochlear, and inguinal lymph nodes.

As you examine the lymph nodes take note of the following:

- i. Enlargement of the lymph nodes occurs much more readily in children than in adults.
- ii. Small inguinal lymph nodes are palpable in almost all healthy young children. Small, mobile, non-tender Shorty nodes are commonly found in residue of previous infection.

After you have looked at the general appearance you need to do a physical examination of the child from head to toe. In the examination of head to toe we shall see how it is done and what to look for in each part of the body.

Note: In examining children, the orderly sequence is frequently altered to accommodate child development needs. Some schools of thought encourage toe –to head examination

Physical examination

Head

The head of a child will be assessed for:

- The size,
- The shape: Note the shape of the head (fig.1) whether microcephaly, macrocephaly, plangicephaly (asymmetrical due to lying of the normal infants with their heads persistently on one side), scaphocephaly (boat shaped with increased AP diameter due to premature closing of sagittal suture), brachycephaly (decreased AP diameter) and oxycephaly (tower-shaped skull).
- Circumference,
- Asymmetry,
- Cephalohematoma,
- Bosses,
- Craniotabes,
- Control,
- Moulding,
- Bruit,
- Fontanel (size, tension, number, abnormally late or early closure),
- Sutures,
- Dilated veins,
- The scalp,
- The hair note the texture, distribution, and there are any parasites such as lice
- The face

During examination of the head ensure that you measure the head at its greatest circumference; this is usually at the midforehead anteriorly and around to the most prominent portion of the occiput posteriorly.

Fontanel tension is best determined with the quiet child in the sitting position. Take note that slight pulsations over the anterior fontanel may occur in normal infants. You may also find that a positive Macewen's sign ("cracked pot" sound when skull is percussed with one finger) may be present normally as long as the fontanel is open.

After you have assessed the head the next part to assess is the face. Let us assess the face and see what needs to be checked.

Face

Assess the face for symmetry, paralysis, distance between nose and mouth, depth of nasolabial folds, bridge of nose, distribution of hair, size of mandible, swellings, hypertelorism, Chvostek's sign, and tenderness over sinuses.

Eyes

The eyes should be assessed for photophobia, visual acuity, muscular control, nystagmus, Mongolian slant, Brushfield spots, epicanthic folds, lacrimation, discharge, lids, exophthalmos or enophthalmos, conjunctivas; pupillary size, shape, reaction to light and accommodation; media (corneal opacities, cataracts), fundi, visual fields (in older children). It is important to note that at 2-4 weeks an infant will follow light. By 3-4 months, coordinated eye movements should be seen.

During the examination of the eye remember that one pupil is normally larger than the other. This sometimes occurs only in bright or in subdued light. It is important to note that a mild degree of strabismus may be present during the first 6 months of life but should be considered abnormal after that time.

To test for strabismus in the very young or uncooperative child, note where a distant source of light is reflected from the surface of the eyes; the reflection should be present on corresponding portions of the two eyes.

Nose

Assess the exterior, shape, mucosa, patency, discharge, bleeding, and pressure over sinuses, flaring of nostrils and septum. At 2-4 years pneumatization of the frontal sinus takes place but is rarely a site of infection until the 6th - 10th year.

Mouth and Lips

Assess the mouth and lips for thinness, fissures, color, cleft and the teeth number, position, caries, mottling, discoloration, notching, malocclusion or malalignment), mucosa (color, redness of Stensen's duct , enantheems, Bohn's nodules, Epstein's pearls), gum, palate, tongue, uvula, mouth breathing, geographic tongue (usually normal).

While examining the mouth it is important to check the number and condition of the teeth that should be recorded. (A child should have 20 teeth by age 2½ years). When the teeth begin to erupt is quite variable but most infants have their two lower central incisors by 8-10 months.

Throat

Before examining a child's throat it is advisable to examine his mouth first. Permit the older child to handle the tongue blade, nasal speculum and flashlight so that he/she can overcome his fear of the instruments. Then ask the child to stick out his tongue and say "Ahhhhh" louder and louder.

In some cases this may allow an adequate examination. In others, if the child is cooperative enough, he/she may be asked to "pant like a puppy;" while he/she is doing this, the tongue blade is applied firmly to the rear of the tongue.

Gagging need not be elicited in order to obtain a satisfactory examination. In still other cases, it may be expedient to examine one side of the tongue at a time, pushing the base of the tongue to one side and then to the other. This may be less unpleasant and is less apt to cause gagging. Young children may have to be restrained to obtain an adequate examination of the throat. Eliciting a gag reflex may be necessary if the oral pharynx is to be adequately seen.

The throat is assessed by looking at the tonsils; you need to check for size, inflammation, exudate, crypts, and inflammation of the anterior pillars. You should also assess mucosa and see

if there is any hypertrophic lymphoid tissue and check also the status of the epiglottis. Finally on the throat you need to assess the voice for hoarseness, stridor, grunting, type of cry and speech.

Neck

Assess the position of the neck to rule out torticollis, opisthotonus, inability to support head and mobility. Assess if there is any swelling on the neck and you should also assess the thyroid for size, contour, bruit, isthmus, nodules and tenderness. Still on the neck you need to assess the lymph nodes, check the veins and position of trachea. Check the neck for webbing, edema and its movement.

Ears

Pinna is pulled down and back to straighten ear canal in children less than 3 years. You need to assess the pinnae for position and size. Before actually examining the ears, it is often helpful to place the speculum just within the canal, remove it and place it lightly in the other ear, remove it again, and proceed in this way from one ear to the other, gradually going farther and farther, until satisfactory examination is completed.

Examine the ear canals and tympanic membranes for landmarks, mobility, perforation, inflammation and discharge. The mastoid bone should be assessed for tenderness and swelling. You need also to carry out a test for hearing as it is an important part of the physical examination of every infant.

In examining the ear, as large a speculum as possible should be used and should be inserted no farther than necessary. This is to avoid discomfort and to avoid pushing wax in front of the speculum so that it obscures the field. The otoscope should be held balanced in the hand by holding the handle at the end nearest the speculum.

One finger should rest against the head to prevent injury resulting from sudden movement by the child. To examine the ears of an infant it is usually necessary to pull the auricle backward and downward (see figure 1A), in the older child the external ear is pulled backward and upward (see figure 1B).

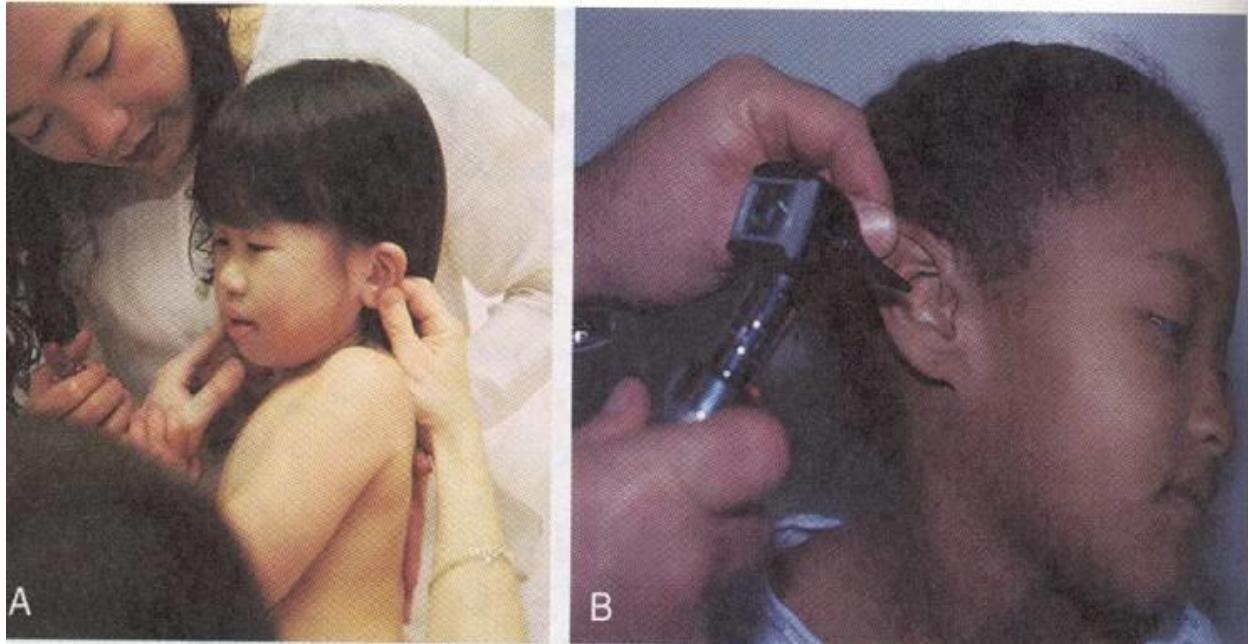


Figure 2.1: Ear examination **Figure A** Note the pinna of the ear pulled down and **Figure B** pinna of the ear pulled up.

It is important to note that low-set ears are present in a number of congenital syndromes, including several that are associated with mental retardation. The ears may be considered low-set if they are below a line drawn from the lateral angle of the eye and the external occipital protuberance.

The other important point to note is that congenital anomalies of the urinary tract are frequently associated with abnormalities of the pinnas.

Thorax

Let us now assess the thorax of the child. You need to look at the shape and symmetry of the thorax and if there are any visible veins, retractions and pulsations, beading, Harrison's groove, flaring of ribs, pigeon breast, funnel shape, size and position of nipples, breasts, length of sternum, intercostal and substernal retraction, asymmetry, scapulas, clavicles.

When you are examining the thorax you should take note that at puberty, in normal children, one breast usually begins to develop before the other and that in both sexes tenderness of the breasts is relatively common. You should also remember that gynecomastia is not scarce in the male.

After you have done all this it is important for you to examine the lungs and see how they are functioning. Let us now examine the lungs.

Lungs

For the lungs you need to examine the type of breathing and see if there is any dyspnea or any prolongation of expiration. Examine the child for any cough, expansion, fremitus, flatness or dullness to percussion, resonance, breath and voice sounds, rales and wheezing. Let us now examine the heart since it is just next to the lungs.

Heart

The heart will be examined to see its location and intensity of apex beat, precordial bulging, pulsation of vessels, thrills, size, shape. The next thing to do is auscultation of the heart and take note the rate, rhythm, force and quality of sounds - compare with pulse as to rate and rhythm; friction rub-variation with pressure), murmurs (location, position in cycle, intensity, pitch, effect of change of position, transmission, effect of exercise).

Take Note

- Many children normally have sinus arrhythmia. The child should be asked to take a deep breath to determine its effect on the rhythm.
- Extra-systoles are not uncommon in childhood.
- The heart should be examined with the child recumbent.

Abdomen

Size and contour, visible peristalsis, respiratory movements, veins (distension, direction of flow), umbilicus, hernia, musculature, tenderness and rigidity, tympany, shifting dullness, tenderness,

rebound tenderness, pulsation, palpable organs or masses (size, shape, position, mobility), fluid wave, reflexes, femoral pulsations, bowel sounds. If the liver is palpable below the right costal margin, its total span must be recorded. A deep abdomen palpation must be done on every child.

- The abdomen may be examined while the child is lying prone in the mother's lap or held over her shoulder, or seated on the examining table with his back to the doctor. These positions may be particularly helpful where tenderness, rigidity, or a mass must be palpated.
- Light palpation, especially for the spleen, often will give more information than deep.
- Umbilical hernias are common during the first 2 years of life. They usually disappear spontaneously.

Male Genitalia

Check for the following in the child: if circumcised, meatal opening, hypospadias, phimosis, adherent foreskin, size of testes, cryptorchidism, scrotum, hydrocele, hernia, pubertal changes.

- In examining a suspected case of cryptorchidism, palpation for the testicles should be done before the child has fully undressed or become chilled or had the cremasteric reflex stimulated. In some cases, examination while the child is in a hot bath may be helpful. The boy should also be examined while sitting in a chair holding his knees with his heels on the seat; the increased intra-abdominal pressure may push the testes into the scrotum.
- To examine for cryptorchidism, one should start above the inguinal canal and work downward to prevent pushing the testes up into the canal or abdomen.
- In the obese body, the penis may be so obscured by fat as to appear abnormally small. If this fat is pushed back, a penis of normal size is usually found.

Female Genitalia

Check the vagina for imperforate, discharge and adhesions. Check for the hypertrophy of clitoris and for pubertal changes.

Rectum and Anus

Activities 2.2 – ASSIGNMENT. In your notebook, outline the procedure for assessment of a child. Discuss your work with your facilitator or mentor.

Well done! Now prepare for the next sub unit - Monitoring of the Health of Children

Check for any irritation, fissures, prolapse, imperforate anus. The rectal examination should be performed with the little finger (inserted slowly). Note muscle tone, character of stool, masses, tenderness, sensation. Examine stool on glove finger (gross, microscopic, culture, guaiac), as indicated.

Extremities

- General: Deformity, hemiatrophy, bowlegs (common in infancy), knock-knees (common after age 2), paralysis, edema, coldness, posture, gait, stance, asymmetry.
- Joints: Swelling, redness, pain, limitation, tenderness, motion, rheumatic nodules, carrying angle of elbows, tibial torsion.
- Hands and feet: Extra digits, clubbing, simian lines, curvature of little finger, deformity of nails, splinter hemorrhages, flat feet (feet commonly appear flat during first 2 years), abnormalities of feet, dermatoglyphics, width of thumbs and big toes, syndactyly, length of various segments, dimpling of dorsa, temperature.
- Peripheral Vessels: Presence, absence or diminution of arterial pulses.

Spine and Back

Posture, curvatures, rigidity, webbed neck, spina bifida, pilonidal dimple or cyst, tufts of hair, mobility, Mongolian spots, and tenderness over spine, pelvis or kidneys.

Congratulations for completing the physical assessment of child. You should be able to conduct physical assessment. It is important to utilize the skills you learnt in fundamentals of nursing and medicine and medical nursing on physical assessment.

Next, you will study monitoring of the health of children. I Kindly ask you to understand the important issues in this section and do not forget to do the activities in each box.

2.6 Monitoring the Health of Children

You will now look at monitoring the health of children. We will start with your understanding of the term ‘monitoring’. What does the term ‘monitoring’ mean? Do the following activity.

Monitoring is to observe and check the progress or quality of (something) over a period of time; to keep it under systematic review. The health of a child should be monitored well and the following areas should be considered:

- Nutrition
- Feeding of infants and children
- Methods of feeding

Activities 2.3 – *In your notebook, define the word monitoring.*

Well done! Now study the following passages

- Immunizations
- Vitamin A supplementation
- Deworming

I now invite you to study these areas in detail.

Nutrition

Nutrition is essential for children because proper nutrition helps prevent illness and disease, and affects their growth, development and learning. Eating the right food promotes a better quality of life because when children feel good physically, they’re able to take part in the activities they

Activities 2.5 – CRITICAL THINKING. *In your notebook, outline three (3) common conditions that a 2 year old child can suffer due to inadequate intake of nutrients such as carbohydrates and proteins.*

Well done! Now study the following passages

enjoy. Children who have proper nutrition generally receive higher grades because it creates a sense of well-being and increases mental clarity.

Nutrition is critical for the health of the child and well-being and is important at every stage of life. The child needs to be provided with all important nutrients and other substances needed for child's health. Poor nutrition can result from either inadequate or excessive levels of nutrient intake and influences the development of chronic diseases.

The child needs to receive all-important nutrients in-order to facilitate growth and development. These nutrients are; carbohydrates, proteins, fats, vitamins and minerals and water. All these nutrients should be provided in good amounts.

Feeding of infants and children

How should infants and children be fed? Infant and young child (upto the age of 2 years) feeding are a cornerstone of care for childhood development. For the first six months breast milk is the only food a baby needs. After that, complementary feeds are very important for growth and development when breast milk no longer provides all the nutrition needed. Complementary feeds are family foods given when breast milk is no longer enough to meet the nutritional needs of the infant. Now you will study how infants and children up to the age of 2 years can be fed.

For the first six months of the child's life

Breast milk is all that is needed for the child's optimum growth and development at this time. Give advice to the mothers to breastfeed as often and for as long as the baby wants, both day and night. Tell that she never give ANY other food or fluids for the first 6 months. Nothing else is necessary and exclusive breastfeeding will protect the baby from infections.



Figure 2.2: Breastfeeding Mother

Source WHO/UNICEF IMCI Caretaker's card (2008)

From six months up to twelve months

It is necessary for you to encourage the caretaker to continue to breastfeed as often as the child wants. Tell her to start adding complementary foods three times daily. These must be nutritious and full of energy since the baby cannot eat large amounts. Suitable foods include porridge with added oil, margarine or peanut butter. Mashed banana, beans, avocados, full cream milk, fruit and vegetables are other suitable complementary foods. At this age the baby is not able to feed himself and a carer needs to practice active feeding (sit with the child and feed him from his own serving) to make sure that he eats until he does not want any more. If the baby is not being breastfed complementary foods should be given five times daily.



Figure 2.3: Caretaker giving complementary feeds

Source WHO/UNICEF IMCI Caretaker's card (2008)

From twelve months up to two years

You should encourage the caretaker to continue to breastfeed as often as the child wants. Then continue with nutritious complementary feeds, gradually increasing the quantity and variety of the food. Tell her that family food should become a bigger part of the child's diet. The child should have three meals a day and two nutritious snacks in between (like fruit, full cream milk or bread with margarine or peanut butter). Tell her that active feeding continues to be important at this age and the child should have his own serving.



Figure 2.4: A toddler feeding on complementary feeds

Source WHO/UNICEF IMCI Caretaker's card (2008)

Feeding of infants and children

You have learnt how infants and children should be feed. What you have learnt is that breastfeeding is very important in infants. What you will study in this subunit are other methods of feeding

Methods of feeding

a) Cup Feeding

Cup feeding is a method of feeding milk to an infant from a small polyprpylene or glass tumbler without a spout or lip.

Indications of cup feeding

- Infants nearing discharge who were already established on the breast but whose mothers were not residents on the unit.
- Preterm infants, who were to be breast fed but who would not settle after gastric tube feeds. These include infants who were awake and alert when a feed was due, but who were either

too immature to breast feed or unable to complete a breast feed, or whose mothers were not present at the time of a feed.

- Infants with a cleft lip and/or palate whose mothers wished to establish breast feeding, but who were also likely to require an additional methods feeding until surgical repair of the defects was completed.
- Infants with an uncoordinated suck, swallow, and breathing pattern caused by asphyxia or some other neurological condition that interfered with the successful establishment of breast or bottle feeding.
- Infants born by caesarean section, if breast feeding was not possible within the first few hours of surgery, or whose mothers were initially unwell but who intended to breast feed.

b) Spoon-Feeding

Spoon-feeding practices vary from one family to another. Breast fed infants tend to start spoon-feeding later than those who are not breast fed. Remember, babies have special nutritional needs and what is healthy for adults (e.g. high fibre, low fat) is not suitable for infants and small children.

c) Tube Feeding

Tube feeding can be administered via different types of tubes but usually a nasogastric tube or gastrostomy feeding tube is used. This facilities improvement in the child's health and growth as a result of tube feeding and serious complications are rare. This method is used as it provides adequate nutrition.

Indications for tube feeding

Under nutrition associated with or due to any of the following may require tube feeding:-

- Poor weight gain
- Inability to swallow
- Reflux / Vomiting
- Distress during feeding
- Prolonged feeding times Aspiration/inhalation of food/drink
- Neurological dysfunction
- Special diets

Types of feeding tubes

- Nasogastric feeding tube
- Percutaneous endoscopic gastrostomy (PEG)
- Balloon inflated gastrostomy

Nasogastric tubes are fine bore tubes with a small internal diameter and are commonly used for short term feeding. These tubes are available in two main types: short term and long term tubes.

i. Short-term tubes

These tubes are made of polyvinylchloride (PVC) and can remain in place for between 3-10 days, dependent on manufacturer's guidelines. These tubes are single use and should the tube become dislodged it should be replaced with a new tube.

ii. Long-term tubes:

These tubes are made of polyurethane and have a guide-wire to aid the passing of the tube. Once the tube has been passed, the guide-wire is removed and should be kept in a safe place as it will be required should the tube become dislodged. This tube can normally remain in situ for approximately 6 – 8 weeks dependent on manufacturer's guidance. Within this time, the tube can be cleaned and re-passed. Cleaning of the tube should also be in accordance with manufacturer's guidance and local policy.

iii. Indications for parenteral feeding

Parenteral nutrition in children is provided to prevent malnutrition in children who are unable to obtain adequate nutrients by oral or enteral routes. This type of feeding may be the only feasible option for providing nutrition to children who do not have a functioning gastrointestinal tract or who have disorders requiring complete bowel rest, including:

- Bowel obstruction,
- short bowel syndrome,
- gastroschisis,
- Prolonged diarrhea regardless of its cause,
- High-output fistula,

Activities 2.5 In your notebook, state three types of feeding that you have learnt in today's discussion.

Well done! Compare your work with what you have covered already

- Very severe Crohn's disease or ulcerative colitis, and
- Certain pediatric GI disorders including congenital GI anomalies.

Immunization

Immunization is a remarkably successful and very cost effective means of preventing childhood infectious diseases. It is a leading achievement of public health and pediatrics. During each well child clinic you should check the immunization status of each under 5 years old child. We shall look at immunization of childhood illnesses in detail in unit 4.

Vitamin A supplementation

Globally, it is estimated that 140–250 million children under five years of age are affected by vitamin A deficiency. A supplementation can be provided safely to all postpartum mothers within six weeks of delivery, when the chance of pregnancy is remote. The recommended doses of vitamin A supplementation for the prevention of vitamin A deficiency are indicated in the following table.

Target group	Vitamin A dose
All mothers irrespective of their mode of infant feeding up to 4 weeks postpartum if they have not received vitamin A supplementation after delivery	200 000 IU (4 drops)
Infants aged 6–11 months (or if < 8 kg) Children aged 12 months to 59 months	100 000 IU (2 drops) 200 000 IU (4 drops)

Children aged 1–4 years	200 000 IU (4 drops)
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Table 2.1: SCHEDULE FOR VITAMIN A SUPPLEMENTATION

* The optimal interval between doses is four to six months. A dose should not be given too soon after a previous dose of vitamin A supplement: the minimum recommended interval between doses for the prevention of vitamin A deficiency is one month (the interval can be reduced in order to treat clinical vitamin A deficiency and measles cases).

Deworming

Worm infections, while not immediately life-threatening, can have a significant negative impact on a child's cognitive ability and general health. For example, children who have worms are more likely to become seriously ill and less likely to attend school on a regular basis. Start deworming children from the age of 12 months onwards every after 6 months during well child clinics or when noted that the child requires deworming. Give

Vermox (mebendazole) 500 mg as a single dose. It is indicated for the treatment of *Enterobius vermicularis* (pinworm), *Trichuris trichiura* (whipworm), *Ascaris lumbricoides* (common roundworm), *Ancylostoma duodenale* (common hookworm), *Necator americanus* (American hookworm) in single or mixed infections.

You have now finished studying monitoring the health of children. Now do the following activity

Congratulations for completing the monitoring of the health of children. Next, you will study factors related to health promotion. Kindly I ask you to understand the important issues in this section and do not forget to do the activities under each box.

2.7 Factors Related to Health Promotion

You will now look at factors related to health promotion. Before you begin your study of this subunit, answer this question, what is health promotion? Health promotion is the process of

Activities 2.6 *In your notebook, explain how infants and children up to the ages of 2 years can be fed.*

Well done! Compare your work with what you have covered already

enabling people to exert control over the determinants of health and thereby improve their health (WHO, 2005).

So many factors are related to child health promotion. Health promotion should target the growth and developmental stage of the child. In this sub unit you will study the following:

- Hygiene
- Training children in health habits
- Environment
- Growth monitoring tools

Hygiene

According to Wikipedia Hygiene is a set of practices performed for the preservation of health. It further states that these practices prevent the spread of disease-causing organisms. For example practices such as hand washing remove infectious microbes as well as dirt and soil. Hygiene is also the name of a branch of science that deals with the promotion and preservation of health, also called hygienic.

According to Angela Oswalt in her write up she explained personal hygiene as people's personal health-promoting habits, and she included practices such as hand washing, tooth brushing, and covering one's nose when sneezing. These practices are important because they prevent spread of

infections. In this section of the write up we are going to consider three areas that promote hygiene of a child:

- i. Bathing of the baby,
- ii. Changing of napkins and
- iii. Oral toilet

Let us now consider the practices one by one and see how they promote the health of a child.

Bathing of baby

This refers to washing of the baby's body with a fluid, usually water or an aqueous solution or the immersion of the body of the baby in water. The purpose of bathing the baby is for hygienic purposes. It is a means of achieving cleanliness by washing away dirt and soil, and a preventative measure to reduce the incidence and spread of disease. It also reduces baby's body odors. Bathing of baby creates a feeling of well-being and the physical appearance of cleanliness. When bathing the baby you need to prevent irritation of the baby's eyes and skin by using gentle soaps, shampoos and body washes. Babies can be washed in a small plastic baby bath, instead of using a standard bath which offers little control of the infant's movements and requires the parent to lean awkwardly or kneel. It is best to bathe the baby when it is awake and relaxed before you start, and in between feeds so he's neither hungry nor full.

Before you start bathing the baby, you need to gather all the things you'll need. These may include:

- A bowl of warm water boiled and cooled if baby is less than two months old, for face washing.
- Several clean pieces of cotton wool.
- A sponge or flannel.
- Baby cleanser, mild soap
- At least one clean, dry towel. Hooded towels are good for wrapping up the baby from top to toe.
- A thermometer, for testing water temperature.
- A clean nappy and clothes.
- A warm blanket

Before you bathe the baby, wash his face. It's easier than trying to do it while the baby is in the water. There's no need to use soap or cleanser on the baby's face. Wash baby's face with clean pieces of cotton wool dipped in warm water (previously boiled if the baby is under two months) and squeezed out. If the baby has dried mucus in his eyes or nostrils, wipe it first to soften the mucus. Wipe each eye from the nose outwards with a fresh piece of dampened cotton wool.

a) **Changing of napkins**

I am sure you are aware what a napkin is but probably it is important to remind you what it is once more. A Napkin is a folded piece of absorbent material, such as paper or cloth that is placed between a baby leg's and fastened at the waist to contain excretion. It is important to change a napkin when it gets soiled and the baby has to be comfortable during this process.

When changing the napkin the baby should be put on a towel or a changing mat. You need to unfasten the tabs on the dirty nappy. Then fold them over to prevent them from sticking to baby, but do not remove the dirty nappy yet. After that then you have to pull down the front half of the dirty nappy. If you are dealing with a baby boy, cover his penis with a clean cloth or another nappy so that baby does not urinate on your face. If there are faeces in the nappy, use the front half of the nappy to wipe the bulk of it off baby's bottom. Fold the dirty nappy in half under a baby, clean side up. To do this, lift baby's bottom off the table by grasping both ankles with one hand and gently lifting upwards. Clean baby's front with a damp baby wipe or cloth.

If you are dealing with a baby girl, wipe from front to back (towards her bottom) to prevent bacterial infection. To clean any faeces that remain, grab another wipe and gently clean her bottom. You can either lift her legs or roll her gently to one side then the other. Clean in the creases of baby's thighs and bottom.

It is important to let baby's skin air-dry for a few moments or pat it dry with a clean cloth, or with the towel that a baby is lying on. Apply a barrier cream or, if it's needed, a rash cream.

Remove the dirty nappy and set it aside. Changing of napkins is important to prevent some problems such as:

- Leaking of waste
- Smell of urine or faeces
- Rash and itchy
- Infection due to prolong skin contact with the urine and faeces
- Sore at thigh gap due to tightly applied

Therefore; it is your role as a paediatric nurse to educate parents on the importance of changing of baby napkin and also demonstrate to them how a soiled napkin can be changed. You need to ensure that the parents are promoting the health of their babies as they have to change napkins on their own wherever they are with the baby. This will keep the baby comfortable and healthy.

b) Oral toilet

Oral hygiene is an important part of personal hygiene. As a paediatric nurse you need to encourage parents to teach young children the importance of brushing their teeth at least twice a day. You have to remind parents that adult modeling of brushing is one of the better ways to teach children appropriate dental self-care behavior. Children are much more likely to regularly brush their teeth if they see their parents doing these things as well. You need to advise parents to teach their children that tooth brushing should be integrated into both the morning and bedtime routines. Thus, it is extremely important that children are taught to take proper and effective care of their teeth from an early age, so that these behaviors can become second nature to them, and the more serious health consequences associated with poor dental care can be avoided.

Training Children in Health Habits

Children need to be trained in health habits so that they can remain healthy throughout their lives. The purpose of training children in health habits is to strengthen their skills and capabilities to take action and to exert control over the determinants of health and achieve positive change. Parents need to train their children in health habits during early childhood stage, because this will

assist them to master the concepts and they will be able to practice on their own without being pushed around. Training children in health habits will promote children's health as they will avoid certain diseases that can occur due to poor health habits therefore; children who are trained in health habits grow into healthy adults.

The following are some of health habits that should be taught to children in order to promote their health:

- Hand washing after using the toilet, before eating food, after playing outside, after sneezing, or after petting the dog.
- Children should also be taught to cover their mouths when they cough and sneeze, and to use a tissue (rather than their shirt sleeve) when they need to wipe their nose or mouth.
- Children should also be taught that sharing cups and eating utensils, particularly at school, is an easy way to spread germs and become sick, and should therefore be avoided.
- Brush their teeth every day at least twice a day
- Bathing every day
- Have nutritious meal every day and they should not miss their breakfast everyday

Environment

A health environment is an important determinant of population health and well-being and this is more important in the case of children. Children worldwide require special protection from longstanding risks such as smoke from traditional fuels and from emerging risks such as exposure to an increasing number of hazardous chemicals.

Although new regulatory standards and greater awareness of children's vulnerability to such hazards have improved children's situation in a number of more developed countries, many children, especially in less developed countries, continue to be exposed to toxins. Their vulnerability is exacerbated by the lack of protective policies and medical and public health interventions. Children are supposed to be protected against specific environmental health issues. Children are more vulnerable to environmental hazards and their vulnerability is due to their size, physiology, and behavior. Children are more heavily exposed to toxins in proportion to their body weight, and have more years of life ahead of them in which they may suffer long-term

effects from early exposure. Perinatal conditions, which can be influenced by environmental conditions, cause 20 percent of deaths worldwide in children under age 5. Furthermore, fetal exposure to chemicals such as lead increases a child's chances of having brain damage or developmental problems. Children at all ages, not just the very young, are at greater risk than adults. Children under age 5 breathe more air, drink more water, and eat more food per unit of body weight than adults do, so they may experience higher rates of exposure to pathogens and pollutants.

Typical childhood behaviors, such as crawling and putting objects in the mouth, can also lead to increased risks. Children between ages 5 and 18 may face higher risks of injuries, including exposure to hazardous chemicals, due to their growing participation in household tasks and work outside of the home. Many school-age children attend schools without sanitation facilities, making them more likely to contract various diseases and less likely to go to school. Let us now consider some environmental risks to children's health.

Environmental risks to children's health

As a paediatric nurse you need to know about the environmental risks to the health of children. This will assist you to give appropriate health education to the parents and their children regarding children's protection against environmental hazards. When you are enlightened about environmental risks it will assist you to be confident enough about the areas in which you can advocate for children and influence the people responsible for policy making.

Therefore; I invite you to look at the following environmental health risks to children:

- Indoor Air Pollution
- Outdoor Air Pollution
- Unsafe Drinking Water and Poor Sanitation
- Infectious Disease Vectors
- Exposure to Hazardous Chemicals

i. Indoor Air Pollution

Half of the world's households use biomass fuels, including wood, animal dung, or crop residues, that produce particulates, carbon monoxide, and other indoor pollutants. The World Health Organization (WHO) has determined that as many as 1 billion people, mostly women and children, are regularly exposed to levels of indoor air pollution that are up to 100 times those considered acceptable. Young children, who spend more time indoors, are more exposed to the noxious byproducts of cooking and heating.

ii. Outdoor Air Pollution

Outdoor pollutants such as sulfur dioxide, ozone, nitrogen oxide, carbon monoxide, and volatile organic compounds come mainly from motor vehicle exhaust, power plant emissions, open burning of solid waste, and construction and related activities.

iii. Unsafe Drinking Water and Poor Sanitation

Contaminated water and inadequate sanitation cause a range of diseases, many of which are life-threatening. The most deadly are diarrheal diseases, 80 percent to 90 percent of which result from environmental factors. Diarrheal infections can cause deaths in children under age 5, primarily due to dehydration; many more children suffer from nonfatal diarrhea that leaves them underweight, physically stunted, vulnerable to disease, and drained of energy. Poor sanitation conditions and inadequate personal, household, and community hygiene are responsible for most diarrheal infections.

iv. Infectious Disease Vectors

Vector-borne diseases, such as malaria, represent an international public health problem, particularly in tropical areas of Africa. Approximately 1 million children under age 5 in sub-Saharan Africa die of malaria each year; malaria causes about 25 percent of all deaths among children in the region, especially among children living in remote rural areas with poor access to health services.

Malaria also contributes to low birth weight, one of the leading risk factors for infant mortality, because pregnant women are more susceptible to both malaria and anemia.

The prevalence of malaria is strongly related to environmental factors such as irrigation and other agricultural practices, land clearing, and changing demographic patterns.

v. Exposure to Hazardous Chemicals

As countries pursue economic development, the increased risk of exposure to chemical hazards may worsen other risks to children's health, such as unsafe water and poor hygiene. Industrialization and modernized agriculture have many benefits, but they have often been accompanied by problems, such as exposure to pesticides, that disproportionately affect children. Other potential toxins include lead discharged from battery-recycling operations; mercury in fish; and nitrates, arsenic, and fluoride in drinking water. Some children scavenge rubbish dumps, where they may be exposed to discarded batteries, medical waste, and pesticides.

Now that you have looked at the environmental health risks and you have seen how these affect the health of children you should be asking yourself how these can be prevented and controlled. Therefore; I invite you to study the next sub-heading which is looking at measures to be taken against environmental risks to children.

vi. Measures to be taken against environmental risks to children

Environmental health risks to children are increasingly being recognized as an international problem. The following are some of the measures that can be followed;

- Policymakers and planners need to address environmental health threats to children by formulating policies.
- Encourage the development and support of community-level initiatives to reduce environmental health threats to children.
- Community- and household-level interventions could also be adopted to reduce exposure to and transmission of ARIs, diarrheal disease, and malaria.
- Continue to raise awareness and provide education about children's environmental health issues.
- Promote the recognition, assessment, and study of environmental factors that affect children's health and development.

- Reduce children's exposure to pollutants through education, regulation, use of cleaner fuels, and reduction of environmental tobacco smoke.
- Government needs to invest in programs to increase access to clean water and

Activities 2.10, *In your notebook, briefly explain the following:-*

1. Hygiene
2. Training children in health habits
3. Environment
4. Growth monitoring tools

Well done! Compare your work with what you have covered already

sanitation facilities and to promote better hygiene practices.

- Government needs to strengthen interventions to prevent and treat malaria. While progress has been made in reducing acute respiratory infections (ARIs) and diarrheal disease, deaths from malaria have increased in the past 10 years, due in part to global climate change and in part to the emergence of antibiotic-resistant strains of the disease.

Growth monitoring tools

Growth monitoring is a very important method used to assess the growth and health of the child.

There are four tools which are essential to conducting the growth monitoring programme and these are:

- The scale: This is used to weigh the child
- The weighing slip: This is used to record the name and weight of the child which is given to the child's attendant/parent by the staff at the weighing point to take to the staff entering data in the register book. This assists work to go smoothly without attendants/parents altering the information about the weight of the child.

- The child health card: This is used to plot the channel of the child and counsel the mother about her child's health status
- The growth monitoring programme (GMP) rooster book or register: This is used to record the weight and channel of the child

You have now finished studying monitoring the health of children. Now do the following activity

2.8 Summary

We have defined key terms in growth and development of a child and discussed the factors influencing growth and development. We have also looked at the principles of growth and development as well as the process of growth and development. Then we have studied the physical assessment of the child and monitoring of the health of children. Finally, you covered the factors related to health promotion.

In the next unit, you will study Management of the Newborn.

Complete the following self-test in order to check your understanding of unit 2. After you have answered all the questions in the self-test, feel free to go back and revise the sections of this unit, which you did not understand.

Self Test

Multiple choice questions. Choose the best answer:

The following are environmental risks for childrens health EXCEPT;a, Indoor Air Pollution

- a. Outdoor Air Pollution
- b. Unsafe Drinking Water and Poor Sanitation
- c. Weighing of the child
 - a. 1000 most critical days of a child is a period from;Birth to 18 years
 - b. Pregnancy to the childs second birthday
 - c. Birth to 5 years of age

- d. Birth to the time the weaning of the child from breast feeding
- a. Exclusive breastfeeding is feeding the child on breast milk only for;The first 2 years of life
 - b. The first 6 months of life
 - c. For 5 years
 - d. For 3 months only
- a. The common drug used in deworming children is;Mebendazole
- b. Albedazole
 - c. Vitamin a
 - d. Calpol
- a. An infant is a child aged;Less than 2 years
 - b. 12 Monts and below
 - c. Less than 5 years
 - d. A pre-school child

childrenANSWERS

- 1. D
- 2. B
- 3. B
- 4. A
- 5. B

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UNIT 3: MANAGEMENT OF THE NEW BORN

3.1 Introduction

Welcome to unit 3. This unit discusses management of the newborn. In the previous unit, we looked at a well-child that dealt with growth and development from conception to adolescent stage. The previous unit also mentioned that physical assessment of the child is important so that abnormalities can be noted and taken care of accordingly and this does not exclude the new born. In this unit, you are going to learn how the newborn is assessed. Therefore, you need to remember the information on the assessment of a child because some information that was discussed previously may be useful and need to be applied in this unit.

The purpose of this unit is to provide you with an overview assessment of a newborn as you will be coming in contact with newborn babies. This unit will also provide you with information on the problems of the newborn which include the following: low birth weight, prematurity, small for dates, Asphyxia neonatorum, Respiratory Distress Syndrome, Neonatal Jaundice,, Hypoglycaemia, Birth injuries and common infections of the new born. The common infections of the new born will include; Neonatal sepsis, Tetanus neonatorum and Ophthalmia neonatorum

3.2 Unit Objectives

By the end of this unit you should be able to:

- 1) Describe the assessment of the newborn.
- 2) Identify the problems of the newborn and be able to manage them
 - Low birth weight
 - Prematurity
 - Small for dates
 - Asphyxia for dates
 - Respiratory distress syndrome
 - Neonatal jaundice
 - Hypoglycaemia
 - Hypothermia

- Birth injuries
- Common infections
 - Neonatal sepsis
 - Tetanus neonatorum
 - Ophthalmia neonatorum

3.3 Assessment of the Newborn

Conducting a thorough neonatal assessment is necessary to ensure that the newborn transitions appropriately to extra-uterine life. Skilled observation should begin at the time of birth and continue frequently during the first 24 hours. As a paediatric nurse you should be aware of the normal features of the transition period in order to detect disorders in adaptation soon after birth. The newborn assessment provides much needed information concerning the state of health of the transitioning newborn as well as a basis with which to formulate further care.

Every infant presents uniquely and has certain individual needs. While the vast majority of infants transition without problems, some present with anatomical, physiological, infectious, and developmental issues that must be addressed. The assessment of the newborn should begin with obtaining a health history and include the initial Apgar assessment, the transitional assessment during the periods of reactivity, the assessment of gestational age, and the systemic physical examination. This systematic approach ensures a thorough examination.

The information provided during newborn assessment includes warning signs, which require immediate attention, as well as basic normal assessment findings in the newborn. Due to the large volume of information, this unit will cover only the first 24 hours of life. Let us first look at the terms we will commonly use in this unit.

Definition Of Terms

Adrenaline—another name for epinephrine, the hormone released by the adrenal glands in response to stress. It is the principal blood-pressure raising hormone and a bronchial and intestinal smooth muscles relaxant.

Anemia—A condition in which there is an abnormally low number of red blood cells in the bloodstream. It may be due to loss of blood, an increase in red blood cell destruction, or a decrease in red blood cell production. Major symptoms are paleness, shortness of breath, unusually fast or strong heart beats, and tiredness.

Anesthesia—Treatment with medicine that causes a loss of feeling, especially pain. Local anesthesia numbs only part of the body; general anesthesia causes loss of consciousness.

Apgar score—This is the evaluation of a newborn's physical status, including heart rate, respiratory effort, muscle tone, response to stimulation, and color of skin.

Asphyxia—A condition arising when the body is deprived of oxygen, causing unconsciousness or death; suffocation.

Asphyxia neonatorum—is respiratory failure in the newborn, a condition caused by the inadequate intake of oxygen before, during, or just after birth.

Bradycardia—A slow heart rate, usually under 60 beats per minute.

Cyanosis—this is a bluish tinge to the skin that can occur when the blood oxygen level drops too low.

Hemoglobin—is an iron-containing pigment of red blood cells composed of four amino acid chains (alpha, beta, gamma, delta) that delivers oxygen from the lungs to the cells of the body and carries carbon dioxide from the cells to the lungs.

Hypotonia—this is having reduced or diminished muscle tone or strength.

Hypoxia—is deficiency in the amount of oxygen reaching the tissues.

Neonatal—it refers to the first 28 days of an infant's life.

Oropharynx—is one of the three regions of the pharynx, the oropharynx is the region behind the mouth.

Respiratory failure—is inability to rid the body of CO₂ or establish an adequate blood oxygen level.

Resuscitation—this is bringing a person back to life or consciousness after he or she was apparently dead.

Assessment of the Newborn

Assessment of a new born is done using Apgar Scoring Tool and this is done immediately after birth. Let us now look at Apgar Scoring Assessment Tool. This assessment tool was designed in 1953 by an anesthesiologist named Dr. Virginia Apgar. The purpose of the Apgar test is to determine quickly whether a newborn needs immediate medical care; it was not designed to make long-term predictions on a child's health.

Apgar score is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two, then summing up the five values thus obtained. The resulting Apgar score ranges from zero to 10. The five criteria are summarized using words chosen to form acronym APGAR (A= stands for Appearance, P= stands for Pulse, G= stands for Grimace, A stands for Activity, and R= stands for Respiration). The Apgar score grades the infant's response to extra uterine life in five categories:

- Color
- Heart rate
- Muscle tone
- Reflex irritability
- Respiratory effort

I Now invite you to check figure 3.1on page 73 which looks at the five criteria of APGAR SCORE. This chart will assist you to understand the features that you have to assess in a newborn.

	Score of 0	Score of 1	Score of 2	Component of Acronym
Appearance/Complexion	blue or pale all over	blue at extremities body pink (acrocyanosis)	no cyanosis body and extremities pink	Appearance
Pulse rate	Absent	<100	≥100	Pulse
Reflex irritability	no response to stimulation	grimace/feeble cry when stimulated	cry or pull away when stimulated	Grimace
Activity	None	some flexion	flexed arms and legs that resist extension	Activity
Respiratory Effort	Absent	weak, irregular, gasping	strong, lusty cry	Respiration

Table 3.1: Apgar score

Interpretation of Apgar score

The test is generally done at one and five minutes after birth, and may be repeated later if the score is low and remains low. A low score on the one-minute test may show that the neonate requires medical attention but is not necessarily an indication that there will be long-term problems, particularly if there is an improvement by the stage of the five-minute test. The score of 5-7 is Mild Asphyxia- Apgar Score, the score of 4-6 is Moderate Asphyxia and a score of 0-3 is Severe Asphyxia. Scoring is done at 1 minute, 5 minutes and 10 minutes depending on the condition of the neonate. Read more about classification of asphyxia under the section looking at problems of the newborn – Neonatal Asphyxia.

A score of 10 is uncommon due to the prevalence of transient cyanosis, and is not substantially different from a score of 9. Transient cyanosis is common, particularly in babies born at high altitude.

a) Appearance/Color

You assess this by noting the color of mucous membranes, the trunk, and the soles of the feet. The infant should be pink and not dusky. An infant that is completely pink, including the hands and feet, would be awarded 2 points in this category. An infant that is pink but is acrocyanotic (i.e., has blue hands and/or feet) would receive 1 point. An infant that is blue, gray, or dusky would receive zero points.

b) Pulse rate/Heart rate

You assess this by auscultation of the apical pulsation or by palpating the umbilical cord. A heart rate greater than 100 beats per minute (bpm) is awarded a score of 2 points. A pulse of less than 100 beats per minute gets 1 point. An absent heartbeat would obtain zero points.

c) Reflex irritability

This is noted as the infant reacts to noxious stimulation. An appropriate response to stimuli, such as suctioning or rubbing the soles of the feet, would be for the infant to cry. This response would be awarded 2 points. If the newborn grimaces in response to such stimuli, 1 point would be awarded for effort. If the infant shows no response, then zero points would be awarded.

d) Activity/Muscle tone:

You should consider muscle tone acceptable if the infant's elbows, hips, and knees are flexed and allow active extension of extremities. The infant should return to the gently flexed position after examination. An attitude of flexion is necessary to obtain 2 points. An infant with some flexion should be assigned 1 point. A limp infant would receive zero points.

e) Assessment of the respiratory effort:

You award a score of 2 when an infant has a good cry for respiratory effort. An infant that is making some attempt at breathing but may be categorized as slow or irregular will obtain only 1 point. An irregular breathing pattern, also known as periodic breathing, is a normal finding in some newborns. However, if periodic breathing is associated with nasal flaring, grunting, retractions, cyanosis, or decreased rate, further assessment and intervention may be required. A newborn with an absent respiratory drive will receive zero points.

Physical Assessment

All healthy newborns go through predictable periods of alertness and sleep that should be assessed and taken into consideration when performing the comprehensive physical examination. Distressed infants also progress through these stages but at a much slower rate. These stages are called the first and second periods of reactivity.

The first period of reactivity generally lasts 6 to 8 hours. For the first 30 minutes after birth, the newborn is generally very alert and active. The infant will usually have a vigorous suck reflex during this time, and it is generally an excellent time to begin breastfeeding. The infant will have open eyes and will be interested in looking around. Physiologically, the infant's respiratory rate may be increased and the lungs will sound quite wet. The heart rate may be increased, bowel sounds are active, mucous production is increased, and body temperature may be slightly decreased.

After this initial period of alertness, the newborn will go into a deep sleep that generally lasts from 2 to 4 hours, though it may continue much longer. During this period, the infant is very calm. Ideally, the physical examination should be completed before this time and the infant can

then be left alone to sleep. Physiologically, the infant will experience a decrease in respiratory rate, mucous production, and temperature and will likely not void or pass meconium.

The second period of reactivity, which usually lasts 2 to 5 hours, begins when the newborn wakes from this deep sleep state. The infant is generally very alert once again and showing signs of hunger. This is an excellent opportunity for the infant and family to interact with each other and for the nurse to begin some teaching regarding hunger cues and other ways that the infant may communicate needs. Physiologically, the newborn's heart and respiratory rates increase, the gag reflex is active, and the production of mucous and meconium resumes.

General measurements should be performed on each newborn. Infants who are found to have values outside the accepted range may require further evaluation and treatment. Weight, length, head circumference, and chest circumference measurements allow the nurse to find abnormalities. Plotting these abnormalities provides a quick reference for comparisons with acceptable ranges.

Weight

One of the most important factors in monitoring an infant's fluid balance is weight. Birth weight should be measured soon after birth because the fluid loss that occurs after birth begins fairly rapidly.

Classification of weight may be used independent of gestational age. Extremely low birth weight infants weigh less than 1000 grams, very low birth weight newborns weigh less than 1500 grams, and low birth weight newborns weigh less than 2500 grams. Normal weight in a term newborn ranges from 2500 to 4000 grams.

Another common classification system for identifying birth weight-related risk factors uses the terms large for gestational age (LGA), appropriate for gestational age (AGA), and small for gestational age (SGA) (Table 1). An LGA infant weighs more than the 90th percentile at any given gestational age. At term, an LGA infant would be considered one that weighs more than 4000 grams.

An AGA infant is one that falls anywhere between the 10th and the 90th percentile for his or her given age. At term, this would be any infant weighing between 2500 and 4000 grams. An SGA infant falls below the 10th percentile for his or her gestational age. At term, an SGA infant weighs less than 2500 grams. Infants are categorized as term when they are born between the first day of week 37 to 42 weeks of gestation. Before 37 weeks, the newborn may be considered premature, and after 42 weeks, the newborn should be classified as post-term (Table 3). Correctly categorizing the newborn can aid in determining future risk factors.

Classification	Birth Weight	Percentile
Small for gestational age (SGA)	<2500 g	10th percentile
Appropriate for gestational age (AGA)	2500–4000 g	10th to 90th percentile
Large for gestational age (LGA)	>4000 g	>90th percentile

Table 3.2: Weight and percentile classifications

Classification	Gestation
Premature	<37 weeks
Full-term	37 to 42 weeks
Post-term	>42 weeks

Table 3.3: Gestational age classification

Length

The length of the new born needs to be assessed immediately the baby is born. The most accurate way to measure length is to fully extend the newborn's leg and record the length from the crown of the head to the heel. To establish an accurate measurement, one person should hold the infant in place while another person completes the measurements (figure below).

To ensure accurate measurements, mark the sheet or the paper on which the infant is lying, at the infant's crown and heel. Acceptable newborn length ranges from 48 to 53 cm or 19 to 21 inches. An adjunct to crown-heel measurement is the crown-rump measurement. This particular assessment is useful in determining anatomical abnormalities such as dwarfism.

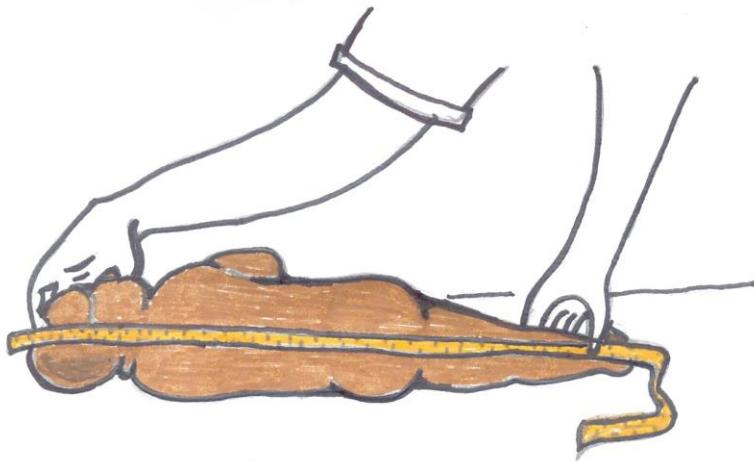


Figure: 3.1...Measurement of length using tape measure

3.4 Problems of the Newborn

The newborn may develop some problems that need attention by a paediatric nurse. Therefore, knowledge of these problems will make you to be competent enough to manage a newborn that has a problem. In this sub-unit, we shall consider the following problems of a newborn:

- Low birth weight
- Prematurity
- Small for dates
- Asphyxia neonatorum
- Respiratory Distress syndrome
- Neonatal Jaundice
- Hypoglycemia
- Hypothermia
- Birth injuries

- Common infections:
 - Neonatal sepsis
 - Tetanus neonatorum
 - Ophthalmia neonatorum

Let us now consider each one of the above mentioned problems of the newborn one by one.

LOW BIRTH WEIGHT (LBW)

Definition This is a neonate with weight of 2.5kg or less regardless of the period of gestation.

Predisposing factors

- Maternal age below 16 and below 35 years
- Short maternal stature
- Poor social – economic status
- Maternal diseases e.g any disease that can reduce blood flow to the placenta. e.g. pre-eclampsia, antepartum hemorrhage, hypertension and renal diseases.
- multiple pregnancies
- Ethnic origins such as Asians have a tendency to have much smaller babies although nutrition may be a complicating factor.
- smoking that increases carbon monoxide in the circulation
- Drug addiction e.g. Heroin, morphine
- nutrition – shortage of food
- fetal causes – intrauterine infections e.g. cytomegalo virus infection, congenital abnormalities

Clinical Features

- Visible muscle wasting with lack of subcutaneous fat.
- Skin is loose and dry often peeling, discoloured with sparsely vernix.
- Ribs are easily seen and the abdomen is narrow.

The head has same proportion with the body. Baby is more active and vigorous than a preterm baby of the same weight.

We will now look at the problems affecting the newborn babies with LBW

Problems Affecting Low Birth Weight

- i. **Asphyxia** – this is caused by subjection to hypoxia prior to labour hence they find it difficult to cope with the additional stress of the birth process.
- ii. **Meconium aspiration** – The effects of hypoxia cause relaxation of the anal sphincter leading to release of meconium into the amniotic fluid. The distressed baby easily develops a reflex gasping and the meconium enters the upper respiratory tract.
- iii. **Hypoglycaemia** – due to decreased hepatic glycogen store and reduced subcutaneous fat stores that are quickly utilized. The baby will present with jitteriness, apnea episodes, lethargy and poor feeding reflexes and untreated hypoglycemia causes brain damage.
- iv. **Infections** – If meconium staining of the skin occurs, it becomes a good media of bacteria multiplication.
- v. **Poor temperature control** - Scanty subcutaneous fat coupled with a large body surface area makes it difficult for these babies to conserve body temperature.
- vi. **Polycythaemia (less common)** – It is due to an increase in haematocrit viscosity and blood flow becomes sluggish.

Management

The management of a neonate with LBW involves investigations, treatment and nursing care. Remember the best nursing management of any patient involves the nursing process.

Investigations

- i. Take history from the mother. Ask about the history of previous pregnancies, e.g. if there were children with congenital disorders.
- ii. Ask about the history of maternal infections like malaria, hypertension, pre-eclampsia, renal disease, syphilis and human immune deficiency virus (HIV)
- iii. Laboratory examination
 - Get blood for Rapid plasma reaction to rule out congenital syphilis.
 - Blood slide if a baby has fever to rule out malaria infection
 - Blood for full blood count to rule out anaemia
 - Blood for Random blood sugar to rule out hypoglycemia.

Medical therapy

- Management normally depends on the outcome of investigations e.g. If hypoglycaemic give dextrose you can also give prophylactic antibiotic.

Nursing management

- The aims of nursing care are; to improve the nutritional status of the baby and to prevent infections to give psychological care to the parents.
- The neonate should be warmed by use of an incubator or use of kangaroo method by the mother. This is done to prevent hypothermia. The environment should be clean to prevent infections because the neonate more susceptible to infection. The environment should be quite, should have enough light and must be well ventilated to promote good rest, recovery and also good air circulation.
- The apical pulse should be checked to rule out tachycardia or bradycardia monitor respiration to make sure that the airway is clear and potent. Check for palmar pectoral to rule out anaemia. Observe the colour of stool, its frequency, consistency to rule out abnormalities like blood and also diarrhoea which can be as a result of malabsorption.
- Counsel relatives close to the mother on the neonate's condition so that they can also help in the care of the child and lessen the anxiety. Counsel the mother on various interventions which may be carried out on the neonate like nasal gastric tube insertion for the purpose of feeding the child.
- Advice the mother to exclusively breast feed the neonate and also teach her its importance in the prevention of hypoglycemia and malnutrition. If the neonate is unable to suck teach the mother on how to express milk and use cup and spoon for feeding. If the child has poor swallowing and sucking reflexes a nasal gastric tube can be inserted for feeding. You can also give 10% dextrose to treat and prevent hypoglycemia. Fluid therapy should be observed and done correctly to avoid overload.

- Change soiled nappies regularly to prevent harboring of infection and skin irritations. If the mother is using cup feeding, all the utensils should be clean at all the time to prevent harboring of microorganisms, which can cause disease to the child. The mother should also make sure that her breasts are clean at all times to prevent the swallowing of microorganisms which may cause diarrhea diseases.
- The opening of bowels should be observed to rule out intestinal obstruction and faecal impaction.

Complications

We will now look at the complications of LBW. Some of the complications are:

- Hepatic jaundice -which is due to the inability of the liver to conjugate bilirubin.
- Compromised immunity as a result of not well developed or not fully functional organs like the liver.
- Hypoglycemic coma – result of mismanaged hypoglycemia.
- Brain damage due to malnutrition or hypoglycemia.

ACTIVITY 3.1 A quick check, Attempt the following

1. Define low birth weight
2. Mention atleast 5 problems of a low birth weight baby

Well done! Check with what was discussed above

Having discussed low birth weight as the first problem of the new born,we will go on and discuss another problem which is prematurity.

PREMATURITY

Definition

Prematurity is a condition in which the baby is born after 28 weeks of gestation but before 37 completed weeks of gestation from the first day of the last normal menstrual period regardless of the birth weight.

Causes

A premature baby maybe born following spontaneous onset of labour or where a complication of pregnancy has necessitated premature intervention. 50% of causes of spontaneous premature labour remain unknown.

However there are numerous predisposing factors some of which are:

a) Maternal factors

- i. Previous history of abortions, preterm births, termination of pregnancy. It is possible that any interference with cervix gives rise to cervical incompetence.
- ii. Maternal age – there is an increase in those less than 20 years and above 35 years of age.
- iii. Maternal illnesses such as amniotic fluid infection, UTI, renal diseases/renal failure, acute febrile conditions e.g. Malaria, heart disease and failure, pre-eclampsia, eclampsia, pregnancy induced hypertension, anemia and diabetes mellitus.
- iv. Social class – mostly found in those in the low socio-economic class, maybe due to overcrowding, poor nutrition, illiteracy, inadequate antenatal care, physical or emotional trauma, poor child spacing, insufficient rest and sleep, heavy workload and bad cultural practices.
- v. Cervical pathology/fibrosis and biopsies
- vi. Uterine abnormalities e.g. bi-cornuate uterus and fibroids. Toxins such as smoking, alcohol and drug abuse. Trauma – falls or heavy blows to the abdomen.

b) Placental factors

- i. Antepartum hemorrhage
- ii. Placenta previa
- iii. Placenta abruptio

c) Fetal causes

- i. Multiple pregnancy
- ii. Congenital abnormalities e.g. hydrocephalus, spinal bifida
- iii. Infections such as syphilis, rubella toxoplasmosis, HIV
- iv. Premature rupture of membranes.

v. Intra uterine growth retardation.

d) Iatrogenic factors

- Incorrect assessment of gestation
- Elective induction

Estimating Gestation Age

a) Dubowitz score – this score measures neurological development and external criteria, but is less used now because margins of error are too wide. It has been found to be accurate method if assessing the gestation age provided it is undertaken within 48 hours of delivery.

b) Ballard score - Measures neurological and physical maturity. It is carried out within 72 hours of delivery.

c) Characteristic of a Preterm Baby

The characteristics of a preterm baby depend on the gestation age.

Length – 49cm, gestation age is less than 37 weeks.

d) Head – circumference is 34cm, skull bones are soft with wide sutures and fontanelles.

The head is large in proportion to the body with a small triangular face which appears worried. Hair is soft and silky and individual strands are relatively wide for the small head. Eyes are

Activity 3.2 – *In your notebook, in your own words state the general causes of prematurity.*

Well done! Now compare your notes with the ones you have studied in the discussion

usually closed. Ears are small and cartilage is soft and the pinna stays folded prior to 34 weeks.

e) Skin and subcutaneous tissue

Skin is thin, red, easily broken and appears wrinkled due to lack of subcutaneous tissue.

Body structures (blood vessels) are easily seen with poorly developed skin creases. Lanugo is plentiful with sparse vernix caseosa. Breast nodules are small or absent (depending on gestation).

Short and soft easily broken nails.

f) Respiratory system

Thoracic cage is relatively small. Breathing is abnormal, usually irregular and shallow with periods of apnea. Cough reflex is weak or absent. Nostrils are small and easily blocked. Crying maybe weak.

g) Abdomen

The abdomen is relatively large and distended. The viscera can be palpated through the thin wall. Umbilicus looks low set with plenty of Wharton's jelly.

h) Genitalia

Males – testes maybe felt in the inguinal canal by 32 weeks and in the scrotum by 36 weeks.

There is little or no rugae on the scrotum.

Female – clitoris and labia minora are prominent and labia majora are poorly developed.

i) Neurological system

- **Reflexes** – sucking is present but weak before 32 weeks. Grasping is noted 28 weeks and is well established after 34 weeks.
- **Posture** - The baby is lethargic and lies in a frog like position due to generalized hypotonia (poor muscle tone).
- **Behaviour** - The baby sleeps most of the day but often stretches yawns and is drowsy

j) Problems of preterm babies

Problems occur largely as a result of immaturity of organs and are as follows:

a) Maintaining respirations

Poor respiratory function due to inadequate surfactant production and poor cough reflex. Signs are tachypnea, nasal flaring, grunting respiration, apnea and xiphoid and intercostal retraction. Apnea and asphyxia are due to immature respiratory center in the central nervous system.

b) Thermo regulation

The preterm baby is very small and can easily lose heat due to;
Immaturity of heat regulating center.
Inadequate storage of brown fat in utero
Poor generation of heat due to reduced activity.
Evaporation heat loss due to open posture adopted by preterm babies.

c) Maintaining nutrition

Hypoglycemia is common due to inadequate storage of glycogen in utero.
Inadequate nutritional intake due to poor or absent sucking reflex.
Any condition that increase their metabolic rate.
Signs include; apnea, tremors, twitching, sweating, cyanosis, refusal to feed and coma.

d) Prevention of infection

Preterm babies are vulnerable to infection due to;
Vulnerability of host defense system.
Little immunity received from mother in utero.
Exposure to invasive procedures and hospital organisms.
Signs of sepsis include; low or high temperature, lethargy, irritability, poor feeding and respiratory distress.

e) Neonatal jaundice

The preterm baby is at risk of developing jaundice due to immaturity of the liver. It may result from;
Reduced hepatic function with immature enzyme system and reduced glucuronyl transferase.

f) Hypoalbuminemia

Signs include; yellow discoloration of the skin and mucous membranes, irritability and lethargy.

g) Bleeding tendencies

This is due to lack of vitamin K and soft thin skin.

Management of a Preterm Baby

i. Maintenance of respirations

Respiratory interventions needed may vary from oxygen hood to mechanical ventilation.

Assess the baby's respiratory status. Consider cause of apnea if present. Keep the baby warm and well hydrated. Administer oxygen 30-40% by the most appropriate method e.g. by hood, but avoid prolonged use of oxygen to prevent retinal damage.

Surfactant maybe given to the very immature babies 50-100mg/kg stat. Monitor vital signs closely and blood gases minimize too much handling to reduce oxygen demands by the tissues leading to disturbed respirations and tachypenic attacks. Position the baby in lateral position for oxygenation and raise the foot end of the incubator to aid drainage of secretions.

ii. Management of thermo regulatory problems

Gestation age and weight will influence the type of care to be given. If less than 2kg, incubator care is indicated with temperature at 30-34 degrees and at 36-37 degrees for babies less than 1.5kg and humidity of 65%. Cot care is used for babies weighing 2kg and above. Surface of the cot mattress should be lined with cot bed sheet to prevent loss of heat through conduction if left to lie on cold surface. The incubator should always be left closed to prevent cold air or draught. Where there are no incubators, hot water bottles, electric blankets or loose flannel can be used Kangaroo care maybe used to provide warmth Temperature of the baby, room and incubator should be monitored closely.

iii. Maintaining nutrition

The baby should not be unduly starved unless the condition is not stable. NG tube can be inserted just to aspirate gastric contents before introducing feeds. If the condition is stable early feeds are

given 8-12 hours after delivery to prevent hypoglycemia. The feeds can either be by breast feeding, tube feeding or IV fluids 60mls/kg/24hours. Nasogastric tube feeds are given 1-5mls/feed/2hourly. The baby should get 60mls/kg on day one. The feeds are first given in small amounts at first 0.5mls 6hourly, 4hourly then 2hourly and then continue with 20mls increment per day as the baby tolerates. Blood sugar levels should be monitored by heel stick samples. IV fluids should be discontinued when oral intake exceeds 90mls/kg/day. Note signs of readiness for nipple feeding like rooting, sucking and presence of gag reflex with no apneic spells.

iv. Prevention of infection

Scrupulous hand washing with soap and by everyone handling the baby is the best way to prevent infection. The environment should be kept clean by mopping the floor and dump dusting every day. Use of gowns when handling the baby and restricting visitors also reduces infection. Clean incubators, equipment, and linen should be used at all times. The midwife should not only be experienced but should have quality of patience, devotion and observant to notice any signs of infection. Ensure aseptic technique when doing sterile procedures e.g. commencing IV fluids, injection administration. Sick babies should be isolated. Maintain warmth and nutritional status. Preterm babies are potentially infected, they are managed on antibiotics like Cephotaxime 50mg/kg BD or Ciprobid 25mg/kg BD to prevent infection. Top and tail bath is done to promote hygiene.

Blood for culture is done to detect causative organisms for infections.

v. Management of jaundice

The goals of treatment is to prevent kernicterus. Place the baby on phototherapy to treat jaundice. Observe the skin, sclera and mucous membrane to note reduction or deepening of jaundice. Observe the baby for signs of kernicterus e.g. lethargy and convulsions. Treat all infections promptly to prevent jaundice. Phenobarbitone 20mg/kg is given to mature the liver enzyme. Monitor bilirubin levels according to the hospital policy.

vi. Assessment of progress of condition and growth

This is done through accurate observations of the baby. Respirations are first done 2 hourly then 4 hourly. Take note of the rate, apneic attacks, tachypnea and any rib recessions. Observe for

grunting respirations. **Colour** – observe the colour of the baby for cyanosis or jaundice and any pallor or greyish colour, which may signify infection.

Heart beat – apex beat is counted 2 hourly and 4 hourly taking note of the rate, rhythm and volume. Note any tachycardia and bradycardia. Observe abdominal distension and edema of legs, face, bowel and bladder function. Frequent loose stools are associated with infection and absence of urine in the first 24 hours should be reported.

Amount of feeds given should be taken note of and any vomiting of feeds should be reported. Blood for HB at birth should be checked then weekly to exclude anemia. Weight should be checked twice weekly. Observe signs of infection e.g. rash, discharging eyes and cord.

vii. Discharge plan

Orient the mother/father to the ward and help build the bond between the baby and mother. Involve them in the care of the baby during hospital stay so that they gain the skill to continue the care at home. Counsel them on the care of the baby e.g. feeding, warmth, hygiene and medical reviews. Plan to discharge the baby when; Parents are competent to continue care on their own. When the baby is constantly gaining weight at 10-30grams/day. When the baby maintains a stable temperature in an open crib. Feeding well on the breast. Educate the mother on prevention of infection whilst in the hospital so that she can be able to carry on at home such as: hand washing, changing soiled linen, minimizing visitations. Discuss with the mother the importance of taking the baby for children's clinic for growth monitoring and immunization. Educate her on identification of signs of infection e.g. fever, failure to feed, foul smelling diarrhoea. Advise the woman to bring the baby for weekly weight checking so that the baby is closely monitored. Advise her on the importance of practicing exclusive breast feeding. She should keep the review date and if the baby falls sick or something goes wrong, she should take to the nearest clinic for advice.

Complications of prematurity

- i. Asphyxia neonatorum – due to immature respiratory center.
- ii. Respiratory distress syndrome – due to lack or insufficient surfactant.
- iii. Necrotizing enterocolitis – due to destruction of intestines by bacteria or hypoxia.
- iv. Retinopathy of prematurity – due to damage of the immature blood vessels by too much arterial oxygen.

- v. Kernicterus – due to accumulations of bilirubin in circulation.
- vi. Hypoglycemia – due to low glycogen stores.
- vii. Infection – low immunity due to less effective immunoglobulin and white cell reaction.
- viii. Anemia – due to inadequate iron stores, hemorrhagic disease and iatrogenic causes.
- ix. Poor mental and intellectual development.
- x. Heart failure or pulmonary failure due to poor circulation.
- xi. Inhalation pneumonia – due to poor or absent cough or swallowing reflex.
- xii. Intracranial birth injuries – due to extreme vascularity of the germinal layer around the ventricles which get hemorrhagic on slight trauma.

Prevention of prematurity

Pre-conceptual

- Raising public awareness about the scope of the problem and its significance as a major contributor to infant mortality.
- Educate against undergoing repeated uterine instrumentation.
- Educate about importance of good diet/nutrition.
- Pre-conceptual intake of folic acid to reduce birth defects.

Activity 3.3 – *In your notebook, state five complications of prematurity;*

Well done! Now compare your notes with the ones you have studied in the discussion

- Reduce smoking before conception.
- Screening of risk factors such as Diabetes mellitus, anemia and heart conditions and treat them or reduce them.

During pregnancy

- Good antenatal care – regular and careful supervision to identify those at risk and refer for further investigations and management.

- Vitamin supplementation
- Routine ultra sound examination of length of cervix to identify client at risk.
- Administering progesterone to relax uterine muscles and maintain cervical length.
- Cervical cerclage to prevent cervical shortening

In labour

- Rest
- Drugs – Dexamethasone should be given to pregnant mothers for a minimum of 48 hours when she goes into premature labour to improve availability of surfactant.

Let us now look at small for dates

SMALL/LIGHT FOR DATES BABY

Small for gestational age (SGA) babies are those who are smaller in size than normal for the baby's sex and gestational age, most commonly defined as a weight below the 10th percentile for the gestational age.

Terminology

Not all fetuses that are SGA are pathologically growth restricted and, in fact, may be constitutionally small. If small for gestational age babies have been the subject of intrauterine growth restriction (IUGR), formerly known as intrauterine growth retardation, the term **SGA associated with IUGR** is used.

Intrauterine growth restriction (IUGR) refers to a condition in which a fetus is unable to achieve its genetically determined potential size. This functional definition seeks to identify a population of fetuses at risk for modifiable but otherwise poor outcomes. This definition intentionally excludes fetuses that are small for gestational age (SGA) but are not pathologically small.

A related term is Low birth weight (LBW), defined as a infant with a birth weight (that is, mass at the time of birth^[4]) of less than 2500 g (5 lb 8 oz), regardless of gestational age at the time of birth. Related definitions include Very Low Birth Weight (VLBW) which is less than 1500 g,

and Extremely Low Birth Weight (ELBW) which is less than 1000 g. Normal Weight at term delivery is 2500 g - 4200 g.

SGA is not a synonym of LBW, VLBW or ELBW. Example: 35 week gestational age delivery, 2250g weight is appropriate for gestational age but is still LBW. One third of low-birth-weight neonates - infants weighing less than 2500g - are small for gestational age.

There is an 8.1% incidence of low birth weight in developed countries, and 6–30% in developing countries. Much of this can be attributed to the health of the mother during pregnancy. One third of babies born with a low birth weight are also small for gestational age. Maternal serum of Vitamin D (25-OH) are associated with SGA.

Diagnosis

The condition is determined by birth weight and/or length. A related condition, IUGR, is generally diagnosed by measuring the mother's uterus, with the fundal height being less than it should be for that stage of the pregnancy. If it is suspected, the mother will usually be sent for an ultrasound to confirm.

Predetermining factors

Not all fetuses that are SGA are pathologically growth restricted and, in fact, may be constitutionally small. The risk factors for and etiologies of pathological SGA can be broadly divided into 3 categories-

- Fetal
- Maternal
- Placental

The primary risk factor is that development of the placenta is insufficient to meet the demands of the fetus, resulting in malnutrition of the developing fetus. There are numerous contributing factors of both environmental and genetic origin:

- Environmental factors such as poor nutrition, maternal tobacco smoking, drug addiction or alcoholism
- Severe anaemia (although hydrops may also occur)

- Thrombophilia (tendency for thrombosis)
- Prolonged pregnancy
- Pre-eclampsia
- Chromosomal abnormalities
- Diabetes Mellitus
- Connective Tissue Disease/Disorders (Systemic Lupus Erythematosus), Ehlers-Danlos Syndrome
- Damaged or reduced placental tissue due to:
 - Chronic renal failure
 - Sickle cell anemia
 - Phenylketonuria
- Infections such as rubella, cytomegalovirus, toxoplasmosis or syphilis
- Twins and multiple births.

ACTIVITY 3.4 Write the following in your note book

1. Definition of small for dates
2. Mention the risk factors for small for dates

Well done! Compare your answers with what was discussed above

Categories of growth restriction

There are two distinct categories of growth restriction, indicating the stage at which the development was slowed. Small for gestational age babies can be classified as having symmetrical or asymmetrical growth restriction. Some conditions are associated with both symmetrical and asymmetrical growth restriction.

Symmetrical growth restriction, less commonly known as global growth restriction, indicates that the fetus has developed slowly throughout the duration of the pregnancy and was thus affected from a very early stage. The head circumference of such a newborn is in proportion to the rest of the body. Common causes include:

- Early intrauterine infections, such as cytomegalovirus, rubella or toxoplasmosis
- Chromosomal abnormalities

- Anemia
- Maternal substance abuse (prenatal alcohol use can result in Fetal alcohol syndrome)

Asymmetrical growth restriction occurs when the head grows at a normal or slightly reduced rate but the body grows at a much slower rate. Such babies have a disparity in their length and head circumference when compared to the birth weight, hence the term "asymmetrical." In these cases, the embryo/fetus has grown normally for the first two trimesters but encounters difficulties in the third, usually secondary to pre-eclampsia. A lack of subcutaneous fat leads to a thin and small body out of proportion with the head. Other symptoms include dry, peeling skin and an overly-thin umbilical cord. The baby is at increased risk of hypoxia and hypoglycaemia.

Causes include:

- Chronic high blood pressure
- Severe malnutrition
- Genetic mutations, Ehlers–Danlos syndrome

Treatment

90 percent of babies born SGA catch up in growth by the age of 2. However, all SGA babies should be watched for signs of Failure-to-Thrive (FTT), hypoglycemia and other conditions common to SGA babies (see below). Hypoglycemia is common in asymmetrical SGA babies because their larger brains burn calories at a faster rate than their usually limited fat stores hold. Hypoglycemia is treated by frequent feedings and/or additions of cornstarch-based products (such as Duocal powder) to the feedings. For the 10 percent of those that are SGA without catchup growth by the age of 2, an endocrinologist should be consulted. Some cases warrant growth hormone therapy (GHT).

There are some common conditions and disorders found in many that are SGA (and especially those that are SGA without catchup growth by age 2). They should be treated by the appropriate specialist:

- Gastroenterologist - for gastrointestinal issues such as: reflux (GERD) and/or delayed gastric emptying (DGE)

- Dietitian - to address caloric deficits. Dietitians are usually brought in for cases that include FTT
- Speech Language Pathologist (SLP) or Occupational Therapist (OT) - for feeding issues. OTs may also treat sensory issues
- Behaviorist - for feeding issues, a behavioral approach may also be used, but usually for older children (over 2)
- Allergist - to diagnose or rule out food allergies (not necessarily more common in those SGA than the normal population)
- Ear, Nose and Throat doctor (ENT) - to diagnose enlarged adenoids or tonsils (not necessarily more common in those SGA than the normal population)

For IUGR (during pregnancy), possible treatments include the early induction of labor, though this is only done if the condition has been diagnosed and seen as a risk to the health of the fetus.

ASPHYXIA NEONATORUM

Introduction

Asphyxia neonatorum is also called birth or newborn asphyxia, is defined as a failure to start regular respiration within a minute of birth. Asphyxia neonatorum is a neonatal emergency as it may lead to hypoxia (lowering of oxygen supply to the brain and tissues) and possible brain damage or death if not correctly managed. Newborn infants normally start to breathe without assistance and usually cry after delivery. By one minute after birth most infants are breathing well. If an infant fails to establish sustained respiration after birth, the infant is diagnosed with asphyxia neonatorum. Normal infants have good muscle tone at birth and move their arms and legs actively, while asphyxia neonatorum infants are completely limp and do not move at all. If not correctly managed, asphyxia neonatorum will lead to hypoxia and possible brain damage or death.

DEFINITION

This is failure of the baby or infant to breathe at birth or failure to initiate and sustain breathing at birth.

Etiology

Anything that affects a baby's ability to take in oxygen can be associated with asphyxia neonatorum. The Causes of asphyxia neonatorum include:

- The baby's airway becomes blocked
- The baby is anemic and his or her blood cells do not carry enough oxygen
- Delivery that lasts too long or is very difficult
- The mother does not get enough oxygen before or during birth
- The mother's blood pressure is too high or low during delivery
- An infection that affects the mother or baby
- The placenta separates from the uterus too quickly, resulting in loss of oxygen
- The umbilical cord becomes improperly wrapped around the baby

Classification

Asphyxia neonatorum is classified into three. These are as follows:

- **Mild Asphyxia- Apgar Score is 5-7**

Here the neonate attempts to breath, has some flexion of the limbs or fair to good muscle tone, shows minimal grimace, slow heart rate but the baby is cyanosed

- **Moderate Asphyxia- Apgar Score is 4-6**

The neonate's Heart beat is 100 beats per minutes or more. However, has low or irregular respiratory effort and some flexion of limbs. The neonate shows minimum grimace and the colour is pale/blue

- **Severe Asphyxia- Apgar Score is 0-3**

Here the neonate has slow, irregular respiratory effort or makes no attempt to breath. The neonate shows flexion of limbs or has poor muscle tone and no response to stimulus. The body is pale blue or grey and the heart beat is less than 100 beats per minute. It is called asphyxia pallida because this is where you find apnea and pallor

Pathophysiology

The heart and the brain need good oxygen supply to function well. The normal PH in the fetus or neonate is from 7.30 to 7.35 which shows that blood is slightly alkaline tissue. When PH falls

blood becomes acidic and this leads to acidosis which means there is excessive hydrogen ions in the body and this is related to a ratio of carbon dioxide to bicarbonates. Reduced oxygen will lead to increased carbon dioxide and reduction in PH

This will stimulate the respiratory centre. Further reduction of oxygen leads to utilization of alternative metabolic path ways of anaerobic glycolysis and these results in exhaustion of glycogen reserves and this produces metabolic acidosis. This leads to depressed cerebral function and even permanent damage to the brain despite the infants BP been maintained. Such an infant is cyanosed and apneic= asphyxia livida.

Increased hypoxia leads to circulatory collapse. This baby passes to a phase called Asphyxia pallid. Brain damage begins after 8 minutes of total asphyxia and is maximum after 12-13 minutes. The baby may not die but will develop a lot of complications.

Predisposing Factors

Fetal

- i. Blockage of airway by mucus, meconium, blood or liquor.
- ii. Prematurity
- iii. Congenital abnormalities
- iv. Intra uterine infections
- v. Intra uterine growth retardation

Maternal

- i. Pre-eclampsia
- ii. Eclampsia
- iii. Chronic nephritis
- iv. Diabetes Mellitus
- v. Prolonged labour

Placental

- Ante Partum Haemorrhage
- Infarctions

Activity 3.5 – In your note book, outline the three classifications of asphyxia neonatorum

Well done! Compare your answers with what you covered under definition of terms

- Diseases such as syphilis

Umbilical Causes

- Cord presentation
- Cord prolapse
- Cord compression
- True knots

Drugs

- Valium
- Pethidine
- Morphine taken by the mother
- Anaesthesia
- Misuse of oxytocin in labour

Clinical Presentation

- Bluish or grey skin color (cyanosis),
- Slow heartbeat (bradycardia)
- Stiff or limp limbs (**hypotonia**) a poor response to stimulation.

- Let us now look at how a baby with Asphyxia neonatorum can be managed

MANAGEMENT

Objectives: The following are the objectives of management of a baby with Asphyxia neonatorum

- To establish and maintain a clear air way
- To ensure effective blood circulation
- To correct the acidosis
- To prevent hypothermia, hypoglycaemia and haemorrhage
- To prevent infections in the new born

Medical management

Diagnosis

Assessment objectively assessed using the Apgar score (a recording of the physical health of a newborn infant, determined after examination of the adequacy of respiration, heart action, muscle tone, skin color, and reflexes. Normally, the Apgar score is of 7 to 10). Infants with a score between 4 and 6 have moderate depression of their vital signs while infants with a score of 0 to 3 have severely depressed vital signs and are at great risk of dying unless actively resuscitated.

Treatment

The treatment for asphyxia neonatorum is resuscitation of the newborn. All medical delivery rooms need to have adequate resuscitation equipment should an infant not breathe well at delivery.

Resuscitation

If stimulation fails to initiate regular respiration in the newborn, attempt resuscitation by firstly gently suction the oropharynx—the area of the throat at the back of the mouth, with a soft catheter. When stimulation and a clear airway do not result in adequate respiration, then 100 percent oxygen via a face mask should be given. If the infant is still not breathing, some form of artificial ventilation is then required. The usual method is to use mask ventilation with a resuscitator. The mask is applied tightly to the infant's face. If this procedure fails, the infant can

be intubated with an endotracheal tube to which the resuscitator can then be connected. The more severe the fetal asphyxia, the longer it will take before the infant starts to breathe spontaneously.

If the infant does not breathe despite adequate ventilation, or if the heart rate remains below 80 beats per minute, the physician can give an external cardiac massage using two fingers to depress the lower sternum at approximately 100 times a minute while continuing with respiratory assistance. Adrenaline may also be administered to increase cardiac output. Once the infant starts breathing, he or she is transferred to a nursery for observation and further assessment. Temperature, pulse and respiratory rate, color, and activity are recorded, and blood glucose levels checked for at least four hours.

Treatment may also include the following:

- medications to support the baby's breathing and sustain blood pressure
- Extracorporeal Membrane Oxygenation (ECMO)
- ECMO is a technique similar to a heart-lung bypass machine, which assists the infant's heart and lung functions with use of an external pump and oxygenator.

Nursing Management

Subsequent Care

After baby has been resuscitated it should be shown to the mother for identification.

Environment

Baby will be nursed in a room within labour ward where all necessary resuscitative equipment will be available. If the condition of the baby is stable after resuscitation then it should be given to the mother to put skin to skin against her body for warmth. If baby's condition is not very stable then the baby will be transferred to special baby care unit where it will be nursed in an incubator for easy observations and the incubator for warmth.

Observation

Apgar score will be used to observe the baby's vital signs to see if there is any improvement in the general condition of the baby. This assessment will be done every 5 minutes thereafter until 2

successful scores 8 or greater. Respirations will be assessed for the pattern of breathing and to see if there is any improvement in the breathing of which the normal rate is 30-60 breaths/minute.

The skin of the baby will be checked for cyanosis which indicates low oxygen supply to the tissues. The skin will also be checked for any signs of bleeding, Jaundice and if there is it is meconium stained (indication that at some point in utero baby was stressed and passed meconium). The baby will be assessed for any abnormalities that may need urgent medical attention. Dextrostix test will be done every 4 to 6 hours to check if baby is going into hyper or hypoglycaemia. If baby has iv line it will be monitored that it is in situ. Baby will be checked if it has opened the bowels then colour, consistence and frequency will be noted. It will be observed for irritability which could be due to brain damage resulting from lack of oxygen supply to the brain.

Prevention of Hypothermia

Baby should be well covered and the environment should be warm to prevent hypothermia. The mother will be encouraged to put the baby skin to skin against her body to facilitate mother baby bonding.

Hygiene

Top and tail will be done to prevent hypothermia and when condition improves a big bath will be given to promote hygiene and comfort. Eye care and cord care will be done for baby's hygiene and prevent infections. Baby's napkins will be changed whenever soiled.

Nutrition

The mother will be encouraged to breastfeed in the first hour if condition allows, if not a cup and spoon will be used. The mother will be asked to express the milk which will be given to the baby.

Medication

After resuscitation the baby may be put on phenobarbitone to prevent convulsions and this will be administered according to the doctor's prescription.

Information, Education and Communication

Condition of the baby

The condition of the baby will be explained to the mother depending on the degree of asphyxia. The mother will be told about some effects of asphyxia such as delaying in the development of milestones. She will be informed that the milestones may delay for example the baby may experience late sitting, walking or talking. Therefore; she has to be patient with the baby and she should not anxious but should give the baby enough time to develop. She will be advised to be monitoring the baby closely and note any abnormalities in the baby such as convulsions and irritability. She should also monitor the type of cry.

Care at home

The mother will be advised to take care of the baby properly at home. Both parents will be encouraged to show love to the baby as this facilitates growth and development of the baby. The mother will be encouraged to bathe the baby to remove dirt and promote baby's comfort, breastfeed baby on demand, protect baby from falls by not allowing little children to hold the baby. The mother will also be advised to protect the baby from cold by covering the baby with warm blankets to prevent complications such as hypothermia.

Infection prevention

To prevent infections to the baby the mother will be advised on the following:

- To clean the umbilical stump until it gets healed
- To wash hands every after changing baby's napkin
- To clean the breasts before giving it to the baby
- To clean and dust the room where baby is being kept
- To bathe and change baby's clothes everyday

Nutrition

Mother will be advised to exclusively breastfeed the baby and not to give baby any liquids apart from breast milk. She will be told that breast milk contains all necessary nutrients that the baby needs for growth and development.

Need for immunization

The mother will be enlightened on the immunization schedule. She will be advised that the baby needs to receive polio zero before the 13th day of life. She will also be advised on other vaccines such as BCG, DPT –HepB – Hib and Measles that the baby is supposed to receive to protect baby from childhood illnesses.

Cord care

Mother will be shown how to clean the cord at home to prevent infection on the umbilical area. She will be advised to clean the stump well with pre- boiled cooled water and not to put any substances such as powder, soil or cow dung on the stump as these can be a source of infection.

Prevention

Anticipation is the key to preventing asphyxia neonatorum. It is important to identify fetuses that are likely to be at risk of asphyxia and to closely monitor such high-risk pregnancies. High-risk mothers should always give birth in hospitals with neonatal intensive care units where appropriate facilities are available to treat asphyxia neonatorum. During labor, the medical team must be ready to intervene appropriately and to be adequately prepared for resuscitation.

Prognosis

The prognosis for asphyxia neonatorum depends on how long the new born is unable to breathe. For example, clinical studies show that the outcome of babies with low five-minute Apgar scores is significantly better than those with the same scores at 10 minutes. With prolonged asphyxia, brain, heart, kidney, and lung damage can result and also death, if the asphyxiation lasts longer than 10 minutes.

Alternative treatment

Giving the antenatal mothers extra amounts of oxygen before delivery. If an inadequate supply of oxygen from the placenta is detected during labor, the infant is at high risk for asphyxia, and an emergency delivery may be attempted either using forceps or by cesarean section.

We have a number of new born problems and so far you have looked at four. The fifth one you are going to study is Respiratory Distress syndrome.

RESPIRATORY DISTRESS SYNDROME

Infant respiratory distress syndrome (IRDS), also called neonatal respiratory distress syndrome or respiratory distress syndrome of newborn, previously called hyaline membrane disease (HMD). RDS is used to describe any infant who develops a respiratory rate of above 60/minute, has difficulty in breathing as shown by the retraction of the sternum and lower costal margin or dilatation of the nares, has an expiratory grunt and has central cyanosis.

Cause

- Lack of surfactant

Predisposing Factors

- Pre-term babies
- Neonatal asphyxia

Pathophysiology

The lungs of infants with respiratory distress syndrome are developmentally deficient in a material called surfactant, which helps prevent collapse of the terminal air-spaces (the future site of alveolar development) throughout the normal cycle of inhalation and exhalation. Surfactant is a complex system of lipids, proteins and glycoproteins which are produced in specialized lung cells called Type II cells or Type II pneumocytes.

The surfactant is packaged by the cell in structures called lamellar bodies, and extruded into the air-spaces. The lamellar bodies then unfold into a complex lining of the air-space. This layer reduces the surface tension of the fluid that lines the air-space. Surface tension is responsible for approximately 2/3 of the elastic recoil forces. In the same way that a bubble will contract to give the smallest surface area for a given volume, so the air/water interface means that the liquid surface will tend towards being as small as possible, thereby causing the air-space to contract.

By reducing surface tension, surfactant prevents the air-spaces from completely collapsing on exhalation. In addition, the decreased surface tension allows re-opening of the air-space with a lower amount of force. Therefore, without adequate amounts of surfactant, the air-spaces collapse and are very difficult to expand. Microscopically, a surfactant deficient lung is characterized by collapsed air-spaces alternating with hyper-expanded areas, vascular congestion and, in time, hyaline membranes.

Hyaline membranes are composed of fibrin, cellular debris, red blood cells, rare neutrophils and macrophages. They appear as an eosinophilic, amorphous material, lining or filling the air spaces and blocking gas exchange. As a result, blood passing through the lungs is unable to pick up oxygen and unload carbon dioxide. Blood oxygen levels fall and carbon dioxide rises, resulting in rising blood acid levels and hypoxia.

Structural immaturity, as manifest by decreased number of gas-exchange units and thicker walls, also contributes to the disease process. Therapeutic oxygen and positive-pressure ventilation, while potentially life-saving, can also damage the lung. The diagnosis is made by the clinical picture and the chest x-ray, which demonstrates decreased lung volumes (bell-shaped chest), absence of the thymus (after about 6 hours), a small (0.5–1 mm), discrete, uniform infiltrate (sometimes described as a "ground glass" appearance) that involves all lobes of the lung, and air-bronchograms (i.e. the infiltrate will outline the larger airways passages which remain air-filled). In severe cases, this becomes exaggerated until the cardiac borders become inapparent (a 'white-out' appearance).

Signs and Symptoms

- Expiratory grunting
- Cyanosis
- Increase in hypoxia
- Lethargic
- Reduced air entry on auscultation
- Apneic spells

ACTIVITY 3.6 IN YOUR NOTE BOOK, STATE THE CAUSE AND LIST THE SIGNS AND SYMPTOMS OF RDS

Well done. Compare with the notes in the discussion on the cause and signs and symptoms.

Assessment of the child with RDS

Silverman's retraction scoring is a system for evaluation of breathing performance of premature infants and neonates with RDS. Like the Apgar system it evaluates five parameters and assigns a numerical score for each parameter. However, unlike the Apgar score, the lower the total scores the better the neonate in the Silverman-Anderson system. The best score possible in each category is a "0" the worst is a "2". Parameters assessed are: retractions of the upper chest, lower chest, and xiphoid, nasal flaring, and expiratory grunt.

Score	0	1	2
Upper Chest Retractions	synchronized	lag on inspiration	see-saw movement
Lower Chest Retractions	none	just visible	marked
Xiphoid Retractions	none	just visible	marked
Nasal Flaring	none	minimal	marked
Expiratory Grunting	none	stethoscope only	naked eye and ear

Table 3.4: Silverman score

Note The less the score the mild the condition. The higher the score the severe the condition.

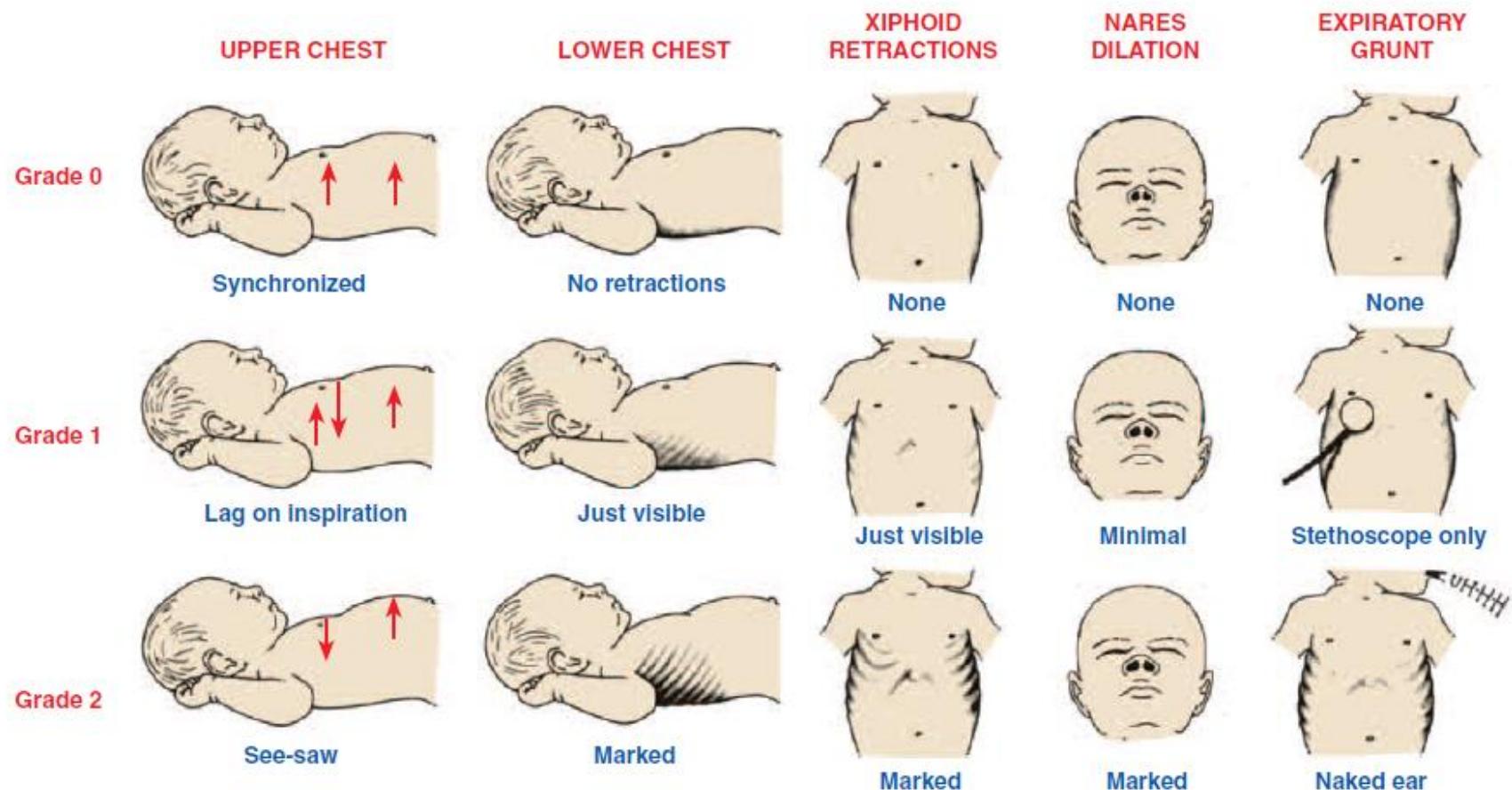


Figure 3.2: Figure showing Criteria for evaluating respiratory distress.

Source “Wong's Nursing Care of Infants and Children 8th edition”

MANAGEMENT

Aims:

- To promote ventilation/respirations
- To maintain a clear and patent airway
- To prevent hypoglycemia
- To prevent hypothermia
- To prevent infection

Investigations

History – may indicate preterm birth (before 28 weeks gestational), maternal history may include diabetes or antepartum hemorrhage. Baby may be premature and born by caesarian section.

Physical examination and Clinical picture – infant may present with nasal flaring, respiratory grunting, cyanosis and chest in drawing.

Aterial blood gas analysis - shows a diminished PaO₂ level, increased PaCO₂ level and reduced pH. (This is a combination of metabolic and respiratory acidosis).

Chest x-ray - which demonstrates decreased lung volumes (bell-shaped chest), absence of the thymus (after about 6 hours), a small (0.5–1 mm), discrete, uniform infiltrate (sometimes described as a "ground glass" appearance) that involves all lobes of the lung. Fine reticulonodular pattern and dark strikes indicating air fields may be evidenced, with diffused hyper distended bronchioles.

Air-bronchograms (i.e. the infiltrate will outline the larger airways passages which remain air-filled). In severe cases, this becomes exaggerated until the cardiac borders become inapparent (a 'white-out' appearance).

Before delivery of the infant

Lecithin-sphingomyelin ratio ("L/S ratio") helps to assess prenatal lung development and RDS risk. For the L/S ratio, if the result is less than 2:1, the fetal lungs may be surfactant deficient.

The presence of phosphatidol glycerol (PG) - usually indicates fetal lung maturity.

Surfactant/albumin (S/A) ratio. For the S/A ratio, the result is given as mg of surfactant per gm of protein. An S/A ratio <35 indicates immature lungs, 35-55 is indeterminate, and >55 indicates mature surfactant production (correlates with an L/S ratio of 2.2 or greater).

Treatment

A radiant warmer for thermo regulation. Oxygen is given with a small amount of continuous positive airway pressure – to reduce the concentration of carbon dioxide in the blood. Intravenous fluids and sodium bicarbonate are administered to stabilize the blood sugar, blood salts, and blood pressure, control acidosis and maintain fluid and electrolyte balance.

If the baby's condition worsens, an endotracheal tube (breathing tube) is inserted into the trachea and intermittent breaths are given by a mechanical device. An exogenous preparation of surfactant, either synthetic or extracted from animal lungs, is given through the breathing tube into the lungs – Survanta,

Nil Per Oral first 24hrs to 48hrs. Dextrose 5% or 10% to control hypoglycemia. Tube feeding or total parenteral nutrition to maintain adequate nutrition since the neonate may be too weak to eat.

Drug therapy

Pancuronium Bromide (which paralyses muscles to prevent spontaneous respirations during ventilation). Prophylactic antibiotics to prevent infection, such as Benzyl penicillin 50,000 IU QID for 5 days. Diuretics to reduce pulmonary edema. Synthetic surfactant to prevent atelectasis. Vitamin K – to control bleeding tendencies. Vitamin E to prevent complications associated with oxygen therapy. Before delivery of the infant, corticosteroids administered maternally to stimulate production of surfactant in fetus at high risk of preterm birth.

Nursing Care

Nurse the infant in a well clean environment with acceptable temperature preferably in an incubator to promote recovery. The environment must be safe from hazardous equipment and micro-organisms to prevent injuries and infections respectively. The environment must be quiet to promote rest.

Explain disease process to the parents. Allow parents to participate in the care of their baby to promote bonding. Explain the function of respiratory devices and equipment to allay their anxieties. Inform parents that recovery may take long and reassure them without giving false hopes. Arrange follow-up care with neonatal ophthalmologist to assess retinal damage.

Allow the baby to have enough rest to promote recovery. Advise the parents not to be disturbing the infant while asleep. Ensure the environment is free from noise to allow the baby to rest.

Monitor arterial blood gas levels. Use pulse-oxymeter to monitor SaO₂ levels. Assess skin color regularly. Assess rate and depth of respirations. Assess severity or retraction (chest in drawing), nasal flaring, frequency of expiratory respiratory grunting and restlessness. Watch for abnormal central nervous pressure. Observe for infection, thrombosis and decreases circulation to the legs. Regularly assess the effectiveness of oxygen therapy or ventilator therapy. Watch for any complications that may result from oxygen administration.

Promote infection prevention measures especially if using mechanical ventilation. Provide mouth care every 2 hours. Rubricate the infant's nostrils and lips with water soluble ointments. Do top and tailing. Change soiled nappies. Position the infant in a supine position with head slightly tilted to aid breathing and promote lung ventilation.

Complications

- i. Respiratory acidosis
- ii. Atelectasis
- iii. Intra cranial haemorrhage
- iv. Retro rental fibroplasia

- v. Infection
- vi. Jaundice
- vii. Metabolic acidosis
- viii. Mental retardation
- ix. Pneumonia

Prevention of RDS

- i. Prevention of preterm labour
- ii. Administration of corticosteroids to help in synthesis of L.S to mothers who are in preterm labour 24 hrs before delivery
- iii. Control of D.M, HTN to prevent preterm labour
- iv. Prevent prolonged labour to prevent asphyxia

Let us now discuss another new born problem,neonatal jaundice.

NEONATAL JAUNDICE

Introduction

In the first week of life, about 50 % of term babies have a transient rise in serum bilirubin as a result of transition from intra-uterine to extra-uterine physiology and the baby become visibly jaundiced.

Definition

Neonatal jaundice is a condition that results from deposits of bilirubin in the skin and sclera. In a term neonates it appears when the serum bilirubin concentrations reach 85-120umol/l (5-7mg/dl) with a cephalo caudal progression as levels increase (Fraser and Cooper, 2003).

Definition

Jaundice is the yellow discoloration of the skin, sclera and mucous membranes due to an increase in the serum bilirubin level (Bennett and Brown, 1989). Jaundice is the yellow discoloration of the skin and the whites of the eyes (sclerae) caused by abnormally high levels of the bile pigments and bilirubin in the blood stream. (Berkow et al, 1997).

Normal Physiology

Bilirubin is a waste product of RBC break down. The destruction of Hb from within the RBC yields a protein globin which is conserved and stored for reuse. Its other component haem yields bilirubin and iron. Iron is reused but bilirubin is waste. Bilirubin is a fatty soluble and must be altered to a water soluble form in-order to be excreted. This is possible by a process of conjugation which occurs in the liver.

Transport of bilirubin

RBCs are broken down in the spleen and to a lesser extent in the liver. Bilirubin has to be conveyed to liver in the blood stream. It has an affinity for fat and nervous tissue and if free in the blood it has a tendency to escape to these types of tissues. Under normal circumstances this does not occur because it will bind to the albumin in the blood. The amount of albumin available to carry bilirubin is described by referring to the albumin binding capacity of the blood.

Conjugation of bilirubin

In the Liver

On arrival in the liver bilirubin is detached from albumin as it is received by the Y and Z receptor proteins in the liver cells. It is modified by a complex process of enzyme actions terminating in its combination (conjugation) with Glucolonic acid of enzyme glucuronyl transferase. The end product is bilirubin diglucuronide which is a water soluble and is excreted from the liver via the biliary system into the intestines. Oxygen and glucose are both necessary for this process. Glucose is a raw material for glucuronic acid.

In The Intestines

Bilirubin is acted upon by the normal flora of the gut and becomes urobirin. Most of this is converted to stecobilinogen which gives colour to the stool. The remainder of the urobirin is absorbed from the gut and becomes urobilinogen which is excreted in the urine giving its colour. If the passage through the gut is slow some of the bilirubin will be acted on by Beta-Glucuronidase which unconjugates it making it fatty soluble again as it is absorbed from the gut.

It enters the portal circulation and it returns to the liver for conjugation.

In the healthy baby the level of bilirubin in the blood will not exceed 250 μ mol/L during the 1st week of life. This depends on:

- Normal amount of bilirubin production,
- Normal conjugation
- Efficient excretion

Classifications

Hyperbilirubinemia in newborns is primarily due to immaturity of the liver enzyme system. Jaundice can be classified as **physiologic** or **non-physiologic** according to post-delivery timing of onset, clinical course, resolution, rate of bilirubin increases and total serum bilirubin levels.

1. Physiological Jaundice

Neonatal physiological jaundice is a normal transitional state that affects up to 50% of the term babies who have a progressive rise in unconjugated bilirubin levels. Jaundice in healthy, full term newborns has been termed physiologic because Hyperbilirubinemia occurs universally in all neonates. The total serum bilirubin concentration usually peaks at 5 to 12mg/dl on the second or third day after birth thus it being called a normal transitional state.

Characteristics of physiological jaundice

- It never appears before 24 hours of age.
- The serum bilirubin levels never exceeds 12 -13 mg/dl.
- The highest serum bilirubin levels occurs on the third or fourth day of life.
- Clinically there is no staining of the [palms and soles]
- The jaundice fades by the seventh day of life.
- The baby is otherwise well.

Predisposing factors for physiological jaundice

Neonatal physiological jaundice is the result of a discrepancy between red blood cells breakdown and the baby's ability to transport, conjugate and excrete unconjugated bilirubin.

i. **Increased red cell breakdown-**

In the newborn, bilirubin production is more than twice that of normal adults per kg body weight and the neonate shades off the excess hemoglobin after birth.

ii. **Decreased activity of UDP Glucuronyl**

Transferase that correlates with gestational age leading to decreased conjugation and excretion of bilirubin. The enzyme is present at birth but in low levels, and these Levels normally increase after the first 24 hours. However, the adult levels are not reached for 6-14 weeks.

iii. **Increased Enterohepatic Reabsorption**

This process is increased in the newborn bowel as neonates lack the normal enteric bacteria that break down bilirubin to urobilinogen. They also have increased beta glucuronidase enzyme activity which hydrolyses conjugated bilirubin back into the system. If feeding is delayed then bowel motility is also reduced. In breast milk the level of beta glucuronidase enzyme is high which also increases the risk for hyperbilirubinemia.

2. Non-physiologic jaundice

Jaundice is said to be non-physiological or pathological if; it occurs in less than 24 hours after birth; bilirubin levels rise at a rate of greater than 0.5m g/dl per hour or 5mg/dl per day.; total bilirubin levels exceed 15mg/dl in a full term infant or 10mg/dl in a preterm infant; evidence of acute hemolysis exists or the high bilirubin levels in blood persists beyond 10 days in a full term infant or 21 days in a preterm infant; conjugated (direct reacting) bilirubin is of 1.5-2mg/dl or the palms and sores are stained.

Predisposing factors for pathological jaundice

The underlying etiology of pathological jaundice is in interference with bilirubin production, transport, conjugation and excretion. Any disease or disorder that increases bilirubin production or that alters the transport or metabolism of bilirubin interferes the normal process physiological jaundice.

i. **Excessive production of bilirubin**

Factors that increase haemoglobin destruction also increase bilirubin levels:-

- Blood type incompatibility- (Rhesus anti-D, anti-A, anti-B and also ABO)
- Haemoglobinopathies, e.g. Sickle cell disease
- Enzyme deficiencies
- Fragile RBC membrane
- Blood may contain too many red cells as in matenofetal or twin-to-twin transfusion (polycythaemia).
- Sepsis can lead to increased haemoglobin breakdown
- Rh incompatibility, mother Rh negative and baby Rh positive.

ii. Transport

Factors that lower blood albumin-binding capacity-

- Drugs that compete with bilirubin or albumin-binding sites e.g. aspirin, sulphonamides and ampicilins.
- Hypothermia, acidosis or hypoxia can interfere with albumin-binding capacity.

iii. Conjugation

Factors that interfere with bilirubin conjugation in the liver are:-

- Dehydration, starvation, hypoxia and sepsis (glucose and oxygen are required for conjugation)
- Infections like toxoplasmosis, others, rubella, cytomegalovirus, herpes (TORCH)
- Other viral infections like hepatitis
- d) Other bacterial infections like those caused by Escherichia coli (E.coli)
- Metabolic and endocrine disorders
- Other metabolic disorders such as hypothyroidism and galactosaemia

iv. Excretion

- Factors that can interfere with bilirubin excretion:-
- Hepatic obstruction caused by congenital anomalies such as extrahepatic atresia.

- Obstruction from bile plugs from increased bile viscosity due to dehydration, haemolytic disorders, etc.
- Saturation of protein carriers needed to excrete conjugated bilirubin in the biliary system.
- Infections and other congenital disorders

Pathophysiology of Jaundice

Bilirubin is a waste product from the breakdown of haem most of which is found in RBCs. Aging, immature or malformed RBCs removed from the circulation and broken down in the reticuloendothelial system (liver, spleen and macrophages) and haemoglobin is broken down to the byproducts haem, globin and iron. Haem is converted to biliverdin and then to unconjugated bilirubin. Globin is broken down into amino acids which are reused by the body to make proteins. Iron is stored in the body or used for new RBCs. There are two types of bilirubin in the body: Unconjugated bilirubin which is fat soluble and cannot be excreted easily in the bile or urine and Conjugated bilirubin which has been made water soluble in the liver and can be excreted either in faeces or urine. Unconjugated bilirubin is transported in plasma to the liver bound to the plasma protein albumin. If not attached to albumin, it can be deposited into extravascular fat and nerve tissues in the body.

Once in the liver, bilirubin is detached from albumin and transported by intracellular carrier proteins Y and Z to the smooth endoplasmic reticulum of the liver. Bilirubin is then combined with Glucose and glucuronic acid and conjugation occurs in the presence of oxygen. Uridine diphosphoglucuronyl transferase (UDP-GT) is a major enzyme involved in bilirubin conjugation. In the liver of the fetus and newborn, the activity of UDP-GT is limited because of the immaturity of the liver enzyme system.

At birth, the UDP-GT activity level is only 0.1 percent to 1 percent that of the adult. Activity increases overtime but does not reach adult levels until 6-14 weeks after birth. As a result of this, bilirubin accumulates in the blood stream of all the newborns. Not only is the liver of the newborn deficient in its enzyme activity level, but also the daily load of bilirubin excretion is disproportionately large.

A twofold increase in neonatal bilirubin production occurs as result of both a large circulating erythrocyte volume and an erythrocyte life span shortened from 120-90 days. Newborns also have higher levels of intestinal beta glucuronidase than adults resulting in much greater reabsorption of unconjugated bilirubin through the enterohepatic circulation. This is especially true of breastfed babies who receive additional beta glucuronidase in breast milk.

Also since infants lack intestinal bacterial flora, very little bilirubin glucuronidase is converted to stercobilins and urobilin with the result that both conjugated and unconjugated bilirubin are excreted as the golden yellow pigment characteristic of the stools of the newborn.

ACTIVITY 3.7 In your note book, state the differences between physiological jaundice and pathological jaundice

Well done. Compare your answer with the notes discussed above on the classification of jaundice

Management

Laboratory investigations

- i. Serum bilirubin to determine levels and whether the bilirubin is conjugated or unconjugated. Clinical significance of bilirubin levels depend on postnatal age in hours. Level of 12mg/dl may be pathologic in an infant younger than 48 hours but low in an infant older than 72 hours.
- ii. Laboratory investigation cont..
- iii. Direct coomb's test to detect the presence of maternal antibodies in serum
- iv. Haemoglobin estimation to assess anaemia
- v. Peripheral blood smear to assess Red Cell structure for abnormal cell.
- vi. WBC count to detect infection
- vii. G6PD assay.
- viii. Most cases of newborn jaundice resolve without medical treatment within two to three weeks, but should be checked by the health care provider.

Care of the neonate with mild jaundice.

A neonate with mild jaundice the palms and soles of the feet are not stained (jaundiced). The neonate can be nursed at home. The mother or caretaker can be advised as follows:

- Increase the times of breast feeding the baby- it is important that the baby is feeding regularly and having normal bowel movements.
- If mother has inadequate breast milk, the baby can be given glucose drink.
- Expose the baby to the sun rays (can lie the baby near the window). The baby to be turned so that the whole body can be exposed to sun rays.

Treatment with phototherapy (moderate/severe jaundice)

A neonate with moderate/severe jaundice the palms and soles of the feet are stained (jaundiced). Phototherapy is used to prevent the concentration of unconjugated bilirubin in the blood stream from reaching levels where neurotoxicity may occur. The neonate's skin surface is exposed to high intensity light. The light chemically converts fat soluble unconjugated bilirubin into water soluble bilirubin. Phototherapy can be intermittent or continuous and can only be interrupted for essential care

Types of Phototherapy

Conventional Phototherapy Systems: These use high intensity light from white and more recently blue fluorescent phototherapy lamps. Place the baby 45-60cm from the light with the entire skin exposed and eyes protected with a pad.

Fibrooptic Light Systems: These use a woven fiber optic pad such as the biliblanket that delivers high intensity light with no ultra violet or infrared irradiation. The device is placed around the baby under clothing and the entire body is exposed to light.

Indications for Phototherapy

Serum bilirubin levels of:

- i. For preterm babies weighing less than 1.5kg of 5-8mg/dl.
- ii. Preterm babies above 1.5kg, sick infants and those with haemolysis between 8-10mg/dl
- iii. Term babies who are healthy with jaundice after 48 hours (17-22mg/dl).

Factors that influence the effectiveness of phototherapy

- i. Type and intensity of light
- ii. The extent of skin surface exposure.
- iii. Special blue fluorescent light has been shown to be the most effective although many nurseries use a combination of daylight, white and blue lamps.
- iv. Recently, fibreoptic blankets have been developed that emit light in the blue green-spectrum.
- v. The intensity of light delivered is inversely related to the distance between light source and the skin surface.

Nursing Care during Phototherapy

Temperature:

Maintain baby in a warm environment and observe for any hypothermia or hyperthermia.

Eyes: Eye shields or patches are closely monitored to prevent light from causing damage to the eyes.

The baby should be turned two hourly so as to expose the whole body to light

Skin: Skin is cleaned with warm water and observed frequently for rashes, dryness and excoriation. Creams and lotions are not used.

Hydration: Fluid intake and stool and urine output are monitored. Demand feeding is continued and routine supplements are not usually required. Extra fluids may be required for severely ill or dehydrated babies.

Neurobehavioral status: Monitoring of the baby's neurobehavioral status is important and should include response to stress and interaction with patients and other carers.

Patient support: Involve the parents in caring for their baby, they need adequate information, support and reassurance to enable them to make decisions and assume this role. Remember for parents to give informed consent, they must know the side effects of phototherapy versus the possible risks of not treating their baby.

Side Effects of Phototherapy

- i. Watery stools
- ii. Increased insensible water loss

- iii. Skin rash

Exchange Blood Transfusion

Exchange transfusion should be considered if the total serum bilirubin level is higher than 25mg/dl and continues to rise despite intense in hospital phototherapy. Exchange transfusion corrects anaemia associated with haemolysis and is effective in removing sensitized RBCs before they are haemolysed. It also removes about 60 percent of bilirubin from the plasma, resulting in a clearance of about 30%-40% of the total bilirubin as it equilibrates with the extra vascular tissues.

Indication for exchange transfusion

- i. Serum bilirubin levels of :
- ii. 15mg/dl for preterm babies less than 1500g
- iii. 17-23mg/dl for sick and preterm babies more than 1500g and those with haemolysis
- iv. 23-29mg/dl for healthy term babies

Approximate indication levels for exchange transfusion in pre-term babies

Gestation	Serum Bilirubin Levels
27 wks or less	250µmol/L
28-30 wks	280µmol/L
31-34 wks	310µmol/L
35 or more wks	340µmol/L

Complications of Exchange Transfusion

- i. Blood exposure risks
- ii. Necrotising enterocolitis
- iii. Acidosis
- iv. Hypocalcaemia
- v. Hypoglycemia
- vi. Electrolyte abnormalities
- vii. Air embolism

Complications of Jaundice

- i. Kernicterus: At an extreme levels bilirubin causes brain damage. The high levels of unconjugated bilirubin on the brain cells.
- ii. Increased risk of infection
- iii. Thrombocytopenia

Let us now discuss neonatal hypoglycaemia

NEONATAL HYPOGLYCEMIA

Neonatal hypoglycemia is low blood sugar (glucose) in the first few days after birth.

Causes

Babies need sugar (glucose) for energy. Most of that glucose is used by the brain.

The developing baby gets glucose from the mother through the placenta. After birth, the baby gets glucose by producing it in the liver and from food.

Glucose levels can drop if:

- There is too much insulin in the blood (hyperinsulinism). Insulin is a hormone that pulls glucose from the blood into the cells to be used for energy.
- There is not enough glycogen, the form in which glucose is stored in the body.
- The baby is not producing enough glucose.
- The baby's body is using more glucose than is being produced.

Neonatal hypoglycemia occurs when the newborn's glucose level is below the level considered acceptable for the baby's age. Hypoglycemia is the most common metabolic problem in newborns. It occurs in approximately 1 - 3 out of every 1,000 births. Infants with the following risk factors are at high risk for neonatal hypoglycemia:

- Blood infection (sepsis)
- Endocrine disorders, such as low thyroid hormone production (hypothyroidism)
- Inborn errors of metabolism
- Intrauterine growth restriction

- Lack of oxygen shortly after birth
- Large for gestational age
- Mother with diabetes
- Mother with chorioamnionitis or infection around the time of the baby's birth
- Premature birth
- Small for gestational age

Symptoms

Infants with hypoglycemia may not have symptoms. If they do occur, symptoms may include:

- Bluish-colored skin (cyanosis)
- Breathing problems
- Decreased muscle tone (hypotonia)
- Grunting
- Irritability
- Listlessness
- Nausea, vomiting
- Pale skin
- Pauses in breathing (apnea)
- Poor feeding
- Rapid breathing
- Problems with maintaining body heat
- Shakiness
- Sweating
- Tremors
- Seizures

Exams and Tests

Newborns at risk for hypoglycemia should have a blood test to measure blood sugar levels every few hours after birth. The health care provider should continue taking blood tests until the baby's blood sugar level is consistently normal.

Other possible tests:

- Newborn screening for metabolic disorders
- Urine tests

Criteria for hypoglycaemia are:

- i. Full term infants - blood sugar < 2.2mmol/l (40mg/dl)
- ii. Premature infants - blood sugar < 1.1mmol/l (20mg/dl)

Treatment

Infants with hypoglycemia may need to receive:

- Feeding with breast milk or formula within the first few hours after birth, either by mouth or through a tube inserted through the nose into the stomach (nasogastric lavage)
- A sugar solution through a vein (intravenously) if the baby is unable to feed by mouth, or if the blood sugar is very low

Treatment normally continues for a few hours or days to a week. If the low blood sugar continues, the baby may also receive medication to increase blood glucose levels (diazoxide) or to reduce insulin production (octreotide). In rare cases, newborns with very severe hypoglycemia who don't improve with treatment may need surgery to remove part of the pancreas (to reduce insulin production).

Prognosis

The prognosis is good for newborns who do not have symptoms, or who have hypoglycemia that gets better with treatment. However, hypoglycemia can return in a small percentage of babies after treatment. The condition is more likely to return when babies are taken off intravenous feedings before they are fully ready to eat by mouth.

Babies with symptoms are more likely to develop problems with learning. This is especially true for babies with lower-than-average weight or whose mothers have diabetes.

Possible Complications

Severe or long-term hypoglycemia may lead to brain damage, affecting normal mental function.

Complications may include:

- Developmental delay

- Heart failure
- Seizures

Prevention

If you have diabetes during pregnancy, work with your health care provider to control your blood sugar levels. Be sure that your newborn's blood sugar levels are monitored after birth.

**ACTIVITY 3.8 In your note book ,mention the signs and symptoms of hypoglycaemia
Well done. Compare with the notes above**

We can now progress and look at hypothermia

HYPOTHERMIA AND ITS MANAGEMENT IN NEWBORN

Introduction

The normal newborn continues to adapt to the extra uterine life within the first week after child birth remaining vulnerable to hypothermia. The baby remains dependent on mother for nutrition and protection.

Mother is responsible for maintaining the body temperature of the baby among other functions essential for survival. Due to certain characteristics such little subcutaneous fat, low birth weight babies, exposing the baby to the cold climatic conditions increases risk of hypothermia.

Hypothermia in newborn

The newborn with a temperature of 36.0-36.4°C (96.8-97.5°F) is under cold stress (mild hypothermia). A baby with a temperature of 32.0-35.9°C (89.6-96.6°F) has moderate hypothermia, while a temperature below 32°C (89.6°F) is considered to be severe hypothermia..

Causes and risk factors

Hypothermia of the newborn is mainly due to lack of knowledge. In many hospitals incorrect care of the baby at birth is the most important factor in causing hypothermia, delivery rooms are not warm enough and the newborn is often left wet and uncovered after delivery.

The newborn is weighed naked and washed soon after birth. The initiation of breast-feeding is frequently delayed for many hours, and the baby is kept in a nursery, apart from the mother. In many newborns these practices will result in hypothermia.

At home, families and Trained Birth Attendants (TBAs) may also not be aware of the importance of drying and wrapping the newborn immediately after birth. Other risk factors include asphyxia, use of anesthetic or analgesic drugs during delivery, infection or other illness of the infant and inadequate measures taken to keep the baby warm before and during transportation.

Ways of losing heat in a new born

A new born can lose heat through the following ways:

1. Evaporation

When wet surfaces are exposed to the air evaporation occurs. Heat is lost when the surface dries. At birth the neonate is bathed with amniotic fluid. As the amniotic fluid dries up on the infant's skin (evaporation), the infant loses heat. The same occurs in bathing an infant.

2. Conduction

When a neonate comes in direct contact with an object cooler than their skin heat loss by conduction occurs. Heat loss by conduction occurs when an infant is placed on a cooler surface or touching them with a cool object or hands.

3. Convection

When heat is transferred to the air surrounding the infant heat loss by convection takes place. If an air conditioner is kept on or when people move around near the infant increase loss of heat occurs.

4. Radiation

The transfer of heat to cooler objects that are not in direct contact with the neonate is called the heat loss by radiation. When infants are placed near cold windows or walls heat is lost by radiation. Even neonates placed in incubators losses heat to the walls of the incubator if it is cold even if the surrounding air temperature is warm.

Signs of hypothermia

An early sign of hypothermia is feet that are cold to the touch. If prolonged leads to hypothermia, the baby becomes less active, suckles poorly, impaired feeding and has a weak cry.

In severely hypothermic babies the face and extremities may develop a bright red colour. The baby becomes lethargic and develops slow, shallow and irregular breathing and a slow heartbeat.

Low blood sugar and metabolic acidosis, generalized internal bleeding (especially in the lungs) and respiratory distress may occur. Such a level of hypothermia is very dangerous and unless urgent measures are taken, the baby will die.

Management of hypothermia

Thermal protection of the newborn is the series of measures taken at birth and during the first days of life to ensure that the baby does not become either too cold (hypothermia) and maintains a normal body temperature of $36.5\text{-}37.5^{\circ}\text{C}$ ($97.7\text{-}99.5^{\circ}\text{F}$).

Newborns found to be hypothermic must be re-warmed as soon as possible. It is very important to continue feeding the baby to provide calories and fluid. Breast-feeding should resume as soon as possible.

If the infant is too weak to breast-feed, breast milk can be given by, spoon or cup. It is important to be aware that hypothermia can be a sign of infection. Every hypothermic newborn should therefore be assessed for infection.

ACTIVITY 3.9 In your note books, state the ways in which a new born can lose heat

Well done. Compare with the discussion above on the ways in which a new born can lose weight.

Management in Hospital

In hospital a diagnosis of hypothermia is confirmed by measuring the actual body temperature with thermometer. In cases of mild hypothermia the baby can be re-warmed by skin-to-skin contact, in a warm room (at least 25°C/77°F).

In cases of moderate hypothermia the clothed baby may be re-warmed by the following measures:

- Under a radiant heater;
- In an incubator, at 35-36°C (95-96.8°F);
- By using a heated water-filled mattress;
- In a warm room: the temperature of the room should be 32-34°C/89.6-93.2°F
- In a warm cot: if it is heated with a hot water bottle, these should be removed before the baby is put in.

The re-warming process should be continued until the baby's temperature reaches the normal range. In cases of severe hypothermia the baby should be put and nursed in an air-heated incubator.

To prevent baby from having hypothermia the following measure should be implemented:

- i. The room where the birth occurs must be warm (at least 25°C/77°F) and free from draughts.
- ii. At birth, the newborn should be immediately dried and covered, before the cord is cut.
- iii. While it is being dried, it should be on a warm surface such as the mother's chest or abdomen (skin-to-skin contact).
- iv. If this is not possible, alternative means of preventing heat loss and providing warmth — such as wrapping, placing the baby in a warm room or under a radiant heater.
- v. Bathing and weighing the baby should be postponed.

Management at home

At home, skin-to-skin contact is the best method to re-warm a baby. The room should be warm; the baby should be covered with a warm blanket and be wearing a cap. The mother should continue breast-feeding as normal. If the baby becomes lethargic and refuses to suckle, these are danger signs and it should be taken to hospital. While being transported, the baby should be in skin-to-skin contact with the mother during transportation.

Prevention of Hypothermia

Refrain from bathing the newborn immediately post-delivery. When bathing a neonate wash and dry only a small area of the body at a time, keeping the rest of the infant's body covered. The baby should be dried well and then wrapped. Avoid unnecessary exposure when attending to baby's needs. The mother should keep the baby close to her body to avoid hypothermia. In general, newborns need a much warmer environment than an adult.

The next new born problem you will study is Birth injuries.

BIRTH INJURIES

A birth injury is a trauma to the baby that occurs during the birth process. The injury is generally due to tremendous pressure put upon the baby while passing through the birth canal. It can be caused by factors such as prolonged labor, a "breech" (legs first) delivery, premature birth, doctor procedures (i.e., the use of forceps), and the small size or irregular shape of the mother's pelvis.

Types of Injuries

Facial paralysis can be caused by pressure on the facial nerves during birth or by the use of forceps during birth. If the nerve was bruised, the condition generally improves within weeks. If torn, however, surgery may be required.

Brachial plexus injury (also known as Erb's Palsy) is a paralysis or weakness of the arm caused by stretching of the nerves around the shoulder during birth. This damage can be caused by excessive pulling on the arm during birth or by pressure on by raised shoulders during a breech

delivery. Most infants recover within 6 months, but those that do not will require surgery to make up for the nerve damage and have a poor outlook for improvement.

Cerebral palsy is a chronic disorder caused by trauma to the brain during or near the time of birth and its symptoms include the loss of movement or other nerve functions. The condition is not progressive (meaning that it does not worsen or improve with time) and its severity is determined by the type of damage done to the brain. A variety of medical mistakes, such as improper use of forceps or leaving the baby in the birth canal for too long (depriving the baby of enough oxygen), can cause cerebral palsy.

Paediatric Cardiac Birth Trauma

Overview

Injuries to the infant that result from mechanical forces (ie, compression, traction) during the birth process are categorized as birth trauma. Factors responsible for mechanical injury may coexist with hypoxic-ischemic insult; one may predispose the infant to the other. Lesions that are predominantly hypoxic in origin are not discussed in this article.

Significant birth injury accounts for fewer than 2% of neonatal deaths and stillbirths in the United States; it still occurs occasionally and unavoidably, with an average of 6-8 injuries per 1000 live births. In general, larger infants are more susceptible to birth trauma. Higher rates are reported for infants who weigh more than 4500 g.

Most birth traumas are self-limiting and have a favorable outcome. Nearly one half are potentially avoidable with recognition and anticipation of obstetric risk factors. Infant outcome is the product of multiple factors. Separating the effects of a hypoxic-ischemic insult from those of traumatic birth injury is difficult.

Risk factors include large-for-date infants, especially infants who weigh more than 4500 g; instrumental deliveries, especially forceps (midcavity) or vacuum; vaginal breech delivery; and abnormal or excessive traction during delivery.

Mortality/morbidity

Birth injuries account for fewer than 2% of neonatal deaths. From 1970-1985, rates of infant mortality due to birth trauma fell from 64.2 to 7.5 deaths per 100,000 live births, a remarkable decline of 88%. This decrease reflects, in part, the technologic advancements that allow today's obstetrician to recognize birth trauma risk factors using ultrasonography and fetal monitoring prior to attempting vaginal delivery. The use of potentially injurious instrumentation, such as midforceps rotation and vacuum delivery, has also declined. The accepted alternative is a cesarean delivery.

Causes

The birth process is a blend of compression, contractions, torques, and traction. When fetal size, presentation, or neurologic immaturity complicates this event, such intrapartum forces may lead to tissue damage, edema, hemorrhages, or fractures in the neonate. The use of obstetric instrumentation may further amplify the effects of such forces or may induce injury alone. Under certain conditions, cesarean delivery can be an acceptable alternative but does not guarantee an injury-free birth. Factors predisposing to injury include the following:

- Prima gravida
- Cephalopelvic disproportion, small maternal stature, maternal pelvic anomalies
- Prolonged or rapid labor
- Deep transverse arrest of descent of presenting part of the fetus
- Oligohydramnios
- Abnormal presentation (breech)
- Use of midcavity forceps or vacuum extraction
- Versions and extractions
- Very low birth weight infant or extreme prematurity
- Fetal macrosomia
- Large fetal head
- Fetal anomalies

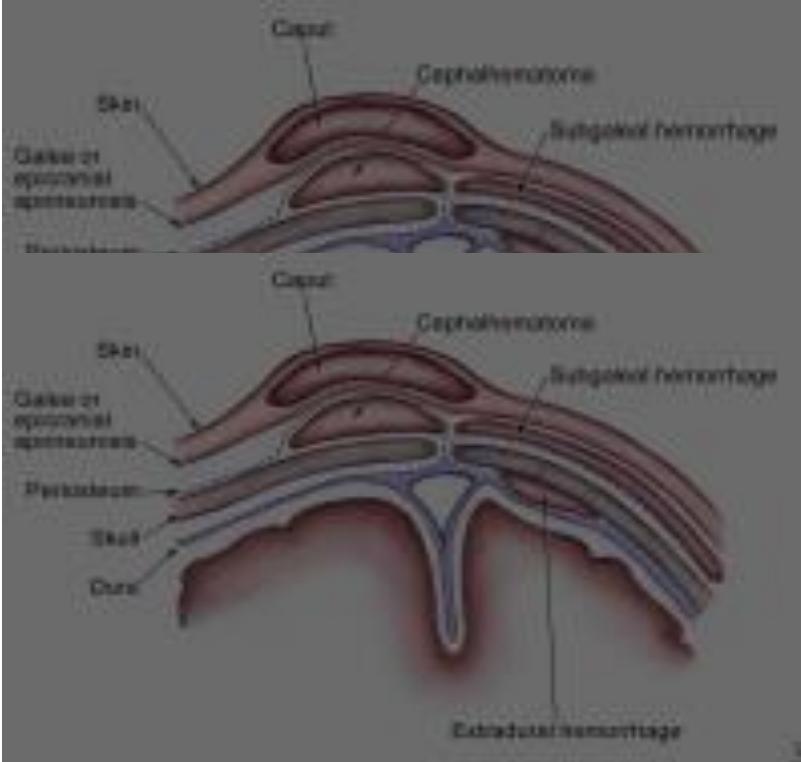


Figure 3.3: Figure showing Cephalohaematoma

Location of injury in soft tissue planes on the scalp and head.

- Abrasions
- Erythema petechia
- Ecchymosis
- Lacerations
- Subcutaneous fat necrosis
- Skull
 - Caput succedaneum
 - Cephalhematoma
 - Linear fractures
- Face
 - Subconjunctival hemorrhage
 - Retinal hemorrhage
- Musculoskeletal injuries
 - Clavicular fractures
 - Fractures of long bones
 - Sternocleidomastoid injury
- Intra-abdominal injuries

- Liver hematoma
- Splenic hematoma
- Adrenal hemorrhage
- Renal hemorrhage
- Peripheral nerve
 - Facial palsy
 - Unilateral vocal cord paralysis
 - Radial nerve palsy
 - Lumbosacral plexus injury

Soft Tissue Injury

Soft tissue injury is associated with fetal monitoring, particularly with fetal scalp blood sampling for pH or fetal scalp electrode for fetal heart monitoring, which has a low incidence of hemorrhage, infection, or abscess at the site of sampling.

Cephalhematoma

Cephalhematoma is a subperiosteal collection of blood secondary to rupture of blood vessels between the skull and the periosteum; suture lines delineate its extent. Most commonly parietal, cephalhematoma may occasionally be observed over the occipital bone.

The extent of hemorrhage may be severe enough to cause anemia and hypotension, although this is uncommon. The resolving hematoma predisposes to hyperbilirubinemia. Rarely, cephalhematoma may be a focus of infection that leads to meningitis or osteomyelitis. Linear skull fractures may underlie a cephalhematoma (5-20% of cephalhematomas). Resolution occurs over weeks, occasionally with residual calcification.

No laboratory studies are usually necessary. Skull radiography or CT scanning is performed if neurologic symptoms are present. Usually, management solely consists of observation.

Transfusion for anemia, hypovolemia, or both is necessary if blood accumulation is significant.

Aspiration is not required for resolution and is likely to increase the risk of infection.

Hyperbilirubinemia occurs following the breakdown of the RBCs within the hematoma. This type of hyperbilirubinemia occurs later than classic physiologic hyperbilirubinemia. The presence of a bleeding disorder should be considered. Skull radiography or CT scanning is also performed if concomitant depressed skull fracture is a possibility.

Subgaleal hematoma

Subgaleal hematoma is bleeding in the potential space between the skull periosteum and the scalp galea aponeurosis. Ninety percent of cases result from vacuum applied to the head at delivery. Subgaleal hematoma has a high frequency of occurrence of associated head trauma (40%), such as intracranial hemorrhage or skull fracture.^[3] The occurrence of these features does not significantly correlate with the severity of subgaleal hemorrhage.

The diagnosis is generally a clinical one, with a fluctuant boggy mass developing over the scalp (especially over the occiput). The swelling develops gradually 12-72 hours after delivery, although it may be noted immediately after delivery in severe cases. The hematoma spreads across the whole calvaria; its growth is insidious, and subgaleal hematoma may not be recognized for hours. Patients with subgaleal hematoma may present with hemorrhagic shock. The swelling may obscure the fontanelle and cross suture lines (distinguishing it from cephalhematoma). Watch for significant hyperbilirubinemia. In the absence of shock or intracranial injury, the long-term prognosis is generally good.

Laboratory studies consist of a hematocrit evaluation. Management consists of vigilant observation over days to detect progression and provide therapy for such problems as shock and anemia. Transfusion and phototherapy may be necessary. Investigation for coagulopathy may be indicated.

Caput succedaneum

Caput succedaneum is a serosanguineous, subcutaneous, extraperiosteal fluid collection with poorly defined margins; it is caused by the pressure of the presenting part against the dilating cervix. Caput succedaneum extends across the midline and over suture lines and is associated with head moulding. Caput succedaneum does not usually cause complications and usually resolves over the first few days. Management consists of observation only.

Abrasions and lacerations

Abrasions and lacerations sometimes may occur as scalpel cuts during cesarean delivery or during instrumental delivery (ie, vacuum, forceps). Infection remains a risk, but most uneventfully heal.

Management consists of careful cleaning, application of antibiotic ointment, and observation. Bring edges together using Steri-Strips. Lacerations occasionally require suturing.

Subcutaneous fat necrosis

Subcutaneous fat necrosis is not usually detected at birth. Irregular, hard, nonpitting, subcutaneous plaques with overlying dusky red-purple discoloration on the extremities, face, trunk, or buttocks may be caused by pressure during delivery. No treatment is necessary. Subcutaneous fat necrosis sometimes calcifies.

Peripheral Nerve Injury

These are

Brachial plexus injury

Brachial plexus injury occurs most commonly in large babies, frequently with shoulder dystocia or breech delivery. Incidence for brachial plexus injury is 0.5-2 per 1000 live births. Most cases are Erb palsy; entire brachial plexus involvement occurs in 10% of cases.

Traumatic lesions associated with brachial plexus injury include fractured clavicle (10%), fractured humerus (10%), subluxation of cervical spine (5%), cervical cord injury (5-10%), and facial palsy (10-20%). Erb palsy (C5-C6) is most common and is associated with lack of shoulder motion. The involved extremity lies adducted, prone, and internally rotated. Moro, biceps, and radial reflexes are absent on the affected side. Grasp reflex is usually present. Five percent of patients have an accompanying (ipsilateral) phrenic nerve paresis.

Klumpke paralysis (C7-8, T1) is rare and results in weakness of the intrinsic muscles of the hand; grasp reflex is absent. If cervical sympathetic fibers of the first thoracic spinal nerve are involved, Horner syndrome is present.

No uniformly accepted guidelines for determining prognosis are available. Narakas developed a classification system (types I-V) based on the severity and extent of the lesion, providing clues to the prognosis in the first 2 months of life.^[4] According to the collaborative perinatal study (59 infants), 88% of cases resolved in the first 4 months, 92% resolved by 12 months, and 93% resolved by 48 months. In another study of 28 patients with upper plexus involvement and 38 with total plexus palsy, 92% spontaneously recovered.

Residual long-term deficits may include progressive bony deformities, muscle atrophy, joint contractures, possible impaired growth of the limb, weakness of the shoulder girdle, and/or Erb engram flexion of the elbow accompanied by adduction of shoulder.

Workup consists of radiographic studies of the shoulder and upper arm to rule out bony injury. The chest should be examined to rule out associated phrenic nerve injury. Electromyography (EMG) and nerve conduction studies are occasionally useful. Fast spin-echo MRI can be used to evaluate plexus injuries noninvasively in a relatively short time, minimizing the need for general anesthesia. MRI can define meningoceles and may distinguish between intact nerve roots and pseudomeningoceles (indicative of complete avulsion). Carefully performed, intrathecally enhanced CT myelography may show preganglionic disruption, pseudomeningoceles, and partial nerve root avulsion. CT myelography is more invasive and offers few advantages over MRI.

Management consists of prevention of contractures. Immobilize the limb gently across the abdomen for the first week and then start passive range of motion exercises at all joints of the limb. Use supportive wrist splints. Best results for surgical repair appear to be obtained in the first year of life. Several investigators recommend surgical exploration and grafting if no function is present in the upper roots at age 3 months, although the recommendation for early explorations is far from universal. Complications of brachial plexus exploration include infection, poor outcome, and burns from the operating microscope. Patients with root avulsion do not do well. Palliative procedures involving tendon transfers have been of some use. Latissimus dorsi and teres major transfers to the rotator cuff have been advocated for improved shoulder function in Erb palsy. One permanent and 3 transitory axillary nerve palsies have been reported from the procedure.

Cranial Nerve and Spinal Cord Injury

Cranial nerve and spinal cord injuries result from hyperextension, traction, and overstretching with simultaneous rotation; they may range from localized neurapraxia to complete nerve or cord transection.

Cranial nerve injury

Unilateral branches of the facial nerve and vagus nerve, in the form of recurrent laryngeal nerve, are most commonly involved in cranial nerve injuries and result in temporary or permanent paralysis.

Compression by the forceps blade has been implicated in some facial nerve injury, but most facial nerve palsy is unrelated to trauma from obstetrical instrumentation (eg, forceps). The compression appears to occur as the head passes by the sacrum.

Physical findings for central nerve injuries are asymmetric facies with crying. The mouth is drawn towards the normal side, wrinkles are deeper on the normal side, and movement of the forehead and eyelid is unaffected. The paralyzed side is smooth with a swollen appearance, the nasolabial fold is absent, and the corner of the mouth droops. No evidence of trauma is present on the face.

Physical findings for peripheral nerve injuries are asymmetric facies with crying. Sometimes evidence of forceps marks is present. With peripheral nerve branch injury, the paralysis is limited to the forehead, eye, or mouth.

Most infants begin to recover in the first week, but full resolution may take several months. Palsy that is due to trauma usually resolves or improves, whereas palsy that persists is often due to absence of the nerve.

Management

Management consists of protecting the open eye with patches and synthetic tears (methylcellulose drops) every 4 hours. Consultation with a neurologist and a surgeon should be sought if no improvement is observed in 7-10 days.

Diaphragmatic paralysis secondary to traumatic injury to the cervical nerve roots that supply the phrenic nerve can occur as an isolated finding or in association with brachial plexus injury. The clinical syndrome is variable. The course is biphasic; initially the infant experiences respiratory distress with tachypnea and blood gases suggestive of hypoventilation (ie, hypoxemia, hypercapnia, acidosis). Over the next several days, the infant may improve with oxygen and varying degrees of ventilatory support. Elevated hemidiaphragm may not be observed in the early stages. Approximately 80% of lesions involve the right side and about 10% are bilateral.

The diagnosis is established by ultrasonography or fluoroscopy of the chest, which reveals the elevated hemidiaphragm with paradoxical movement of the affected side with breathing.

Most patients recover in the first 6-12 months. An outcome for bilateral lesions is poorer and prolonged ventilatory support may be necessary. Management consists of careful surveillance of respiratory status, and intervention, when appropriate, is critical.

Laryngeal nerve injury

Disturbance of laryngeal nerve function may affect swallowing and breathing. Laryngeal nerve injury appears to result from an intrauterine posture in which the head is rotated and flexed laterally. During delivery, similar head movement (when marked) may injure the laryngeal nerve, accounting for approximately 10% of cases of vocal cord paralysis attributed to birth trauma. The infant presents with a hoarse cry or respiratory stridor, caused most often by unilateral laryngeal nerve paralysis. Swallowing may be affected if the superior branch is involved. Bilateral paralysis may be caused by trauma to both laryngeal nerves or, more commonly, by a CNS injury such as hypoxia or hemorrhage that involves the brain stem. Patients with bilateral paralysis often present with severe respiratory distress or asphyxia.

Direct laryngoscopic examination is necessary to make the diagnosis and to distinguish vocal cord paralysis from other causes of respiratory distress and stridor in the newborn.

Paralysis often resolves in 4-6 weeks, although recovery may take as long as 6-12 months in severe cases. Treatment is symptomatic. Once the neonate is stable, small frequent feeds minimize the risk of aspiration. Infants with bilateral involvement may require gavage feeding and tracheotomy.

Spinal cord injury

Spinal cord injury incurred during delivery results from excessive traction or rotation. Traction is more important in breech deliveries (minority of cases), and torsion is more significant in vertex deliveries. True incidence is difficult to determine. The lower cervical and upper thoracic region for breech delivery and the upper and mid-cervical region for vertex delivery are the major sites of injury.

Major neuropathologic changes consist of acute lesions, which are hemorrhages, especially epidural, intraspinal, and edema. Hemorrhagic lesions are associated with varying degrees of stretching, laceration, and disruption or total transaction. Occasionally, the dura may be torn, and rarely, the vertebral fractures or dislocations may be observed.

The clinical presentation is stillbirth or rapid neonatal death with failure to establish adequate respiratory function, especially in cases involving the upper cervical cord or lower brain stem. Severe respiratory failure may be obscured by mechanical ventilation and may cause ethical issues later. The infant may survive with weakness and hypotonia, and the true etiology may not be recognized. A neuromuscular disorder or transient hypoxic ischemic encephalopathy may be considered. Most infants later develop spasticity that may be mistaken for cerebral palsy.

Prevention is the most important aspect of medical care. Obstetric management of breech deliveries, instrumental deliveries, and pharmacologic augmentation of labor must be appropriate. Occasionally, injury may be sustained in utero.

The diagnosis is made using MRI or CT myelography. Little evidence indicates that laminectomy or decompression has anything to offer. A potential role for methylprednisolone is recognized. Supportive therapy is important.

Head and chest circumference

Head circumference, often referred to as occipital-frontal circumference, may be determined by measuring the circumference of the skull from the frontal to occipital area by placing the tape measure above the ears. It is important to measure the largest part of the head when measuring occipital-frontal circumference. Because of edema and molding due to the birth process, the subsequent occipital-frontal circumference measurements may increase or decrease as much as 2 cm during the first week of life.

It is important to note that when the fetus is developing its head circumference is larger than the abdominal circumference until 32 through 36 weeks gestation, when it is equal. After this time, the abdominal circumference should be larger than the head circumference. So when the baby is born the acceptable head circumference is 33 to 35.5 cm or 13 to 14 inches.

Chest circumference is obtained by measuring around the infant's chest at nipple line midway between inspiration and expiration. Acceptable chest circumference is 30.5 to 33 cm or 12 to 13 inches. As noted, the head circumference should generally be larger than the chest circumference.

Gestational Age Assessment

A gestational age assessment should be performed on any infant that is thought to be premature or when there is a question of gestation. When assessing the gestational age of newborns, the New Ballard Score is often used. The type of assessment will be covered in detail later in this unit when it comes to discuss Prematurity under problems of the new born.

Gestational age should be assessed within the first 4 hours of birth for maximum reliability. The nurse should initially conduct the parts of the examination that can be done without disturbing

the infant. This includes the physical maturity section of the New Ballard Score as well as the resting posture component of the neuromuscular maturity section.

b) Vernix Caseosa

Vernix caseosa is a lubricant found on the skin or in the skin folds. While usually white, it may be yellow from bilirubin stains or green from meconium staining. It disappears as the fetus ages and, by term, is generally found only in the folds such as the armpit or the groin. Vernix caseosa is almost entirely absent in post mature fetuses and may be an important indicator of gestational age.

c) Lanugo

Lanugo is the name for the fine hair that covers the body, ears, and forehead of many newborns. Lanugo first develops at 19 weeks gestation and becomes most obvious at 27 to 28 weeks gestation. As such, lanugo is an important indicator of gestational age. It may be important for parents to understand that the hair will fall off within the first few weeks of life.

Warning Signs

Warning signs of the skin assessment that would warrant further investigation and/or immediate intervention include:

- Long nails and desquamation, indicating postmaturity
- Thin translucent skin with abundant vernix and lanugo, indicating prematurity
- Pallor, possibly caused by hypothermia, anemia, sepsis, or shock
- Cyanosis, possibly caused by cardiorespiratory disease, hypoglycemia, polycythemia, sepsis, or hypothermia
- Petechiae, possibly caused by thrombocytopenia, sepsis, congenital infection, or pressure sustained during delivery
- Plethora, possibly caused by polycythemia
- Meconium staining, possibly caused by intrauterine asphyxia
- Abnormal hair distribution or extra skin folds, possibly associated with genetic abnormalities
- Poor skin turgor associated with intrauterine growth retardation and hypoglycemia
- Large hemangiomas, which may trap platelets within their borders and cause thrombocytopenia

- Bullae or pustules, possibly caused by staphylococcal infection

Skin Temperature and Maturity

During the first few moments of life, when the infant is first exposed to the sensation of cold, skin receptors become stimulated. These receptors aid in stimulating the respiratory center to begin the first sequences of breaths and pulmonary gas exchange.

A skin temperature range of 36°C to 36.5°C (96.8°F to 97.7°F) is acceptable for the term newborn. In a preterm infant, you will find the skin to be more translucent as opposed to the thick, cracked appearance of the term infant's skin. Being able to visualize vessels through the skin on the abdominal wall is also an age marker. It is easy to see abdominal vessels in preterm infants because of the transparency of the skin. Creases in the sole develop from toe to heel. A decrease in the amount of creasing of the soles of the feet may be a sign of motor deficits. This is based on the belief that foot creasing is caused by movement of the lower extremities, movement of the fetus, and uterine compression. Increased creasing of the sole, generally seen in postmaturity, is also a sign that warrants further investigation.

The assessment of skin turgor may be easily completed along with the assessment of the infant's hydration status, fontanelles, and mucous membranes. The skin turgor test is simple and corroborates the other findings of dehydration. To test the infant's skin turgor, simply pinch the skin. The skin should automatically recoil. If the skin remains "pinched," the infant has poor skin turgor.

Skin Color

Color is a valuable finding in the assessment of a newborn. Alterations in cardiovascular or respiratory function may present in the form of mottled or dusky skin color. Pallor can be a sign of poor oxygen perfusion or anemia. If the infant's skin appears to be pale, then it should be noted and reasons should be identified. Other symptoms of poor skin perfusion are mottling and delayed capillary refilling. Central cyanosis, or a blue color of the face, trunk, or mucous membranes, is not a normal finding and should be acted upon immediately.

You need to assess the skin of the newborn for jaundice. Newborns become jaundiced for two main reasons: immaturity of the liver and/or the excessive amount of fetal hemoglobin that is required in utero. The liver is thought to be one of the last organs to fully mature; therefore, even the full-term infant may be considered to have an immature liver. The liver is where bilirubin, a byproduct of hemoglobin metabolism, is processed, and the immature organ may not be able to keep up with the increased demand that occurs shortly after birth. The increased demand is caused by the breakdown of fetal hemoglobin.

Birthmarks

When assessing for dysmorphic features of the skin, findings of birthmarks, missing skin, skin tags, vesicles, and lesions should be documented. Birthmarks are common in the newborn but may cause considerable anxiety in parents. Some birthmarks involute voluntarily, while others may persist into adulthood. The majority of birthmarks are benign; however, some birthmarks may necessitate further investigation to assess their potential for future malignancy or possible underlying conditions. Birthmarks may be divided into three etiological categories:

- Vascular
- Pigmented
- Abnormal development

Vascular nevi include hemangiomas, nevus flammeus (i.e., port wine stain), and nevus simplex (i.e., stork bite or salmon patch). Pigmented nevi include congenital melanocytic nevi and dermal melanosis (i.e., mongolian spots). Nevi caused by abnormal development, such as supernumerary nipples and lesions along the spine associated with spinal dysraphism, will be discussed in the chest and back assessment sections of this course, respectively.

Vascular Nevi

- **Strawberry hemangiomas**

Also referred to as strawberry mark, nevus vascularis, capillary hemangioma, or hemangioma simplex, strawberry hemangiomas consist of newly formed capillaries occupying both the dermal and subdermal layers. Strawberry marks are typically raised, sharply demarcated, and bright red. However, these lesions may also present as a patch of pale skin or may not be visible at all. Hemangiomas may be present at birth but most often appear in the first several months of life.

They occur most often on the neck and face. Generally, no intervention is required, though many parents will need reassurance that the lesion will involute spontaneously in most cases. It is possible for these lesions to compress the eyes, airway, or vital organs, in which case the infant should be referred immediately for treatment, usually with steroid injections or laser therapy.

- **Cavernous Hemangiomas**

Cavernous hemangiomas are located in the subcutaneous tissue and generally do not involve the overlying skin, though they may be topped by a strawberry hemangioma or nevus flammeus. Cavernous hemangiomas are composed of a communicating network of interconnected venules. They are often present at birth and undergo a period of rapid growth before they begin to recede on their own. They appear as a reddish-blue, spongy swelling filled with blood. Steroids and/or laser therapy may be used to reduce the size of hemangiomas, especially if their location is obstructive or makes them prone to bleeding.

- **Nevus Flammeus**

Nevus flammeus, or port wine stain, is usually observed at birth and is composed of dilated or distended dermal capillaries and postcapillary venules. Most frequently found on the face, nevus flammeus are generally red-to-purple in color, can be of varying size, and are generally unilateral. They are not raised and do not blanch with pressure. Treatment is usually unnecessary unless the lesion is very large or associated with an underlying condition. When it appears along with glaucoma and seizures, nevus flammeus is associated with Sturge-Weber syndrome. An infant with nevus flammeus near the eye should be referred to an ophthalmologist.

- **Nevus Simplex**

Nevus simplex, also referred to as stork bites, angel kisses, or salmon patches, appear in 30% to 50% of all newborns. Nevus simplex is generally found at the nape of the neck, but may be also found on the face and scalp. It appears pink in color, blanches with pressure, and is commonly bilateral. It has no clinical significance and fades quickly, often having disappeared entirely by 18 months of age.

Pigmented Nevi

- **Congenital Melanocytic Nevi**

Most nevi, or moles, do not appear until after birth. However, 0.2% to 2.1% of infants are born with congenital melanocytic nevi. These lesions are usually flat, but some may be raised. They appear brown or black in color and may be hairy. Due to their potential for malignancy, careful

consideration regarding management is required. A hairy nevus discovered along the base of the spine is often associated with spina bifida. Infants with large or giant melanocytic nevi should be referred to a surgeon.

- **Dermal Melanosis**

Dermal melanosis, or Mongolian spot, is a common finding in infants of Asian, East Indian, or African descent. Caused by melanocytes trapped deep in the skin, these lesions appear flat and bluish-gray or brown and are most commonly found on the back or buttocks. Due to their resemblance to bruises, which may lead to unsubstantiated allegations of child abuse, it is important to document all dermal melanoses in the infant's medical record and explain their presence to the infant's parents. No intervention is required, and most cases resolve by 2 years of age

Common Rashes

- **Erythema Toxicum Neonatorum**

It is estimated that 40% to 70% of infants are born with erythema toxicum neonatorum, commonly referred to as newborn rash [60]. The lesions, which may appear as erythematous macules, papules, or vesicles, can appear suddenly in the first three weeks on any part of the body, with the exception of the palms and soles. Although it is not cause for concern in healthy infants, infants who appear ill and have an atypical rash should be tested for fungal, viral, and bacterial infections. The rash has an unpredictable occurrence and presentation. Though it may appear significant to the parents, it requires no treatment and typically resolves within 7 days.

- **Acne Neonatorum**

Acne neonatorum, consisting of closed comedones, is normally found on the forehead, nose, and cheeks. An estimated 20% of infants have acne neonatorum, which is believed to be caused by infant or maternal androgen levels. Parents should be reassured that the acne will resolve with no residual scarring within approximately four months.

- **Milia**

Milia are sebaceous glands that are occluded with keratin. They appear as tiny white or yellow papules, approximately 1–2 mm in size, and are generally found on the nose, chin, forehead, and cheeks. They require no special care and usually resolve by 4 weeks of age

When assessing the newborn's head, one begins with the general appearance of the head, including the shape, circumference, suture lines, and fontanelle size. Symmetry or asymmetry should be noted, though asymmetry can be a normal variation resulting from the fetal lie in utero. Facial bruising is commonly caused by birth trauma and should be noted. The following section addresses assessment of the newborn's head shape, size, and fontanelles.

The Head

Head Size and Shape

During physical examination, the head should be supported appropriately. The head should move easily from side to side and up and down. Infants may or may not be able to support their heads initially. The shape of each infant's head is unique. After a vertex vaginal delivery, a newborn's head is generally flattened over the forehead and rises to a point at the posterior of the skull over the occiput. This shape reflects the process of molding, where the presenting part engages the cervix and becomes molded to the shape of the cervix. Molding is generally symmetrical in nature and is caused by the skull bones coming together to facilitate birth. The infant is born with a classic "cone head" appearance (**see figure below**). This occurrence resolves spontaneously within 3 to 5 days and requires no intervention, beyond reassuring parents that their infant's head shape is not permanent.



Figure 3.5: Moulding of fontanelles and suture spaces

During birth Caput succedaneum and cephalohematoma may occur as a result of birth trauma. Caput succedaneum is the formation of edema of the scalp at the presenting part of the head. It has a generally symmetrical appearance and crosses the suture lines see the figure below:



Figure 3.6 Showing caput succedaneum

Cephalhematoma is a collection of blood beneath the periosteum, may also occur as a result of increased force to the newborn's head during vaginal birth. It has a generally asymmetrical appearance and does not cross suture lines. It may look like a large "goose egg." It can be very alarming to parents, and they should be reassured that it is normal and will go away without treatment. Refer to figure below.

Figure: showing cephalohematoma



Figure 3.7: showing Cephaloheatoma

The occipital-frontal circumference in an AGA infant should measure 33–38 cm. As noted, the head circumference is approximately 2–3 cm larger than the chest circumference in newborns

Cranial Structure

Important information can be gained by the accurate assessment of both anterior and posterior fontanelles. The fontanelle is best palpated with the second or third finger pad when the infant is quiet and in an upright position. The anterior fontanelle, or soft spot, is diamond-shaped and demarcated by the coronal and sagittal sutures. Its anteroposterior measurement is approximately 4–5 cm, and it can be palpated midline, above the forehead. The anterior fontanelle normally closes by 18 months of age.

The posterior fontanelle can be palpated midline, toward the back of the head, above the occiput. It is triangular in shape and demarcated by the sagittal and lambdoidal sutures. Its posterolateral measurement is approximately 0.5–2 cm. The posterior fontanelle normally closes by 2 months of age; it is possible for a newborn to be born with a posterior fontanelle already closed.



Figure 3.8: Figure A Location of sutures and fontanelles. Figure B Palpating anterior fontanel

A normal fontanelle should feel soft, yet spongy, and very slightly depressed. A bulging fontanelle appears as a convex shape that feels firm but not spongy. The presence of a bulging fontanelle is indicative of increased intracranial pressure (ICP). Although there are numerous causes, the most common are hydrocephalus, trauma, intracranial hemorrhage, and infections, such as meningitis and encephalitis. Accurate diagnosis of the cause of increased ICP may require imaging techniques, such as magnetic resonance imaging, computed tomography, and/or cranial ultrasound. Crying, lying down, or vomiting can also cause slight bulging of the fontanelle. If the fontanelle returns to normal when the infant is returned to an upright position, it is not considered a true bulging fontanelle.

A sunken fontanelle presents as a concave area that feels spongy but depressed. Sunken fontanelles are associated with dehydration and decreased ICP. Decreased peripheral perfusion, poor skin turgor, and sunken eyes may also be present. During fluid resuscitation for dehydration, frequent assessments of the fontanelle can aid in preventing overload.

There are four suture lines that can be palpated: the frontal, coronal, sagittal, and lambdoid sutures. The frontal suture can be felt midline above the eyes running up the forehead and ending at the anterior fontanelle. The coronal suture can be felt from the anterior fontanelle running

down the side of the head along the forehead line towards the ears. The sagittal suture can be palpated running midline between the anterior and posterior fontanelle. The lambdoid suture can be felt from the posterior fontanelle running down the head above the occiput towards the area behind the ears.

Overriding sutures are a normal finding resulting from birth trauma and molding and usually resolve spontaneously. However, they should be followed closely, and in the event that they do not spontaneously resolve, intervention should be taken to correct the problem. Widely spaced sutures may occur with a bulging anterior fontanelle and are a red flag for increased ICP. In more severe cases of increased ICP, the veins over the scalp may appear enlarged. These infants should receive an infectious disease and metabolic work-up, a standard eye exam, and imaging techniques similar to those used for diagnosing a bulging fontanelle.

Warning Signs

During the head assessment, warning signs that warrant further investigation and/or immediate intervention include:

- Abnormally large fontanelles
- Abnormally small fontanelles
- Suture lines that do not override or are widely spaced
- Bulging fontanelles
- Sunken or depressed fontanelles
- Enlarged veins over the scalp

Eyes

Following an examination of the general size and appearance of the head, you should now assess the eyes. Warning signs should be noted followed by an orderly assessment of eye size, shape, placement, sclera color, and reflexes. Observations of any anomalies should be reported immediately.

All regions of the eye should be examined thoroughly for abnormal features. Determining the symmetry and completeness of brows and lashes with intact lid margins is important. Initial observations should assess that the eyes are equal in size and placed symmetrically on the face.

The outer corner of the eye should be at the same height as the top of the ear, if one were to draw an imaginary line between the two. Low-set ears may be associated with other signs of trisomy 21, such as Brushfield spots, a speckling of the iris. Short palpebral fissures are associated with fetal alcohol and other syndromes.

When assessing for abnormal features, any missing or defective ocular tissue or incomplete development of portions of the eye should be noted as a possible coloboma. Colobomas may involve the eyelid margin or the iris and retina and are associated with several syndromes. The iris may be absent altogether, referred to as aniridia; this most often occurs bilaterally.

The upper lid should cover only the top part of the eye. Drooping of the eyelid, or ptosis, may signal neuromuscular weakness. "Doll's eyes" are characterized by a lag in eye movement. This is a normal finding in newborns with muscular immaturity.

Epicantal folds are vertical folds of skin covering the inner canthus of the eye. Epicantal folds commonly occur among some races (i.e., Asian, Native American) and in newborns of any race prior to the elevation of the bridge of the nose. However, presence of epicantal folds has also been associated with fetal alcohol syndrome, Down syndrome, and Turner syndrome.

Examination of the internal parts of the eye should follow the peripheral examination. Lifting the infant's head while he or she is in the supine position encourages the infant to open its eyes. Term infants are myopic, with a visual acuity of 20/200. Their optimal visual field is approximately 8 to 12 inches, or about as far away as their mother's face would be during feeding. The lids should unfuse by 28 weeks gestation, but infants do not have full muscle control of the eyelids at birth. It is also important to assess newborns' tears and exudate. Exudate that is copious, greenish-yellow, or persists or appears after 24 hours of age is a sign of underlying infection.

The sclera may be white or bluish-white. A yellow appearance of the sclera is indicative of jaundice. Subconjunctival hemorrhage may be present from the pressure of birth. Any irregular shape or unequal size of the iris or pupil should be noted. A white pupil, or cat's eye reflex,

indicates abnormalities. Downward deviation of the irises exposing the sclera, or sun-setting sign, may be caused by hydrocephalus. When assessing the infant's pupils the terms "equal," "round," "reactive," and "accommodating" can be helpful.

The red reflex is characterized by an equal and round red area of light at the pupil. If a red reflex is absent, white, dull, opaque, or asymmetric, the infant should be further examined for congenital cataracts, and dysmorphia related to chromosomal abnormalities should be considered.

There are several eye reflexes that should be examined. The blinking reflex can be tested either by bright light or a light touch. The infant should demonstrate an immediate blink when the eyes are stimulated. The corneal reflex is tested by a light pressure applied to the cornea with a piece of cotton, which should induce an instinctive blink. This reflex is not generally examined unless brain or eye damage is suspected. The pupillary reflex may be determined by shining a light into the eye. The pupil should constrict instantly. Both eyes should be examined in the same manner, with a comparison made between the two. They should have equal size constriction in the same amount of time.

Ear Assessment

Examination of the ears should include size, shape, and location. Ear cartilage becomes firmer as the fetus ages, so preterm infants may have more pliable ears. The placement of the ear should be assessed as it relates to the inner canthus of the eye. A normal ear will at least touch the imaginary horizontal line. If the top of the ear falls below the line, then the ear is considered low set. A low-set ear may indicate chromosomal abnormalities and may be associated with renal complications. The ears can be measured at their longest axis and compared to standardized charts for determination of dysmorphia. Ears are considered small if less than 2.5 cm in the term infant.

In addition to size and position, appearance should also be analyzed for malformations, including absent pinna, abnormal folds, discharge, reddening, or preauricular tags. Abnormal structure may be indicative of other conditions

Infants with normal hearing should have some response to sounds and voices. In newborns, risk factors for hearing loss include a family history of hearing loss, assisted ventilation, ototoxic medications, hyperbilirubinemia, in utero infections, and ear anomalies.

Nose Assessment

The nose should be assessed for placement, shape, patency, and the presence of drainage. The nose should be midline on the face. Nares should be symmetrical in placement and size. The assessment for abnormal features, such as asymmetric nares or a notched or broad nasal tip, is necessary.

A small amount of clear or white discharge from the nose may be noted as a normal finding in the newborn. However, copious or discolored nasal discharge may be a sign of congenital syphilis or respiratory problems. Patency may be determined by closing the infant's mouth and assessing the quality of respiratory effort. Obstructing one nare at a time can be useful in determining choanal atresia, which is a blockage in the posterior nasal passage. One can assess the movement of air in and out of the nares by placing a finger under the nares to feel air movement. Obstructed nasal passages are an important finding as newborns are obligatory nose breathers and usually cannot breathe orally even when compromised.

Mouth Assessment

When examining the mouth of a newborn you need to consider the symmetry, completeness, size, and color. The mouth should be midline and symmetrical. Asymmetrical movement may be caused by nerve injury from birth trauma and may include other parts of the face.

Inspect the mouth, lips, tongue, and gums for deformities. If the lighting is poor, a pen light may be used to thoroughly visualize the palate. Gentle assistance should be employed to open the mouth while a second team member completes the assessment. The intactness of the palate may be determined by both visual and tactile strategies. The palate should be palpated for intactness by inserting a gloved finger, soft side up, and feeling the roof of the mouth. Alterations in the shape of the palate may cause breathing or feeding problems.

The infant's tongue may appear large for its mouth and shorter than either a child's or an adult's. Abnormal findings concerning the mouth, tongue, and chin include a flattened or elongated philtrum, disproportionate tongue, small chin, short frenulum ("tongue tie"), and cleft palates and lips. If the infant's mouth remains open and the tongue protrudes, this may be a sign of an existing condition, such as Down syndrome, and should be noted.

The color of mucous membranes and lips should be monitored. The colors may be described as dark, purple, dusky, pink, or pale. Using a referenced color gauge or having two nurses assess the infant's color can help with the accuracy. Mucous membranes should be pink and well-hydrated, and a small amount of saliva should be present. If there is a large amount of saliva and the infant is "blowing bubbles," the mouth should be suctioned with a bulb syringe. If this does not resolve the issue, further assessment should be conducted to determine the patency of the esophagus before the infant is allowed to eat.

Observe for natal teeth. While natal teeth occur in normal infants, they are more likely to occur with cleft palate. If teeth are present, they should be noted and reported. Natal teeth are generally removed to prevent a choking hazard, especially if they are loose.

Assessing reflexes in the mouth

There are several reflexes that should be assessed while examining the mouth. The intensity of the sucking reflex may be described as strong or weak and may be assessed either by placing a finger in the infant's mouth or monitoring feeding. For the critically ill infant who is being fed through a tube, the assessment of the strength of his or her sucking reflex may be determined as the infant sucks on either the feeding tube or the endotracheal tube. A strong suck response occurs when the infant is capable of forming a tight seal around the finger, nipple, or bottle. A weak suck occurs if the infant is either unable to form a seal or unable to suck because of fatigue or deformity. If an alert term infant is unable to suck after many attempts, the infant should be evaluated further.

Assess for a gag reflex by gently stimulating the posterior oral cavity. The infant should have a strong coughing response to the stimulation. If the response is weak, this should also be noted

and the appropriate intervention completed. Absence of a gag reflex should be considered an emergency situation because newborns cannot protect their airway without a gag reflex. The extrusion reflex occurs when the infant responds to foreign objects in the mouth by pushing them outward with the tongue.

The rooting reflex is present at birth and assists the feeding process in newborns. To elicit this reflex, the infant's cheek is gently stroked. The normal response is for the infant to turn the mouth in the same direction of the cheek that was stroked and initiate a sucking motion. Variants of this reflex include stroking the upper lip, which should cause the infant to flex his or her head back, and stroking the bottom lip, which should cause the infant to drop his or her jaw. This reflex may be slowed as a result of maternal sedation or a recent feeding. The rooting reflex lasts until approximately 4 to 6 months of age.

Neck Assessment

The neck of the normal newborn is noticeably shorter and more flexible than that of an adult or child. The normal newborn will exhibit creasing and skinfolds on the neck. Infants are generally not capable of supporting their heads at birth and will experience head lag when they are moved to a sitting position from a lying one. Assess lymph nodes and monitor for webbing and any masses. Webbing of the neck, generally noticed from the back of the neck, may be indicative of chromosomal abnormalities.

Palpation of each clavicle may help determine intactness. A fractured clavicle may present with an elevation of the bone, or a grating sensation may be felt when manipulated. The newborn should be able to demonstrate free range of motion that is symmetrical.

Neurological Assessment

The newborn neurological assessment takes into consideration the immaturity of the neurological system. As the infant grows and develops, a more certain presentation of the intactness of the neurological system will surface. When assessing neurological status, you should be alert for warning signs and then proceed by assessing the newborn's reflexes.

The table on the next page shows some of the reflexes and neurological assessments

Reflex	Appears	Disappears (Approximate)	Brief Description
Rooting	At birth	Generally becomes voluntary after 3 weeks of age	Turns mouth to the same side of the cheek that is being stroked
Gag	At birth	Continues into adulthood	Strong coughs in response to stimulation of the posterior oral cavity
Extrusion	At birth	3 to 4 months of age	Uses tongue to push foreign objects out of mouth
Moro (startle)	As early as 32 weeks gestation	6 months of age	When dropped slightly, quickly abducts extremities and forms the index finger and thumb into a "c" shape
Tonic neck (fencing)	Between birth and 2 months of age	4 to 6 months of age	When the infant's head is turned to one side, with the jaw over the shoulder, the arm and the leg on the infant's same side extend while the opposite arm and leg flex
Stepping	At birth	2 months of age	Simulates walking when held in an upright position and the sole of the foot touches a flat surface
Palmar grasp	As early as 28 weeks gestation	4 to 6 months of age	Wraps fingers around the examiner's finger when it is placed into the infant's palm
Plantar grasp	At birth	8 months of age	Curls toes downward in response to pressure applied to the sole of the foot at the base of the toes
Babinski's	At birth	2 years of age	Flexes the big toe when an object is dragged along the sole of the foot from the heel to the head of the 5th metatarsal

Table 3.5: PRIMITIVE REFLEXES IN THE NEWBORN



Figure 3.9: Figure showing Moo reflex

Tonic Neck Reflex

The tonic neck reflex, commonly referred to as fencing, appears between birth and 2 months of age and disappears at approximately 4 to 6 months of age. To obtain this response, place the infant in a supine position. Rotate the infant's head to one side so the jaw is over the shoulder. The arm and leg on the same side should extend and the arm and leg of the opposite side should flex. Turn the head to the other side and the extremities should mirror this posture.

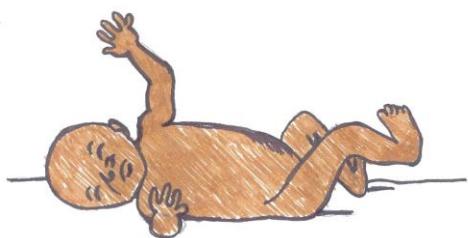


Figure 3.10: Figure showing tonic neck reflex

Stepping Reflex

The stepping reflex is generally present from birth to 2 months of age. This reflex is elicited by holding the infant upright and placing his or her sole of the foot against a hard, flat surface. The infant should respond by alternately flexing and extending the legs to simulate walking.

Palmar and Plantar Grasp Reflexes

Palmar grasp reflex is present from 28 weeks gestation until 4 to 6 months after birth. Pressing the examiner's finger into the palm of the infant's hand may elicit this response. The infant's fingers should flex around the examiner's finger. The plantar grasp is present from birth to 8 months of age. The examiner applies pressure to the bottom of the foot at the base of the toes. The toes should curl downward.

Figure: A, Babinski reflex .

B, plantar and grasp reflex

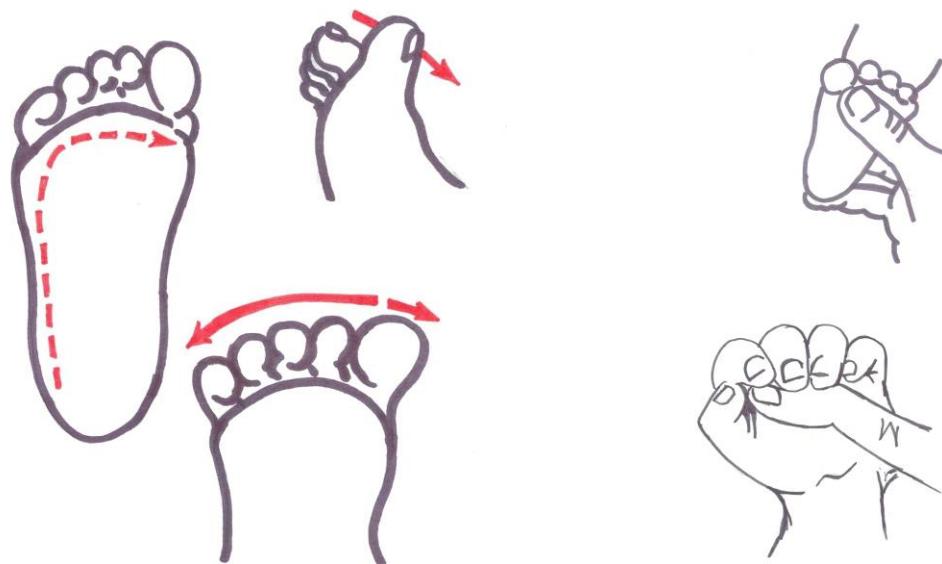


Figure 3.11: Figure A showing Babinski reflex and figure B showing plantar and grasp reflex

Babinski reflex

Babinski's reflex is generally present from birth to 2 years of age. Babinski's reflex is simple yet extremely important in the determination of pathology. The infant should be awake with the head in a midline position for testing. The examiner may drag the wooden or plastic end of a cotton-tipped applicator along the lateral aspect of the sole from the heel to the head of the 5th

metatarsal. One study rated the response based on flexion or extension of the great toe and did not gauge the response based on fanning of the other toes. Using the described method, researchers found a 90% response of extension of the great toe. They also found that a small percentage of infants may demonstrate extension at a later age and suggested that other infants may demonstrate extension when in a more awake state. Other studies found similar responses. An inappropriate response to this test indicates the need for further neurological evaluation.

Warning signs

Warning signs of the neurologic assessment, which would warrant further investigation and/or immediate intervention, include:

- Lack of reflex/response to stimuli
- Hypertonic or hypotonic position
- General lethargy
- Pupillary changes

Pain Response

Pain is an important consideration when assessing an infant's neurological status. A failure to respond appropriately to painful stimuli can be an indicator of altered neurological status. The newborn should demonstrate chemical, behavioral, and physiological responses to pain. Chemical responses are caused from the release of catecholamines, glucagon, growth hormone, cortisol, and aldosterone. This, in turn, results in an increase in metabolic demand, possibly leading to metabolic instability.

Behavioral responses such as facial expression, crying, and body movements are appropriate areas of assessment of pain response in the newborn. Factors that affect pain response include exposure to multiple painful procedures, lower Apgar scores, earlier gestational age, and illness. When assessing behaviors associated with pain in the newborn, these factors should be considered. Physiologic responses also include changes in heart rate, respiratory rate, blood pressure, color, oxygen saturation, vagal tone, and increased intra cranial pressure (ICP).

Chest Assessment

A visual inspection of the chest should be completed initially for size, shape, symmetry of movement, and presence of identifying features. The chest should be round and 1–2 cm smaller than the circumference of the infant's head. Chest circumference is obtained by measuring around the infant's chest at the nipple line midway between inspiration and expiration. Measuring the distance between the nipples divided by the chest circumference determines a narrow versus broad chest. In a narrow chest, the inter-nipple distance will be less than 25% of the chest circumference. In a broad chest, the difference will be more than 33% of the chest circumference.

Assessment of the infant's breasts should include size, shape, and nipple formation, placement, and number. Breast bud size is an important indicator of gestational age. Some infants are born with supernumerary nipples, usually located vertically, below the normal nipple.

Gynecomastia is common in either gender and may be noted as late as the second or third day of life. It is caused by high levels of maternal estrogen that have passed through the placenta and should resolve spontaneously. Neonatal gynecomastia is often accompanied by galactorrhea, also called pseudomenses milk. In infants with galactorrhea, the discharge is usually bilateral. Unilateral, bloody, serous, or purulent discharge should be noted as a sign of an underlying pathologic cause. If no underlying disease exists, galactorrhea will resolve spontaneously.

Respiratory Assessment

A thorough evaluation of the infant's respiratory system includes two components. Inspection of the newborn's breathing effort and chest movement begins the process, followed by auscultation of the infant's lung fields. The normal respirations of the newborn are regular and abdominal, and the rate is between 30 and 60 breaths/minute. Pauses in respirations less than 20 seconds in duration are considered normal. After the initial forceful breaths which are required to initiate respiration, subsequent breaths should be easy and fairly regular in rhythm. Occasional irregularities occur in relation to crying, sleeping and feeding. The infant's lungs are positioned anteriorly from above the middle third of the clavicles to the sixth rib at the midclavicular line and to the eighth rib at the midaxillary line. A thorough posterior assessment is warranted as the infant's lower lobes are primarily located posteriorly to the eleventh rib at the vertebral line.

Inspection

Inspection of the infant's breathing effort and chest movements is ideally done while the infant is at rest. Many newborns experience a breathing pattern commonly known as periodic breathing of the newborn. The infant's breathing pattern may be irregular and include pauses lasting 5 to 15 seconds. Respiratory patterns change in the newborn depending upon the infant's state. If in a deep sleep, the pattern is usually regular; however, it may become irregular with increased motor activity. The work of breathing should be assessed and noted to be unlabored. The infant should appear to be breathing easily. The chest should rise and fall with each breath and be symmetrical in its movement. Chest movement should be synchronized and smooth. Infants in distress may present with seesaw movements of the chest. The assessment of the infant's skin color is necessary as changes in color offer information regarding air exchange.

Auscultation

When auscultating neonatal lung fields, it is recommended that a diaphragm stethoscope of 2.5 cm diameter or less be used. When listening with a stethoscope, it is beneficial to first assess one position and then, immediately after, assess the mirror position on the opposite side of the body to determine even the slightest differences in quality. The method of moving the stethoscope in an "S" shaped pattern over the chest is optimal but not always possible if the infant is squirming or has bandages that preclude this systematic manner. Listening along the axilla for resonant sounds can also provide vital information.

The normal newborn may have very noisy or wet-sounding lungs, especially in the first 24 hours of life. In general, there is vast improvement in the noise of the newborn's lungs in the first several hours of life. Abnormal sounds include:

- Stridor: An inspiratory, high-pitched piercing sound usually indicative of an upper airway blockage
- Rales: Low, coarse sounds heard on inspiration or expiration
- Crackles: A cracking or popping sound that occurs when the air that passes through the small airways in the lung is somewhat obstructed by fluid, mucous, or pus at different cycles of inspiration
- Wheezing: A continuous, high-pitched sound heard on inspiration

Warning Signs

Warning signs of the respiratory assessment, which would warrant further investigation and/or immediate intervention, include:

- Respiration rate less than 30 or greater than 60 breaths per minute. In some cases, respiratory rates up to 70 breaths per minute in the first few hours of life are acceptable. When assessing rate, a full minute count should be taken to compensate for irregularities in pattern.
- Apnea lasting 20 seconds or longer
- Presence of central cyanosis. Acrocyanosis may be a normal finding in the newborn, but central cyanosis, or the blue or gray coloring of the mucous membranes, trunk, or entire body, is never a normal finding and requires immediate intervention.

Assessment Of Cardiovascular System

Before you look at assessment of cardiovascular system in detail it is important for you to revise the fetal cardiovascular system. This is important to consider because it is one of the systems that needs to change following delivery of the baby. Now you will go through fetal cardiovascular system.

Fetal cardiovascular system

Fetal cardiovascular system is markedly different from that of the newborn. Because the fetus does not rely upon its lungs for oxygenation, very little blood flows through the pulmonary vasculature. Fetal circulation begins with oxygenated blood traveling to the fetus through the umbilical vein. Note the unusual circumstance of a vein carrying richly oxygenated blood. The blood enters the fetus at the site of the umbilicus and divides into two branches. One branch carries blood to the fetal liver, while the other, larger branch carries blood through the ductus venosus into the fetal vena cava. The oxygen-rich blood then travels to the fetal heart through the right atrium.

In an adult, the blood passes into the right ventricle for distribution into the pulmonary vasculature, which would then oxygenate the blood. Because the blood in the fetus is already

oxygenated, the majority then passes through the foramen ovale to the left atrium. A small amount of blood does pass into the right ventricle, which pumps the blood into the pulmonary artery to oxygenate the lung tissue. However, the majority of this blood also passes through another duct, the ductus arteriosus, into the aorta for distribution to the body. The deoxygenated blood then leaves the fetus via two umbilical arteries for nutrient and gas exchange in the intervillous spaces of the placenta.

Once the newborn is breathing and maternal blood flow from the umbilicus stops, changes in blood flow, pressures, and volume occur within the heart, causing structural changes. The foramen ovale, which is a naturally occurring atrial septal defect, closes, as does the ductus venosus, due to the changes in pressure and flow. The increase in arterial oxygen tension causes the ductus arteriosus to begin to close at a later time, approximately 12 hours after birth. It is completely closed no later than 21 days after birth. The size and shape of the heart changes over a period of time as the left ventricle assumes the primary pumping role.

After the newborn's structural cardiovascular changes occur and the infant is breathing, the pressures in the heart and the volume of blood during flow also shift because of the new route. When the lungs begin receiving a higher concentration of oxygen, the pulmonary vascular bed relaxes, allowing blood to flow through the lungs. Blood through the ductus venosus is halted following the clamping of the umbilical cord. The ductus venosus usually completely closes 7 days after birth, though there is no flow through it after the umbilical cord is clamped. When the cord is clamped, it separates the newborn from maternal blood flow, causing systemic vascular resistance to rise. This is due to the increase in pressure of the newborn's circulatory system as opposed to the low pressures in the placenta.

It takes time for the fetal right ventricular muscle to remodel itself into the lesser pump side and decreased work. Though the left side of the heart is functioning as in an adult, the muscle mass may not achieve complete dominance over the right ventricle until the sixth month of life.

The cardiovascular assessment is composed of auscultation, electrocardiogram (ECG) analysis, blood pressure monitoring, pulse quality, and capillary refill time. However, in the healthy term

infant, there is little more than auscultation if there are no other signs of problems. Cardiac abnormalities generally present themselves quite obtrusively.

Abdominal Assessment

Assessing the infant's abdomen includes inspection, palpation, and auscultation. Inspection will include looking at the shape, contour, and movement of the abdomen as well as assessing the umbilical stump. Auscultation should be done for bowel sounds and bruits. Palpation for abdominal masses, as well as for major organs, is an important aspect of the abdominal exam, followed lastly by assessment of the infant's stool.

Assessing stool quantity and quality is an important part of the gastrointestinal assessment. Meconium should be passed within 24 hours. If the infant has not passed meconium within the first 24 hours, a further assessment is warranted to rule out ileus or obstruction. By the second or third day, the infant should begin to have transitional stool, which is green or yellowish and may have a seedy appearance. Within several days to a week, breastfed infants' stools take on the appearance of mustard.

Inspection

The first step in assessing the abdomen is inspection. The shape, contour, and movement should be evaluated. The shape should be domed or cylindrical because of immature musculature. There should be no bulging or distention. Distention is one of the first signs of problems. Movement should be fluid and synchronous with chest movement. The presence of localized edema or discoloration is a finding of peritoneal disease. The umbilical stump initially is white and gelatinous in appearance and begins to dry within the first few hours. The umbilical stump should be inspected for the presence of two umbilical arteries and one vein. They make the appearance of a "smiley face," as the musculature in the arteries makes them appear round, like the eyes of a face, and the vein tends to collapse due to lack of musculature. The anus should be inspected for patency and absence of fissures. A digital examination can assist in ruling out complications, if necessary.

Auscultation

Auscultation should be completed before palpation. Listen for the presence of bowel sounds. Bowel sounds should be present approximately 1 to 2 hours after birth. In the older newborn, absence of bowel sounds is a significant finding. Auscultation over the kidneys for bruits from renal artery stenosis is important. Auscultation over the liver for bruits may reveal arteriovenous fistula.

Palpation

Palpate and percuss beginning below the umbilicus and proceeding upward. The abdomen should feel soft. Infants may draw their legs up or cry if in pain during palpation of the abdomen. The liver is palpable 1–3 cm below the right costal margin.

The most reliable measurement of the liver via palpation and percussion may be obtained in the midlines and below the right costal margin. The first step is percussion of the upper and lower borders. In this step, the upper border is defined by percussion in a downward manner while the lower borders are palpated with the fingers in a perpendicular position to the midclavicular line. The second step includes percussion of both upper and lower borders at the position of the midclavicular line. The kidneys are moderately firm and lobulated. The bladder can be assessed for distension by palpating for a firm dome shape midline, in the lower portion of the abdomen.

Warning Signs

Warning signs of the abdominal assessment, which would warrant further investigation and/or immediate intervention, include:

- Obvious defects in the abdominal wall, possibly hernia
- Single umbilical artery, associated with congenital, especially renal, anomalies
- Meconium-stained or shriveled umbilical cord, associated with intrauterine growth retardation or perinatal asphyxia
- Imperforate anus, which may be associated with a tracheoesophageal fistula or esophageal atresia
- Hepatosplenomegaly, associated with congenital infections and hemolysis
- Flat or scaphoid-shaped abdomen, which may be associated with a diaphragmatic hernia
- Failure to void within the first 24 hours
- Failure to pass meconium stool within 12 hours

Genitourinary system assessment

Observe for color, odor, frequency, and amount of void. Failure to void within the first 24 hours is considered a warning sign and warrants further evaluation. The normal urine output for an infant is at least 1–2 ml/kg/hr. Output may be as high as 4 ml/kg/hr in the first few days of life. Urine output should be made with a stream of urine under an adequate amount of pressure. Urine is normally straw colored, though variations in color do exist, ranging from clear to amber, and may or may not have sediment.

During the initial head-to-toe assessment of all infants, a thorough examination of genitalia should be completed. The infant's genitalia should be assessed initially for appropriate development and function. Unusual appearance of the genitalia is more often a structural abnormality and not ambiguous genitalia. Accurate diagnosis is vital in order to avoid adverse consequences and undue stress for the family.

However, a true case of ambiguous genitalia, or disorder of sex development (DSD), may be disturbing to parents and carries lifelong therapeutic and psychosocial implications. Immediate intervention is required in newborns with a DSD in order to evaluate adrenal and pituitary function, as certain underlying conditions, such as congenital adrenal hyperplasia, may be life-threatening. DSDs have variable etiology, ranging from chromosomal abnormalities to maternal ingestion of androgenic steroids or other drugs.

An expeditious assessment and decision on gender assignment is necessary for improved patient outcome and to ease parental anxiety. Gender assignment is generally influenced by a variety of aspects, including diagnosis, structure and appearance of the genitalia, surgical alternatives, possible requirement of lifelong therapeutic measures, fertility, and family and cultural views and beliefs.

Male infants

When examining a male infant, the penis should be midline and straight, with the urethral opening midline at the tip of the penis. Hypospadias occurs when the meatus is located on the ventral surface of the glans, penile shaft, or the perineal area. It may be identified by a groove that extends from the usual area of the meatus inferiorly. Epispadias occurs when the urethral

meatus occurs on the dorsal surface of the penis. The length of the non erect penis is 2–3 cm at birth. Until 3 to 4 years of age, the foreskin is usually tight but should not affect the stream of urinary output. The urinary stream should be neither highly pressurized nor of reduced force.

The scrotum should appear loose and pendulous, and each side should be manually assessed to determine the presence of testes. The testes usually descend in the third trimester and are approximately 1 cm in diameter at birth. Containing the testes with the index finger and the thumb of one hand at the upper part of the scrotal sac may prevent retraction of the testes during assessment. Undescended testes may or may not be palpable in the inguinal canal. If the testicle cannot be pushed into the scrotum manually, then it is considered undescended. The appearance of rugae may assist in providing information concerning the maturity of the infant. Absence of rugae may be a sign of prematurity. Edema of the genital area following birth may be present, especially in breech births, but should resolve in a few days. Hydrocele is the collection of fluid around the testes in the scrotum and a relatively common finding. It can appear quite large and feel tight; diagnosis is made by transilluminating the scrotum. Hydrocele generally resolves on its own and requires no intervention.

Female infants

Appearance of the female genitalia is dependent upon the general nutritional status of the newborn as well as gestational age. The genitalia should be inspected for placement of labia and hymen. The placement of the urinary meatus as well as position of the rectum and length of the perineum should be noted. If the newborn is undernourished, the genital area will appear less developed than it should, with the exception of the clitoris, which may appear to be large because of the underdeveloped state of the surrounding tissues. In a healthy term infant, the labia cover the clitoris without fusion. Due to maternal hormone involvement, labia may appear swollen and darker than surrounding tissue. Mucous and possible blood-tinged vaginal discharge called pseudomenstruation may be present for several days. Hymenal tags are common and usually resolve spontaneously within a few weeks

The final portion of the head-to-toe assessment of the newborn is examining the extremities and back. A thorough examination of the arms and legs begins with noting the presence of any

warning signs. Attitude, or resting posture, is an important piece of the neonatal evaluation, as is the evaluation of reflexes. The infant should be observed closely for the presence of tremors, and neuromuscular maturity and symmetry should be noted.

Extremities

Even in sleep states, the normal resting posture for an infant is flexion. Tone should be assessed in the alert infant. Both decreases and increases in muscle tone can be symptoms of underlying problems and should be further evaluated. Hypotonia, sometimes referred to as low tone, is noted in the "floppy" infant with poor head control and limp extremities. Hypertonia is noted in the infant with tightly flexed upper extremities and extended lower extremities.

Tremors are not considered a normal finding in the newborn; periodic jerking or brief twitching is considered normal. If not yet completed, reflexes should also be evaluated, as discussed in the neurological assessment section of this unit. Neuromuscular maturity should be evaluated with the use of age determination scales. Symmetry should be addressed in the alert infant. Bilateral assessment of the infant's reflexes and resting movement can provide a picture of muscular symmetry.

Arms and hands

The arms and hands should be evaluated for symmetry, webbing, range of motion, and the number of digits. Fingernails are generally long and in need of trimming in the term newborn. The palms should be examined for the presence of a simian crease, which is a single palmar crease that extends all the way across the hand. A simian line is associated with Down syndrome.

Legs

The newborn's legs should be assessed for flexion, symmetry, and length. In some cases, the uterine position can make an infant's foot appear clubbed, such as in the case of metatarsus adductus. The feet should be examined for the presence of metatarsus adductus and club foot. With metatarsus adductus, only the front of the foot is turned inward; the back of the foot and ankle remain straight. In cases of true club foot, both the foot and the ankle are turned inward and offer resistance.

Developmental dysplasia of the hip

A newborn should also be assessed for dysplasia of the hip and this is formerly known as congenital hip dislocation, developmental dysplasia of the hip. Diagnosis of developmental dysplasia of the hip is based upon the presence of unstable, dislocated hips or acetabula malformations. Conditions that predispose infants to developmental dysplasia of the hip include:

- Breech birth
- Maternal oligohydramnios
- Family history
- Female gender

The Ortolani and Barlow tests are recommended to assist in determining hip instability. Both tests are best performed with an infant relaxed and in the supine position. The Ortolani test begins by holding the infant's thigh with a thumb. Place the index finger of the same hand over the greater trochanter area. Lift and abduct the hip gently and simultaneously push down on the knee. If the hip is not stable, a "clunk" sound will be heard. This sound should not be confused with a click type sound that is sometimes audible from the knee area during this examination. The Barlow test also begins by holding the infant's thigh with a thumb. Use the palm of the same hand to press down on the knee. While applying this gentle pressure, feel for dislocation with the middle finger of the same hand. If the hip is not stable, one should feel the hip dislocate. If findings of the clinical evaluation are unclear, the infant should be re-evaluated in two weeks.

Back and spine

The back is generally the last part of the newborn that undergoes examination. Skin intactness over the spinal area should be noted as well as curvatures and asymmetry. Assess for hip and shoulder symmetry. Trunk incursion can be elicited by stroking the infant's back along the spine. The hips should move toward the stimulated side. Gluteal folds should also be symmetrical and may have small dimples within the gluteal crease.

When nevi appear midline on the back, they are considered possible cutaneous markers for spinal dysraphism. Other signs include lipomas, dimples (especially if they are connected to the spinal cord), dermal sinuses, tails or skin tags, hypertrichosis, and signs of drainage or local infection. If two or more of these anomalies appear concomitantly, the risk of spinal dysraphism

is considered higher. Due to the serious neurological implications of missed diagnoses of spinal dysraphism, it is important that anomalies be noted and referred appropriately.

Warning signs

Warning signs of the extremities assessment, which would warrant further investigation and/or immediate intervention, include:

- Absence of limbs or digits, usually isolated
- Deformities of digits, including fusion (i.e., syndactyly) and extra digit(s) (i.e., polydactyly), also usually isolated deformities
- Simian line associated with Down syndrome
- Lack of movement of limb, possibly from brachial nerve palsy due to excessive traction and flexion of the neck during delivery (arm held adducted and internally rotated) or fracture
- Limited abduction and unequal femur length

Activity 3.1 – *In your notebook, explain the following;*

1. Rooting
2. Moro (startle)
3. Tonic neck (fencing)
4. Stepping
5. Palmar grasp
6. Plantar grasp
7. Babinski's

Well done! Now compare your notes with the ones you have studied in the discussion

Asymmetrical thigh creases or positive Ortolani maneuver (i.e., clicks indicating developmental dysplasia of the hip)

SUMMARY

A thorough neonatal assessment should be performed on all newborns in the first hours after birth to ensure an appropriate transition to extra-uterine life. This assessment should be done systematically and early so that intervention may be initiated in the event that an abnormality is discovered. The formal assessment and documentation of the newborn assessment in a timely fashion is essential. In this section of unit 3 you have looked at accepted assessment tools, such as the Apgar and the New Ballard scoring methods that can be used in the assessment of the newborn. These tools assist you to identify the problems of the newborn immediately after birth without delaying. You have also learnt in that assessment of the newborn is important because abnormalities may be noted early and that these should be reported immediately to the physician and appropriate measures should be taken. By following the same consistent approach with each newborn assessment, you need to be confident as a paediatric nurse that the highest level of care has been provided for each infant.

Congratulation for successfully finishing this sub-unit I am confident that you have been equipped with knowledge on the assessment of the newborn and you are now able to identify a new born who has some problems. I now invite you to proceed to the next sub-unit which is looking at problems of the newborn.

Bone injury

Fractures are most often observed following breech delivery, shoulder dystotia, or both in infants with excessive birth weights.

Clavicular fracture

The clavicle is the most frequently fractured bone in the neonate during birth; this is most often an unpredictable, unavoidable complication of normal birth.^[8] Some correlation with birth weight, midforceps delivery, and shoulder dystocia is recognized.^[9] The infant may present with pseudoparalysis. Examination may reveal crepitus, palpable bony irregularity, and sternocleidomastoid muscle spasm. Radiographic studies confirm the fracture.

Healing usually occurs in 7-10 days. In order to decrease pain, arm motion may be limited by pinning the infant's sleeve to the shirt. Assess other associated injury to the spine, brachial plexus, or humerus.

Long bone fracture

Loss of spontaneous arm or leg movement is an early sign of long bone fracture, followed by swelling and pain on passive movement. The obstetrician may feel or hear a snap at the time of delivery. Radiographic studies of the limb confirm the diagnosis. Femoral and humeral shaft fractures are treated with splinting. Closed reduction and casting is necessary only when displaced. Watch for evidence of radial nerve injury with humeral fracture. Callus formation occurs, and complete recovery is expected in 2-4 weeks. In 8-10 days, the callus formation is sufficient to discontinue immobilization. Orthopedic consultation is recommended. Radiographic studies distinguish this condition from septic arthritis.

Epiphyseal displacement

Separation of humeral or femoral epiphysis occurs through the hypertrophied layer of cartilage cells in the epiphysis. The diagnosis is clinically based on swelling around the shoulder, crepitus, and pain when the shoulder is moved. Motion is painful, and the arm lies limp by the side. Because the proximal humeral epiphysis is not ossified at birth, it is not visible on radiography. Callus appears in 8-10 days and is visible on radiography.

Management consists of immobilizing the arm for 8-10 days. Fracture of the distal epiphysis is more likely to have a significant residual deformity than is fracture of the proximal humeral epiphysis.

Intra-abdominal Injury

Intra-abdominal injury is relatively uncommon and can sometimes be overlooked as a cause of death in the newborn. Hemorrhage is the most serious acute complication, and the liver is the most commonly damaged internal organ.

Signs and symptoms of intra-peritoneal bleeding

Bleeding may be fulminant or insidious, but patients ultimately present with circulatory collapse. Intra-abdominal bleeding should be considered for every infant who presents with shock, pallor, unexplained anemia, and abdominal distension. Overlying abdominal skin may have bluish discoloration. Radiographic findings are not diagnostic but may suggest free peritoneal fluid. Paracentesis is the procedure of choice.

Hepatic rupture

The most common lesion is subcapsular hematoma, which increases to 4-5 cm before rupturing. Symptoms of shock may be delayed. Lacerations are less common, often caused by abnormal pull on peritoneal support ligaments or effect of excessive pressure by the costal margin. Infants with hepatomegaly may be at higher risk. Other predisposing factors include prematurity, postmaturity, coagulation disorders, and asphyxia. In cases associated with asphyxia, vigorous resuscitative effort (often by unusual methods) is the culprit. Splenic rupture is at least a fifth as common as liver laceration. Predisposing factors and mechanisms of injury are similar. Rapid identification and stabilization of the infant are the keys to management, along with assessment of coagulation defect. Blood transfusion is the most urgent initial step. Persistent coagulopathy may be treated with fresh frozen plasma, transfusion of platelets, and other measures.

Hepatic rupture has no specific racial predilection and has equal sex distribution. Patients usually present immediately following birth, or rupture becomes obvious within the first few hours or days.

COMMON INFECTIONS OF A NEW BORN

Definition

Neonatal sepsis

This is a blood infection that occurs in an infant younger than 90 days old. Early-onset sepsis is seen in the first week of life. Late-onset sepsis occurs between days 8 and 89.

Causes, incidence, and risk factors

A number of different bacteria, including Escherichia coli (E.coli), Listeria, and certain strains of streptococcus, may cause neonatal sepsis. Early-onset neonatal sepsis most often appears within 24 hours of birth. The baby gets the infection from the mother before or during delivery. The following increases an infant's risk of early-onset sepsis:

- Group B streptococcus infection during pregnancy
- Preterm delivery
- Early rupture of membranes that lasts longer than 24 hours before birth
- Infection of the placenta tissues and amniotic fluid (chorioamnionitis)

Babies with late-onset neonatal sepsis get infected after delivery. The following increase an infant's risk of sepsis after delivery:

- Having a catheter in a blood vessel for a long time
- Staying in the hospital for an extended period of time

Symptoms

Infants with neonatal sepsis may have the following symptoms:

- i. Body temperature changes
- ii. Breathing problems
- iii. Diarrhea
- iv. Low blood sugar
- v. Reduced movements
- vi. Reduced sucking
- vii. Seizures
- viii. Slow heart rate
- ix. Swollen belly area
- x. Vomiting
- xi. Yellow skin and whites of the eyes (jaundice)

Signs and tests

Laboratory tests can help diagnose neonatal sepsis and identify the bacteria that is causing the infection. Blood tests may include:

- Blood culture
- C-reactive protein
- Complete blood count (CBC)

A lumbar puncture (spinal tap) will be done to examine the cerebrospinal fluid for bacteria. If the baby has a cough or problems breathing, a chest x-ray will be taken. Urine culture tests are done in babies older than several days.

Treatment

Babies in the hospital and those younger than 4 weeks old are started on antibiotics before lab results are back. (Lab results may take 24-72 hours.) This practice has saved many lives. Older babies may not be given antibiotics if all lab results are within normal limits. Instead, the child may be followed closely on an outpatient basis. Babies who do require treatment will be admitted to the hospital for monitoring.

Prognosis

With prompt treatment, many babies with these bacterial infections will recover completely with no remaining problems. Nevertheless, neonatal sepsis is a leading cause of infant death. The more quickly an infant receives treatment, the better the outcome.

Complications

- Disability
- Death

Prevention

Preventative antibiotics may be given to pregnant women who have chorioamnionitis, Group B strep, or who have previously given birth to an infant with sepsis due to the bacteria.

Preventing and treating infections in mothers, providing a clean birth environment, and delivering the baby within 24 hours of rupture of membranes, where possible, can all help lower the chance of neonatal sepsis.

Neonatal tetanus

Definition

This is a condition caused by the toxin produced by anaerobic bacterium clostridium tetani, characterized by local or generalized tonic muscular spasms, a manifestation of toxic effects on the nervous system by the exotoxin of the bacilli, in a newborn.

Cause

It is caused by the toxin produced by anaerobic bacterium clostridium tetani.

Predisposing factors

Signs and symptoms

- i. Stiffness of the muscles controlling the jaw (trismus), the jaw is held tightly closed and cannot open (locked jaw).
- ii. Difficult in swallowing and speech due to trismus or tetanic spasms of the muscles of the jaw, throat and tongue.
- iii. Opisthotonus, a characteristic position where the head is drawn back and arched (neck stiffness), due to increased muscle tone leading to extension of the neck and the spine.
- iv. Feeble or absence of respiratory movements due to paroxysms as the thorax is held immovable, this results in cyanosis, anoxia and in many instances death.
- v. Fever of 40°C or higher due to toxemia
- vi. Irritability and restlessness

Nursing Management

Aims

- i. To promote and maintain adequate respirations.
- ii. To provide adequate nutrition
- iii. To provide supportive care

Environment;

Nurse the baby in ICU in a cool environment with dim light to prevent photophobia and spasms. A quiet environment is preferred to reduce external stimuli. The door should have rubber ends to

avoid noise as this might precipitate a spasm. All resuscitative equipment should be available in the room for resuscitation.

Position;

Usually the baby attains an opsthotonus position. Clear the airway by suctioning and placing baby in lateral position. Avoid unnecessary handling of the neonate as this may precipitate muscle spasms.

Rest and sleep

The child is restless due to painful muscle contractions therefore; effort shall be made to control or eliminate stimulation from sound, light and touch. The baby shall be nursed in a quiet room to prevent spasms as a result of noise. Excessive handling of the baby will be avoided to prevent spasms and promote rest. All procedures will be done collectively to create periods of rest and prevent spasms which may arise as a result of excessive handling of the baby. Visitors will be restricted from visiting the baby to prevent unnecessary disturbances to the baby hence this will promote rest.

In addition to all the above mentioned measures in order to promote rest some drugs such as sedatives or muscle relaxants will be administered to help reduce tetanic muscle spasm and prevent seizures. Magnesium sulphate can be administered intrathecal in the management of tetanus. Also drugs such as diazepam 15-30mg in divided doses/day will be administered to keep the baby relaxed, antispasmodic eg chloropromazine 12.5mg im 4-6hrly and Phenobarbitone to control convulsions.

Observations;

Muscle spasms will be assessed and the following will be noted; location, severity and extent of muscle spasms. Respiratory status is carefully evaluated for signs of distress, and appropriate emergency equipment should be kept available all the time. Effects of the drugs given will be observed e.g. central nervous depression which may be caused by muscle relaxants, opioids, and sedatives. Monitor oxygen saturation and when needed, blood gases are obtained frequently to evaluate respiratory status.

The baby will be monitored for hydration and nutrition status and this may be done by monitoring the IV infusion, nasogastric or gastrostomy feeding. Baby will be monitored for any secretions and if present suctioning of the oropharyngeal will be done to clear and maintain clear airway. The general condition of the baby will be observed to see if it is improving or not. Vital signs such as temperature, pulse and respirations will be done 1/2 hourly to monitor if there is any change which may be an improvement or deterioration of the condition.

The eyes will be assessed for corneal dryness to rule out corneal ulceration. The skin will also be observed for cyanosis which may indicate reduced oxygen tissue perfusion as a result of spasms in the respiratory system. Baby will be monitored for the degree of restlessness as this may indicate hypoxia. The ability to suck will be assessed and if baby is unable to suck other modes of feeding such as insertion of a nasogastric tube for feeding will be implemented so as to prevent hypoglycemia. Intake and output will be observed to avoid dehydrating or over hydrating the baby.

Nutrition and hydration;

Adequate fluid and electrolyte balance will be maintained and a nasogastric tube is inserted for feeds. In acute stage baby should be kept nil orally and parental fluids should be administered eg dextrose saline for hydration. When the condition improves expressed breast milk can be given by cup and spoon 2-3hrly, when able to suckle from the mother's breast the breastfeeding will be encouraged.

Infection prevention;

The cord stump will be cleaned and aseptic technique will be maintained every day to prevent re-infection and also to prevent neonatal sepsis. The mother will be advised on the importance of hand washing before attending to the baby and after changing baby's napkins as this removes dirty and some bacteria that can cause infection to the baby. Baby will be isolated and all utensils used on the baby will be decontaminated to prevent spread of infection. Visitors and staff with infectious respiratory conditions will be restricted from coming in contact with the baby to prevent baby from getting the infections.

Psychological care;

The disease process will be explained to the mother and she will be told that the baby has neonatal tetanus and that this disease affects the muscle that is why her baby is not able to suck from her breast as it is not able to coordinate the muscles well. She will also be informed that this disease is infectious that is why her baby has been isolated to prevent spread of infection to other babies. This is to make the mother understand the condition of her baby so as to allay anxiety. The parents to this baby will be allowed to express their feelings, concerns and worries which should be addressed in a calm and reassuring manner as this may make them understand their baby's condition and may assist greatly. The parents will be encouraged to stay with the child to offer security, love and support.

Hygiene;

Top and tail cleaning will be done to promote cleanliness and comfort for the baby. All Nappies and linen will be changed whenever soiled to prevent skin excoriation. The incubator or cot will be cleaned to prevent infection and promote baby's comfort. The cord stump is cleaned to reduce the number of proliferating organisms.

Elimination

Recurrent laryngospasm causes excessive accumulation of secretions, and the child is normally intubated. Careful suctioning of the secretions is done to maintain a clear airway. The child is usually incontinent of stool and urine. Ensure the child is always dry and comfortable.

Medication

Sedatives or muscle relaxants are administered to help reduce muscle spasms and seizures. Antibiotic treatment that is metronidazole, benzylpenicillin. Oxygen therapy

Information Education and Communication

- i. Cord care; this should be done using boiled cooled water, nothing should be applied onto the stump to avoid contamination and infection.
- ii. Immunization; encourage mother to attend ANC so that she is protected against tetanus. Advise on importance of immunizations and when to receive them ie DPT and others.

- iii. Hygiene; hand washing before feeding the baby, after changing the nappies to prevent infection.
- iv. Importance of exclusive breastfeeding to promote growth and development
- v. When to return to the health facility immediately, baby stops breastfeeding, convulsions and difficulties in breathing.
- vi. Review to monitor the baby's condition

Prevention

- Immunization of pregnant women
- IEC to mothers on cord care
- IEC to TBAs on hygiene when conducting deliveries and care of the new born.
- For convulsions, sedatives maybe prescribed.
- The baby should be tube fed.
- Clear the airway by suctioning
- Reassure the parents.

Ophthalmia Neontorum

Definition

This is inflammation of the baby's eyes with purulent discharge occurring within 21 days of birth. It is notifiable because it can cause blindness. The causative organisms are; bacillus protease, staphylococcus aureas, pneumococcus, streptococcus and pseudomonas aruginosa which causes severe ophthalmia neonatorum leading to blindness.

Signs and symptoms

- i. Eyes become sticky followed by watery discharge.
- ii. The discharge increases and becomes thick and purulent.
- iii. Conjunctivitis
- iv. Swollen eye lids which are kept tightly shut.

Prevention

- i. Treat all vaginal discharges during pregnancy.

- ii. Use aseptic technique during delivery, wiping the baby's eyes with sterile cotton wool as soon as the head is born.
- iii. During the bath or to tail, the baby's face should be cleaned first and the midwife/mother should wash her hands before touching the baby's face.

Treatment

Isolate the baby and inform the doctor. Eye swab is collected and taken to the lab for C/S. Eye drops are administered e.g. Soframycin and systemic antibiotics e.g. gentamycin can also be given. Eye care with normal saline before administering eye drops. Lay the baby on the affected eye.

3.5 Summary

Now that you have successfully completed Unit three (3) it is valuable to reflect on the work you have read in this unit before moving on to the next unit. In this unit you have covered some definition of different terms, Assessment of the newborn and problems of the new born. Further you went on to look at management of different types of problems of the new born. If you are not certain about any aspect, go back and review the relevant part of the unit to make sure that you are happy with your understanding.

In the next unit, we shall discuss expanded programme in immunization. But before then, I invite you to complete the following self-test in order to check your understanding of unit 3. After you have answered all the questions in the self-test, feel free to go back and revise the sections of this unit which you did not understand.

Complete the following self-test in order to check your understanding of unit 3.

SELF TEST

1. A low birth weight baby is one;
 - a. Born at term with a weight less than 2.5kg
 - b. Born as a premature with a weight of less than 2.5kg
 - c. Born with the weight that is below the 10th percentile

- d. Born at any gestation with a weight of less than 2.5kg
2. A premature baby is one born;
- a. Before the 37 complete weeks of gestation regardless of the birth weight
 - b. After the 28th week of gestation with a birth weight less than 2kg
 - c. With a birth weight of less than 2kg compared to the other babies
 - d. At 36 weeks
3. Small for dates babies are:
- a. Always premature babies
 - b. Can either be premature or term babies
 - c. The same as low birth weight babies
 - d. As a result of post dates
4. The ratio of lecithin to sphingomyelin a lipo protein responsible for reducing the surface tension pressure in the alveoli is;
- a. 2:1
 - b. 1:2
 - c. 1:1
 - d. 3:1
5. One of the fetal causes of asphyxia is
- a. Maternal distress
 - b. Placenta praevia
 - c. Pematurity
 - d. Precipitate labour
6. The two classifications of jaundice are;
- a. Hepatic and obstructive
 - b. Infectious and physiological
 - c. Natural and infectious
 - d. Physiological and pathological
7. All of the following are treatments of jaundice EXCEPT:
- a. Phototherapy
 - b. Exchange transfusion
 - c. Glucose therapy

- d. Anti-retro viral therapy
8. A new born can lose heat by:
- a. Conduction
 - b. Convection
 - c. Radiation
 - d. All of the above
9. Neonatal sepsis is any infection that a baby suffers from within:
- a. The first month of life
 - b. The first 28 days of life
 - c. Within one year of birth
 - d. None of the above
10. Tetanus neonatorum can be acquired by:
- a. Maternal infections such as syphilis
 - b. Vaccinations of Tetanus toxoid
 - c. Use of unsterile equipment during child birth and labour
 - d. Cleaning of the umbilical cord with cool boiled water

ANSWERS

- 1. D
- 2. A
- 3. B
- 4. A
- 5. C
- 6. D
- 7. D
- 8. D
- 9. B
- 10. C

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UNIT 4: EXPANDED PROGRAMME IN IMMUNIZATION

4.1 Introduction

Welcome to Unit 4 which presents the Expanded Programme in Immunization. This unit looks at review of immunology and it also explains the Expanded Programme in Immunization and it provides information about Child Immunization. In this unit you will review definition of different key terms that are used in Expanded Programme for Immunization. The unit will also take you through immunization guidelines and schedule, the target groups for vaccination and Vaccination schedule. It also discusses the contra-indications to immunizations, immunization campaigns, cold chain, how to evaluate immunization programme and how to report effectively and keep records.

The unit looks at administration of vaccines and side effects of vaccines. Finally, you will learn about School health and nutrition programme. It is important to study this chapter because it discusses ways of using antibody system to protect people especially children from different infectious diseases. Therefore; this unit will help you understand the importance of immunization in children. The other importance is that the unit will make you understand and appreciate the fact that infections are the major cause of sickness and death in children therefore preventing them is one of the most important things you can do to improve children's health.

Let us now consider the learning objectives of this unit so that you know what is expected of you at the end of this unit.

4.2 Unit Objectives

At the end of this unit you should be able to:

1. Describe the concept of immunology
2. Explain the EPI
3. Describe the immunization guidelines and schedules
4. Outline contraindications to immunizations
5. Explain the Reaching Every District (RED) Strategy
6. Describe immunization campaign

7. Explain cold chain and Logistics
8. Evaluate immunization programme
9. Report effectively and keep records

4.3 Review of Immunology

Immunology deals with the defense mechanisms including all physical, chemical and biological properties of the organism that help it to combat its susceptibility to foreign organisms, material, etc. This branch looks at immunity system which is the capability of the body to resist harmful microbes from entering it. There are two types of components that are involved in immunity.

These are:

- Non-specific component or innate immunity.
- Specific component or adaptive immunity

The non-specific components act either as barriers or as eliminators of wide range of pathogens irrespective of antigenic specificity. Other components of the immune system adapt themselves to each new disease encountered and are able to generate pathogen-specific immunity. Let us now look at these two components one by one and see how they function in response to protection of diseases.

Nonspecific immunity or innate immunity is the natural resistances with which a person is born. It provides resistances through several physical, chemical and cellular approaches. Microbes first encounter the epithelial layers, physical barriers that line skin and mucous membranes. Subsequent general defences include secreted chemical signals (cytokines), antimicrobial substances, fever, and phagocytic activity associated with the inflammatory responses. The phagocytes express cell surface receptors that can bind and respond to common molecular patterns expressed on the surface of invading microbes. Through these approaches, innate immunity can prevent the colonization, entry and spread of microbes.

Specific immunity or Adaptive immunity consists of two responses which are

- Humoral response

- Cell mediated response

Let us now look at the two immune responses one by one and see how they respond to antigens.

Humoral immune system

This is the first way of the body's response to antigens and it happens through substances called antibodies which circulate within the body and can act against antigens at sites very far from where they were originally produced. Antibodies are produced by special cells called B-lymphocytes which are within the lymphatic tissues of the body. They are complex chemical substances called immunoglobulins which match the particular antigen they were made for just as a key matches one particular lock only.

Cell mediated immune system

This is the second way of the body's response to antigens and it happens through other special cells called T-lymphocytes and macrophages that circulate through the body and destroy micro-organisms or other cells that the micro-organisms may have invaded. The special T-cells are tuned in the same way as antibodies to a particular infecting germ.

Both these systems (humoral immune system and cell mediated immune system), as well as being specific for a particular infection or toxin, are capable of retaining the memory of the antigen. The response to specific antigens by both systems is the reason why immunity developed against one disease, such as measles does not protect against other diseases such as poliomyelitis or pneumonia. Memory recall protects the body against subsequent attacks by the same antigens, whether germs or poisons. If a person is exposed again to an infection he has already had or been vaccinated against, the body will quickly recall the cells and make more antibodies to neutralize the toxins or fight off the micro-organisms and prevent the establishment and spread of the infection again.

Adaptive immunity is often sub-divided into two major types depending on how the immunity was introduced.

- **Naturally acquired immunity** which occurs through contact with a disease causing agent, when the contact was not deliberate.

- **Artificially acquired immunity** which develops only through deliberate actions such as vaccination.

Both naturally and artificially acquired immunity can be further subdivided depending on whether immunity is induced in the host or passively transferred from an immune host.

Therefore; at this point I invite you to check the diagram below which summarizes these divisions of immunity as this will assist you to understand immunity system:

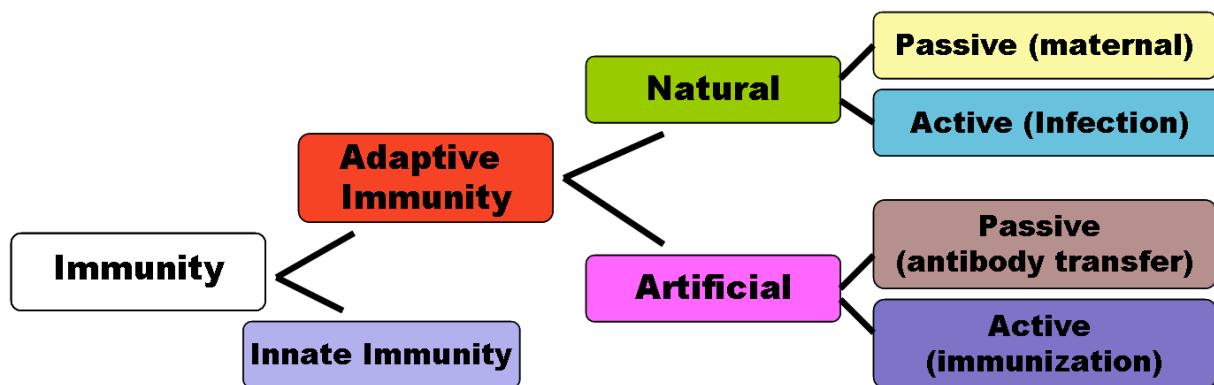


Figure 4.1: Classification of immunity

Let us now look at the types of immunizations.

Types of immunization

Immunization is the process by which an individual's immune system becomes fortified against an agent (known as the immunogen) or it is the process of protecting a person from a specific disease. There are two types of immunizations which are:

- Passive immunization
- Active immunization

Passive immunization: This is the transfer of active humoral immunity in the form of ready-made antibodies, from one individual to another Or it is the acquisition of readily formed antibodies (Transplacental transmission, immunoglobulin administration).

This happens when readymade antibodies are taken and given to another person, because the person receiving these antibodies is not making them himself. It is acquired through transfer of

antibodies or activated T-cells from an immune host, and is short lived—usually lasting only a few months.

Active immunization: this is stimulating the immune system to produce antibodies and cellular elements against an infectious agent.

This happens automatically when a person is exposed to an infection/antigen and develops his own antibodies. It is induced in the host itself by antigen and lasts much longer, sometimes lifelong.

ACTIVITY 4.0

A quick check before you proceed; Define the following terms in your note books

3. *Immunity*
 4. *Adaptive and Inate immunity*
 5. *Immunisation*
 6. *Passive and active immunization*
- ***GOOD! Go back to what was covered and check if your answers are correct***

We hope you have enjoyed learning about review of immunology. Knowledge of immunology will help you understand the importance of immunization in children therefore; you will protect and advocate for policies that will support children's immunization. Now let us turn to introduction to expanded programme for immunization (EPI).

4.4 Introduction to Expanded Programme in Immunization (EPI)

The Expanded Program on Immunization is a World Health Organization program with the goal to make vaccines available to all children throughout the world.

The World Health Organization (WHO) initiated the Expanded Program on Immunization (EPI) in May 1974 with the objective to vaccinate children throughout the world. Ten years later, in 1984, the WHO established a standardized vaccination schedule for the original EPI vaccines: Bacillus Calmette-Guérin (BCG), diphtheria-tetanus-pertussis (DPT), oral polio vaccine (OPV),

,measles, Pneumococcal Conjugate vaccines(PCV) and Rota virus vaccine(RVV). Increased knowledge of the immunologic factors of disease led to new vaccines being developed and added to the EPI's list of recommended vaccines: Hepatitis B (HepB), yellow fever in countries endemic for the disease, and Haemophilus influenza meningitis (Hib) conjugate vaccine in countries with high burden of disease.

In 1999, the Global Alliance for Vaccines and Immunization (GAVI) was created with the sole purpose of improving child health in the poorest countries by extending the reach of the EPI. The GAVI brought together a grand coalition, including the UN agencies and institutions (WHO, UNICEF, the World Bank), public health institutes, donor and implementing countries, the Bill and Melinda Gates Foundation and The Rockefeller Foundation, the vaccine industry, non-governmental organizations (NGOs) and many more. The creation of the GAVI has helped to renew interest and maintain the importance of immunizations in battling the world's large burden of infectious diseases.

The current goals of the EPI are:

- i. To ensure full immunization of children under one year of age in every district,
- ii. To globally eradicate poliomyelitis,
- iii. To reduce maternal and neonatal tetanus to an incidence rate of less than one case per 1,000 births by 2005, to cut in half the number of measles-related deaths that occurred in 1999.
- iv. To extend all new vaccine and preventive health interventions to children in all districts in the world.

In addition, the GAVI had to set up specific milestones to achieve the EPI goals: that by 2010 all countries have routine immunization coverage of 90% of their child population, that HepB be introduced in 80% of all countries by 2007 and that 50% of the poorest countries have Hib vaccine by 2005.

Immunization program has guidelines that need to be followed. (EPI is also being applied in Zambia therefore; it is important that we look at the background of this program in Zambia). Let us now look at immunization guidelines and schedule

Immunization guidelines and schedule

Optimal response to a vaccine depends on multiple factors, including the type of vaccine, age of

Activity 4.1 – In your own words outline the two types of immunization

Well done! Compare your answers with what you covered under definition of terms

the recipient, and immune status of the recipient. Recommendations for the age at which vaccines are administered are influenced by age-specific risks for disease, age-specific risks for complications, age-specific responses to vaccination, and potential interference with the immune response by passively transferred maternal antibodies. Vaccines are recommended for members of the youngest age group at risk for experiencing the disease for which efficacy and safety have been demonstrated.

The various factors influencing the administration of vaccines have been now covered. This knowledge, together with the goal of protecting children from these infections as rapidly, effectively and cheaply as possible, gives enough information to construct an immunization schedule (see table below). This schedule does give a standard plan that is widely used.

VACCINE	DOSE	SITE	AGE
BCG	0.05ml <1 yr 0.1> 1yr	ID in the upper outer aspect of the left lower arm	At birth or 1 st contact. Repeat if no scar after 6wks
OPV	2-3 drops	Oral	From birth to 13 days; 6,10,14 wks and at 9months (if OPV0 was missed)

ROTA VIRUS	1ml	Oral	6,10. weeks
DPT HepB-Hib	0.5mls	IM into the thigh	6,10,14 weeks
PCV	0.5mls	IM into the thigh	6,10,14 weeks
Measles	05.ml	SC into the upper left arm	9 months and 18 months as a booster dose
TT	0.5mls	IM into the deltoid muscle of the upper arm	School entry (Grade ones) Women of Child Bearing age Pregnant women

Table4.1: Immunization schedule in Zambia

All children should be fully immunized within the first year of life. Let us now look at the target groups for vaccinations.

Target groups for vaccinations

The following are the target groups for vaccinations

- Infants 0-12 months
- Pregnant and Post-Partum Women
- School Entrants/ Grade 1 / 7 years old

At this point it is important to discuss the vaccination schedule. The next sub-unit is looking at vaccination schedule. I now invite you to study the next sub-unit.

Vaccination schedule

Vaccination is the giving of vaccines to prevent disease. Immunization means acquiring immunity against disease. A vaccination schedule is a series of vaccinations, including the timing of all doses, which may be either recommended or compulsory, depending on the country of residence. Vaccine schedules are developed by governmental agencies or physicians groups to

achieve maximum effectiveness using required and recommended vaccines for a locality while minimizing the number of health care system interactions. Over the past two decades, the recommended vaccination schedule has grown rapidly and become more complicated as many new vaccines have been developed. (See table 2 above)

Administration of vaccines

The vaccines that need to be administered include the following:

- OPV
- BCG
- Measles
- DPT+HepB-Hib
- Tetanus toxoid
- PCV
- Rota virus

The above mentioned Vaccines are used in the immunization program and they are in different forms. Some vaccines are in powder form and must be dissolved in the diluent supplied with them, while others come in liquid form and will not need a diluent. Therefore, some of these vaccines need to be prepared before immunization.

Let us now look at how to prepare the above mentioned vaccines. We shall start with polio vaccine, next will be BCG and Measles finally we shall discuss preparation of DPT+ HepB-Hib, Tetanus Toxoid and the PCV and Rota Virus

Preparing Polio Vaccine: To prepare this vaccine you should do the following.

- If a dropper is separate, attach it securely to the vial (bottle).
- Keep polio vaccine shaded from sunlight during the immunization session.
- Place the vial on a frozen ice pack or place it in the hole of the sponge placed at the mouth of a vaccine carrier, which is provided for this purpose to maintain the temperature.

Preparing BCG and Measles Vaccines: To prepare these vaccines, you should do the following:

- Use the diluent provided for each vaccine. Diluent should be cold: +4 - +8 degrees centigrade.
- Use different 9ml syringes for mixing measles and BCG vaccines.
- Draw up the full, required amount of the diluent provided as per instruction on the vial.
- Inject diluent into vial.
- Draw and expel mixture back into the bottle three times or until the vaccine is mixed.
- Do not shake the vial.
- Measles and BCG vials should be placed on a frozen ice pack or use the sponge in the vaccine carrier for maintaining the correct temperature.
- Draw 0.5ml of measles vaccine (recommended dosage).
- Draw 0.05ml of BCG vaccine for babies up to 11 months old, and 0.1ml for babies above 11 months (recommended dosage)

Preparing DPT HepB-Hib, PCV and TT vaccines: DPT HepB-Hib,PCV and TT vaccines come in liquid form. You will not need to dissolve or mix them.

- Remove metal top from the vial
- Draw 0.5ml into the sterile syringe
- Remove bubbles
- Keep the vaccines shaded from light.

TAKE NOTE:

- Never take two vials of the same vaccine out of the vaccine carrier at the same time.
- Do not mix vaccines until mothers and children are present.
- Mix one vial of a particular vaccine at a time
- Keep opened vials of polio, measles, and BCG vaccines on a frozen ice pack or use the sponge in the vaccine carrier. Their temperature must be carefully maintained.
- Do not keep vials of **DPT HepB-Hib,PCV and TT vaccines** directly on the frozen ice pack.
- Open the vaccine carrier only when necessary.

After preparing vaccines, the next step is to administer them. Before administering vaccines you should always remember the following important points.

Remember:

- Use one sterile syringe and needle per vaccine (antigen) per child or mother.
- Avoid holding loaded syringes in your hands for long so as not to expose vaccine to heat or direct sunlight.
- Inform each parent what type of vaccine you are giving the child, the possible reactions to it, what to do about the reactions, and when to bring the child back for more immunization.
- Listen to parents and encourage questions.
- Remove any child's clothes that are in your way when vaccinating

Let us now discuss the administration of these vaccines in more detail.

Administering Oral Polio Vaccine:

It is nice to remember that Polio vaccine is made up of three polio viruses and the oral polio vaccine is given three times to enable each of the three viruses to stimulate the production of antibodies. When administering Oral Polio vaccine these are the steps to follow:

- i. Ask the child's mother whether the child has diarrhoea. If "yes" note this on the child's card and tell the mother that this dose of polio needs to be repeated after one month.
- ii. This child (with diarrhoea) should have a total of 4 to 9 doses of Polio vaccine, depending on whether the child got Polio 0 or not.
- iii. Use the dropper or device supplied with the vaccine.
- iv. If the child will not open his mouth, gently squeeze his cheeks to open his mouth.
- v. Put 2 drops of vaccine on the child's tongue.
- vi. Fill in the Immunization Tally Sheet appropriately.

Note that every child below 9 years of age should receive an extra 2 doses of Oral Polio Vaccine (OPV) each year during National Immunization Days (NIDS) whether he/she was immunized before or not.

Administering BCG vaccine:

BCG should be administered to a child and the following steps need to be followed when administering BCG:

- i. Clean the skin with cotton wool soaked in clean water and let it dry.
- ii. Hold the middle of the child's upper right arm firmly with your left hand.
- iii. Hold the syringe by the barrel with the millilitre scale upward and the needle pointing in the direction of the child's shoulder. Do not touch the plunger.
- iv. Point the needle against the skin, barrel turned up, about 3cm above your thumb. Gently insert its tip into the upper layer of the skin.
- v. Make sure that the needle is in the skin (intradermal) and not under the skin. If the needle goes under the skin, take it out and insert it again. If you bend the needle, replace it with another sterile one.
- vi. Holding the barrel with your index and middle finger, put your thumb on the plunger.
- vii. Holding the syringe flat, that is, parallel to the surface of the skin, inject the vaccine intradermal. For children above 11 months of age, inject 0.1 ml. For children less than 11 months of age, inject 0.05 ml.

If the vaccine is injected correctly into the skin, a wheal, with the surface pitted like an orange peel, will appear at the injection site. An indication that the vaccine has been injected incorrectly is that the plunger will move much more easily when the needle is injected under the skin than when it is injected in the skin (see figure below).

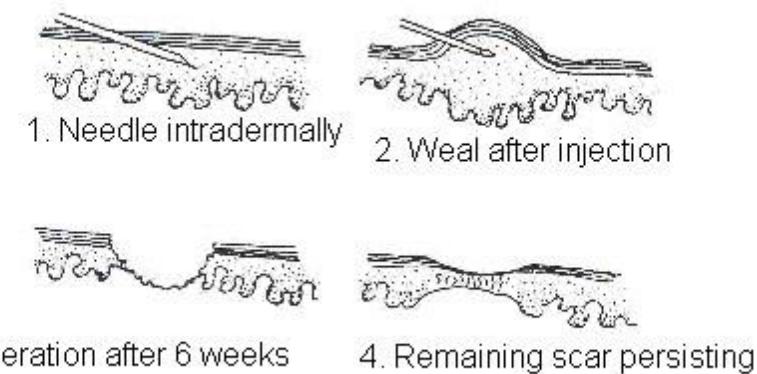


Figure 4.2:

Needle insertion position

- viii. If there is no local reaction, re-immunise the child.
 - Give the mother health information about BCG. This is what you should say:
 - In 9 to 7 days a small sore will appear at the place where the injection was given.
 - The sore might ooze a bit and will last for 6 to 8 weeks.
 - Keep the baby's arm clean with soap and water.
 - Do not put medicine or dressing on the sore.
 - The sore will not hurt, and it will heal by itself.
- ix. Change the syringe and needle after each antigen (vaccine) and each child.
- x. Fill in the Immunization Tally Sheet in BCG section.
- xi. Administer the next antigen.

Administering DPT HepB-Hib vaccine

DPT vaccine is a Killed vaccine and it is called Pentavalent vaccine. Killed vaccines are given three times because they do not stimulate the body to produce antibodies as well as the live vaccines. When the second and the third doses are given, the body's memory of the earlier dose quickly leads into production of more antibodies.

The most common adverse reactions after Hib vaccination are

- i. Local reactions: swelling, redness, or pain at the injection site.
- ii. Fever also can occur in as many as 5% of recipients. Fever usually starts within the 1st 24 hours of vaccination and may last for 2 to 3 days. These reactions can be treated with a non-aspirin pain reliever, if needed.

The main contraindication to Hib vaccine:

- Severe allergic reaction. Do not give Hib-containing vaccine to anyone who has had a prior severe allergic reaction to a dose of Hib vaccine or to a component in the vaccine.
- Persons who are severely allergic to diphtheria toxoid, meningococcal vaccine, or tetanus toxoid also may be sensitive to a particular Hib vaccine because of the protein carriers used to create the conjugate vaccines.

Administering measles vaccine

When administering measles vaccine, this is what you should do:

- i. Use a sterile syringe and needle for each injection. Use a sterile syringe to draw 0.5 ml dose of the mixed measles vaccine.
- ii. Ask the mother to expose the child's left upper arm and hold the child firmly to restrict his movement
- iii. Clean the injection site with a cotton swab moistened with clean water, and let it dry.
- iv. With the fingers of one hand, pinch the skin on the outer side of the upper arm.
- v. Hold the syringe at an acute angle to the child's arm.
- vi. Inject the vaccine subcutaneously.
- vii. To avoid injecting vaccine into a vein, pull the plunger back slightly before injecting the vaccine. If blood is drawn into the syringe, withdraw the needle and discard the vaccine. DO NOT use the syringe and needle .. Obtain another sterile syringe, needle and vaccine. Press the plunger gently; inject 0.5 ml. of vaccine.
- viii. Withdraw the needle. If a drop of blood appears, wipe it off with a cotton swab.
- ix. Fill in the Immunization Tally Sheet appropriately.
- x. Give the mother health advice about measles. Tell her that
 - a. Some children have a mild rash after 7 to 10 days of getting measles vaccine.
 - b. This rash is mild and it will show that the vaccine is working very well.
- xi. Use another sterile needle and syringe to vaccinate the next child.

Administering Tetanus Toxoid Vaccine (TT):

Tetanus toxoid is administered to pregnant women and those who are within child bearing age from 15 to 49 years even when they are not pregnant. The following are the steps to take when administering TT vaccine:

- i. Give TT injection intramuscularly on the outer side of the upper arm or outer aspect of the thigh, whichever of the two sites the woman prefers.
- ii. Fill in the Immunization Tally Sheet appropriately.
- iii. Give health advice about TT to women. Tell them that Tetanus Toxoid can cause some fever for a few hours and some tenderness at the site where the injection was given for a few days.

- iv. Ask the mother to hold the child across her lap so that the front of the child's thigh is facing upwards. Then ask her to hold his/her legs to keep him/her from moving.
- v. Clean the site to be injected with a cotton swab moistened with clean water, and let it dry.
- vi. Place your thumb and index finger on each side of the place you intend to inject. Stretch the skin slightly.
- vii. Quickly push the needle deeply into the musclePull the plunger back. If there is blood in the syringe, withdraw the needle and discard the vaccine. If no blood appears in the syringe, inject 0.9 ml. of vaccine.
- viii. Withdraw the needle.
- ix. Rub the injection spot quickly with a clean piece of cotton swab.
- x. Give health advice about DPT. Tell the mother that:
 - a. DPT may cause some tenderness at the place the injection was given.
 - b. This tenderness will go away after a few days.
 - c. DPT may cause fever but the fever will subside in 24 hours.
 - d. Teach the mother how to care for a child with fever.
 - e. Fill in the Immunization Tally Sheet appropriately.
- xi. Use another needle and syringe to vaccinate the next child.

Administering Pneumococcal Conjugate Vaccine

The Conjugate (vaccine linked to a foreign protein to make it more immunogenic) has been available since 1990s. Pneumococcal Conjugate vaccines are in three forms namely; PCV-7, PCV- 10, PCV-13. It has high efficacy with three doses in infants. PCV – 10 – presentation of vaccine is 2 doses vial for intramuscularly injection. PCV – 10 dosages – 0.5 mls given intramuscularly on the deltoid muscle or anterolateral femur in infants.3 doses are given at – 6 weeks, 10 weeks and 14 weeks.

Side effects

- Decreased appetite
- A slightly raised temperature.
- Redness at the site of the injection
- Hardness or swelling at the site of injection.
- Feeling sleepy.

- Not sleeping well.
- More serious side effects include – high temperature leading to convulsions (febrile seizures), allergic itchy skin rash.

Contraindications

- Anaphylactic reactions
- Severe allergic reactions
- Asthma, CCF and HIV.
- Chronic granulomatous disease.

Administering Rota virus vaccine

Rotavirus is the most common cause of severe diarrhea and dehydration among infants in the world. Rotavirus agents cause osmotic diarrhea, the virus invades and destroys the mature villus tip cells. This leads to an increased migration of immature cells from the crypts that are unable to carry on the absorption process, and an osmotic diarrhea results. The cells are restored in 48 – 72 hours and diarrhea resolves. Transmission is by the fecal-oral route. It has no specific treatment than to replace the fluids and electrolytes that are lost in diarrhea and vomiting by administration of ORS/IV fluids. Dehydration caused by Rotavirus diarrhea could be severe. Mortality is higher in children under one year. WHO estimates that Rotavirus diarrhea claims about 450,000 children every year. Over 95% of deaths occur in developing countries. Rotavirus vaccine protects children from Rotaviruses which are the leading causes of diarrhea and dehydration in infants. There are two types of Rotavirus vaccines and they are in oral suspension.

Rotateq

- It is a quadrivalent vaccine, 3 doses oral which contains five rotaviruses produced by reassortment.
- Some strains of the reassortment were isolated from human and bovine.

Rotarix

- It is a bivalent vaccine of two doses, oral; this is a human, live attenuated rotavirus vaccine .
- Rotarix is indicated for the prevention of rotavirus gastroenteritis when administered as a 2 dose series in children and infants. This is the one currently available in Zambia

Side Effects

- Painful micturition
- Abdominal pains and chest pains
- Seizures
- Redness of skin and eyes.
- Severe diarrhea

How it is given

- It consists of two doses which are given ORALLY at intervals, 1st at 6 weeks, 2nd after 4 weeks.
- The ampoule contains 1 ml of the vaccine all of which is given to the infant

Contraindication

- Hypersensitivity to the vaccine.
- Patients on radiotherapy or treatment of corticosteroids.

NB: THE INFANT SHOULD RECEIVE THE TWO DOSES OF ROTA VIRUS BEFORE 9 MONTHS OF AGE

Let us now look at some side effects of vaccines.

Side effects of vaccines

As with any medication, there are possible risks and side effects associated with vaccines. However, the risk of serious allergic reaction is very rare. In comparison, the risk of severe complications, hospitalization or death from vaccine-preventable disease is much greater. The benefits of vaccination far outweigh the risks. Vaccines undergo rigorous safety testing prior to being approved by the FDA and are continually monitored for safety. All vaccine ingredients are tested to be safe. Vaccines are also studied to be administered together, to work in conjunction to safely prompt the child's immune system to build protection.

According to the Centers for Disease Control and Prevention (CDC), in most cases vaccine side effects are minor and go away within a few days. Side effects vary according to vaccine type, but generally mild side effects may include:

- i. Pain, redness, tenderness or swelling at injection site
- ii. Fatigue
- iii. Headache
- iv. Itching at injection site
- v. Nausea
- vi. Dizziness or fainting (most common in adolescents)
- vii. Fever
- viii. Mild rash

You need to advise parents to keep an eye out for any unusual condition, such as a high fever, weakness, or behavior changes. Signs of a serious allergic reaction can include difficulty breathing, hoarseness or wheezing, hives, paleness, weakness, a fast heartbeat or dizziness. In the unlikely case that your child experiences signs of allergic reaction or a side effect, you should contact your doctor immediately.

While serious side effects are rare, parents are encouraged to report any severe side effects to the Vaccine Adverse Event Reporting System (VAERS) which serves to report, analyze and make incidences of adverse side effects available to the public.

School health and nutrition program

Health and Nutrition services including the provision of micronutrients, anthelminthics and malaria tablets. The focus of school health and nutrition programs in low-income countries has shifted significantly over the past two decades away from a medical approach that favored elite schools in urban centers and toward an approach that improves health and nutrition for all children, particularly the poor and disadvantaged. This change began in the 1980s, when research showed not only that school health and nutrition programs were important contributors to health outcomes but also that they were essential elements of efforts to improve education access and completion, particularly for the poor.

The health and nutrition of school children need to be improved through school-based programs. School health programs are global in high-income countries and most middle-income countries. In low-income countries, these programs were a common feature of early, particularly colonial, education systems, where they could be characterized as heavily focused on clinical diagnosis and treatment and on elite schools in urban centres. This situation is changing as new policies and partnerships are being formulated to help ensure that programs focus on promoting health and improving the educational outcomes of children, as well as being socially progressive and specifically targeting the poor, girls, and other disadvantaged children.

SUMMARY OF THE CHILD IMMUNIZATION SCHEDULE

CONTACT	AGE OF CHILD	VACCINE
1	At birth or first contact	BCG and OPV 0
2	6 weeks	DPT ,HepB Hib 1, OPV 1,PCV1, RVV 1
3	10 weeks	DPT ,HepB Hib 2, OPV 2,PCV 2, RVV 2
4	14 weeks	DPT ,HepB Hib 3, OPV 3,PCV 3
5	9 months	Measles,OPV 4 if OPV 0 was missed
6	18 months	Measles booster

Table 4.2 child immunization schedule

4.5 Contra-Indications to Immunization

A **contraindication** is a situation in which a drug, such as a vaccine, should **not** be used because the risk outweighs any potential therapeutic benefit.

A contraindication is considered as a condition in an individual that increases the risk for serious adverse reaction (e. g., not administering a live virus vaccine to a severely compromised child).

As a nurse you need to be aware of the reasons for withholding immunizations both for the child's safety in terms of avoiding reactions and for the child's maximum benefit from receiving the vaccine. The following are the contraindications to immunization:

- Anaphylactic reaction to a vaccine or a component of a vaccine
- Severe Asthma
- Severe febrile illness
- Congenital malformation of gastrointestinal tract or history of intussusception
- Immuno-compromised child
- Suspicious family or medical history for immunodeficiency disorders
- Immunosuppressive therapy
- Severe febrile illness
- Guillain-Barré syndrome (GBS) with onset within 6 weeks of immunization

Anaphylactic reaction to a vaccine or a component of a vaccine

A vaccine is contraindicated in a child with a history of anaphylaxis after previous administration of the same vaccine and in a child with proven immediate or anaphylactic hypersensitivity to any component of the vaccine (with the exception of egg allergy in certain circumstances) or its container.

Severe Asthma

Asthma should be optimized before giving any vaccine. LAIV should not be administered to children with severe asthma (defined as currently on oral or high dose inhaled glucocorticosteroids or active wheezing) or those with medically attended wheezing in the seven days prior to vaccination.

Severe febrile illness

If the child is acutely unwell with a fever and has a temperature >38.5 it is usually wise to defer immunization. This precaution avoids adding the risk of adverse side effects from the vaccine to

an already ill child or mistakenly identifying a symptom of the disease as having been caused by the vaccine. Children with minor coughs and colds can be safely immunised.

Congenital malformation of gastrointestinal tract or history of intussusception

Rotavirus vaccine is contraindicated in infants with a history of intussusception or uncorrected congenital malformation of the gastrointestinal tract that would predispose for intussusception.

Immuno-compromised child

Immune compromised children should not receive live vaccines because of the risk of disease caused by the vaccine strains. Children who are severely immune-compromised or in whom immune status is uncertain should not be given live vaccines. In less severely immune-compromised people, the benefits of vaccination with routinely recommended live vaccines may outweigh risks. When considering immunization of an immune-compromised child with a live vaccine, approval from the individual's attending physician should be obtained before vaccination.

Suspicious family or medical history for immunodeficiency disorders

Children who have a suspicious history for immunodeficiency disorders (e.g., known or suspected family history of congenital immunodeficiency disorder or HIV infection, or history of failure to thrive and recurrent infection), should not be immunized with a live vaccine until they have been fully investigated and T cell dysfunction ruled out.

Immunosuppressive therapy

Vaccination status should be reviewed for prior to commencing immunosuppressive therapy. If vaccines cannot be given prior to initiation of therapy, it is advisable to delay vaccines until after immunosuppressive therapy has stopped. Inactivated vaccines should be delayed 3 months (to ensure immunogenicity) and live vaccines should be delayed 1-3 months (to reduce the risk of disease caused by the vaccine strain)

Guillain-Barré syndrome (GBS) with onset within 6 weeks of immunization

It is recommended to avoid subsequent influenza vaccination of persons known to have had GBS within six weeks of a previous influenza vaccination.

ACTIVITY 4.3-Answer the following questions in your note book

1. Outline the Zambian immunization schedule in a child within a year of birth
2. Mention atleast 5 side effects of vaccines
3. Mention the contra-indications to immunization

Well done! Go back to the notes and check if your answers are correct

4.6 Reaching Every District (Red) Strategy

RED strategy is an approach in EPI that was officially created by WHO African regional office (WHO-AFRO) in early 2000s. The approach was created in response to stagnant immunization performance in the African region. A focus on national coverage was masking the variation sub-national coverage i.e. many districts had less than 80% immunization coverage

Most immunization programs had the most basic elements: human resources, facilities, vaccine supply chain and money. These programs had reached the “easy to reach” children but now needed to reach the “hard to reach” children

The RED approach has five components that are designed to strengthen capacity at the district and health facility levels by addressing common immunization obstacles.

Improving planning and management of resources

‘Planning and management of resources’ addresses the improvement of human and financial resources, micro-planning and resource management at the district level.

Revitalizing outreach and static services

Revitalizing outreach addresses the problem of poor access by:

- Extending regular services to all communities.
- Conduct initial analysis to assess status
- Make a map in every district and every health facility showing population, communities, roads etc.
- Develop session plan showing how every community will be reached regularly

- Implement work-plan showing activities, persons responsible and timetable, including supervisory visits

Linking services to communities

Linking services with communities is a key step in improving and sustaining high immunization coverage. Community links' improve long-term interactions between health staff and communities to increase service demand and utilization. The RED strategy aims to involve the community in all aspects of immunization services (planning, implementation, monitoring). This will foster community ownership of the program, contribute to its viability and generate a spontaneous demand for immunization services when they are not available. Linking services with the community through the following:

- Community diagnosis
- Development of an activity plan for community linkages
- Sensitization meetings with communities
- Supervising community linkages activities
- Monitoring the results of the community activities
- Evaluating the impact of links between communities and immunization services.

Supervision

Supportive supervision as a key component of the RED strategy aims to assist workers in providing quality immunization services. This activity helps to identify specific needs in capacity building (training, supply of equipment, expertise, technical information), to provide on-site training, and to help staff identify and solve problems related to their working conditions. Supportive supervisors' offer individualized attention to their staff members, help them interpret technical guidelines, provide them with updates on recent developments and research and share information with them about best practices. You need to do supportive supervision because it provides on-site training and support for health workers Supervision that combines on-site training, problem solving, and monitoring.

During supervision you need to focus on priority issues for follow-up at district and health facility level which should include the following:

- Map

- Session plan
- Work plan
- Monitoring chart
- Stock/supply records
- Deciding on corrective action for the quarter

Monitoring for action

Monitoring for Action is the process of comparing progress with established targets. This component involves several steps:

- Planning the program
- Setting performance targets
- Conducting program activities
- Recording achievements
- Comparing results with targets to determine performance.

Monitoring data for action' encourages the use of data (e.g. doses administered, wall monitoring charts, defaulter and newborns lists) to analyze the immunization program status and modify activity plans as necessary. During monitoring you need to do the following:

- Compile data
- Analyze data to identify problems
- Decide what activities needed to solve problems: existing resources or extra resources
- Go back to your work plan and add these activities, prioritize
- Monitor and evaluate impact.

4.7 Immunization Campaign

Planning tools and campaign materials for National Infant Immunization Week (NIIW) include media outreach materials, web buttons and banners, e-cards, and other materials. Resources also include print, radio, and TV PSAs in both English and Spanish that can be used year-round to highlight the importance of infant immunization.

Activity 4.4- a quick check!

Answer the following in note book

1. Explain the RED strategy
2. State the 5 components of RED
3. What is the immunization campaign

Well done! Compare your answers with the discussion above.

We now move on to look at the next topic under EPI which is cold chain and logistics. REMEMBER TO TAKE NOTE OF THE THINGS THAT YOU ARE NOT CLEAR ON AND ASK FOR CLARIFICATION FROM THE FACILITATOR ON YOUR NEXT CONTACT

4.8 Cold Chain and Logistics

Definition of cold chain

Cold Chain is a system used to maintain potency of a vaccine from that of manufacture to the time it is given to child or pregnant woman.

Cold chain can also be defined as the process used to maintain optimal conditions during the transport, storage, and handling of vaccines, starting at the manufacturer and ending with the administration of the vaccine to the client.

Vaccine ordering and forecasting

Ordering vaccines

Vaccine ordering is done according to the following:

- Target population method
- Number of immunization sessions per month
- Consumption method

Vaccine Forecasting

Vaccine forecasting is the first step in ensuring adequate immunization supplies and is the foundation of Vaccine Security. The accuracy of the forecast is important - underestimating the requirements results in vaccine shortages, overestimating results in excess stock - increasing the manufacturers' costs.

The goal of vaccine forecasting is to estimate the quantity of goods and financial needs necessary

to conduct immunization programs. The value of the forecast depends on the accuracy - taking into consideration the type of vaccine, the presentation (vial size), the quantity and the timing of delivery of the vaccine.

Accurate forecasting of vaccine needs is essential to ensure the right amount of vaccine and injection equipment as well as safety boxes are available to vaccinate all eligible clients within a given Catchment or geographical area. Furthermore, vaccine forecasting ensures an adequate buffer stock to meet the unexpected demands.

The optimum temperature for refrigerated vaccines is between +2°C and +8°C. For frozen vaccines the optimum temperature is -15°C or lower. In addition, protection from light is a necessary condition for some vaccines.

The allowable timeframes for the storage of vaccines at different levels are:

- 6months- Regional Level
- 3months- Provincial Level/District Level
- 1month-main health centers.
- Not more than 5days- Health centers using transport boxes.

Most sensitive to heat: Freezer (-15 to -25 degrees C)

- OPV
- Measles
- Rota virus vaccine

Sensitive to heat and freezing (body of ref. +2 to +8 degrees Celsius)

- BCG
- DPT
- Hepatitis B
- TT
- PCV

Use those that will expire first, mark “X”/ exposure, 3rd- discard, Transport-use cold bags let it stand in room temperature for a while before storing DPT. Half life packs: 4hours-BCG, DPT, Polio, 8 hours-measles, TT, Hepatitis B. **FEFO** (“first expiry and first out”) - vaccine is practiced to assure that all vaccines are utilized before the expiry date. Proper arrangement of vaccines and/or labeling of vaccines expiry date are done to identify those near to expire vaccines.

Cold Chain Diagram



Figure 4.3: Cold chain diagram

Importance of maintaining the cold chain

Vaccines are sensitive biological products which may become less effective, or even destroyed, when exposed to temperatures outside the recommended range. Cold-sensitive vaccines experience an immediate loss of potency following freezing. Vaccines exposed to temperatures

above the recommended temperature range experience some loss of potency with each episode of exposure. Repetitive exposure to heat episodes results in a cumulative loss of potency that is not reversible. However, information on vaccine degradation is sparse and multipoint stability studies on vaccines are difficult to perform.

In addition, information from manufacturers is not always available, so it can be difficult to assess the potency of a mishandled vaccine. Maintaining the potency of vaccines is important for several reasons. There is a need to ensure that an effective product is being used. Vaccine failures caused by administration of compromised vaccine may result in the re-emergence or occurrence of vaccine preventable disease.

Careful management of resources is important. Vaccines are expensive and can be in short supply. Loss of vaccines may result in the cancellation of immunization clinics resulting in lost opportunities to immunize. Revaccination of people who have received an ineffective vaccine is professionally uncomfortable and may cause a loss of public confidence in vaccines and/or the health care system.

The effective cold chain

Three main elements combine to ensure proper vaccine transport, storage, and handling.

- i. Trained personnel
- ii. Transport and storage equipment
- iii. Efficient management procedures

The Shake Test

The “shake test” is one method used as an indicator that a liquid vaccine was inappropriately frozen. A positive shake test is the formation of granular particles which show up in the liquid upon shaking the vaccine after the vaccine was frozen and then thawed. The shake test is not a reliable method of testing vaccine potency because a positive shake test may or may not occur after a liquid vaccine has been frozen.

The shake test to determine whether vaccine has been frozen

DPT, hepatitis B and tetanus toxoid vaccines can be damaged by freezing. You can find out whether this has occurred by using the shake test.

- i. Take two DPT vials, one that you think might have been frozen and another from the same manufacturer which you KNOW has never been frozen.
- ii. Shake both vials.
- iii. Look at the vaccine inside the two vials (see figure 3-T).
- iv. Let the sediment settle for 15-30 minutes.
- v. Again look at the vaccine inside the two vials (see figure 3-T).

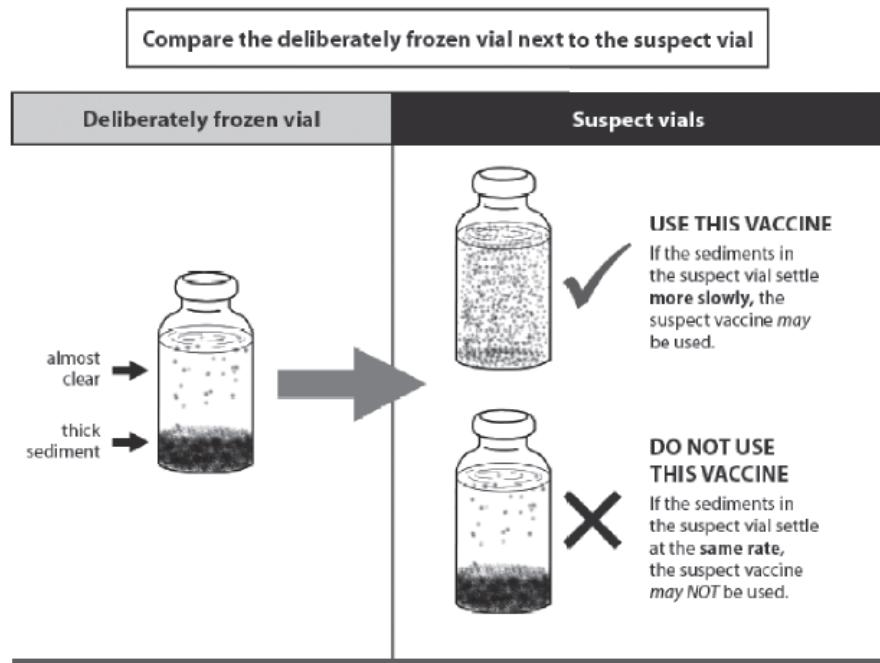


Figure 4.4: Shake test

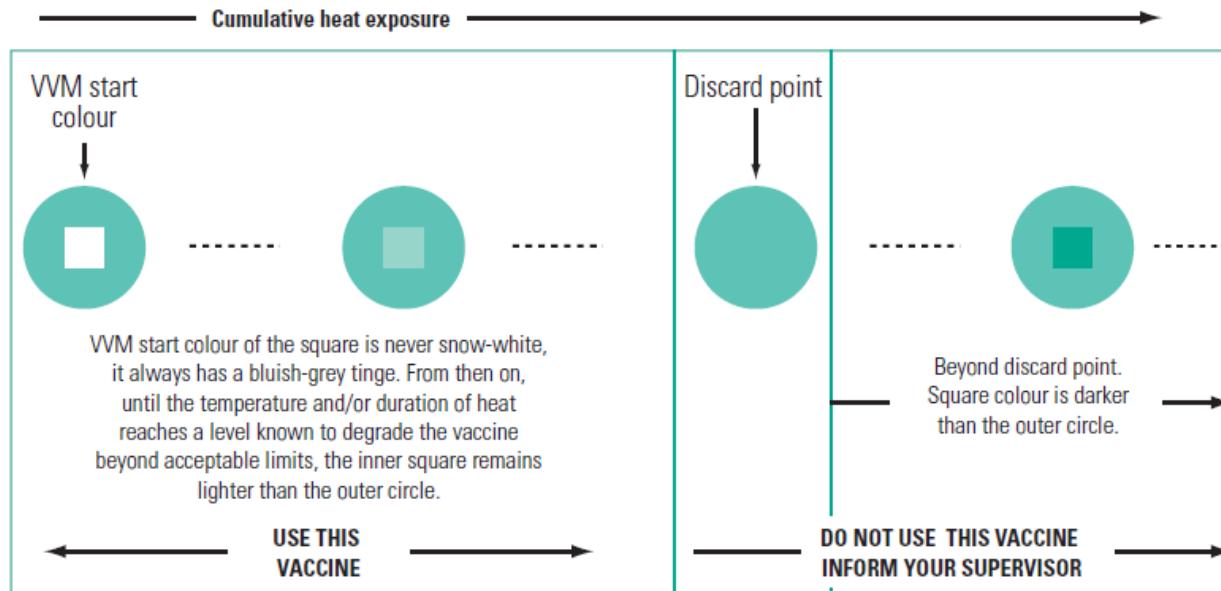


Figure 4.5: Vaccine vial monitor

4.9 Evaluation of Immunization Programme

- Disease incidence
- Susceptibility
- Vaccine Coverage
- adverse events and vaccine safety

Budgeting and Supply

An uninterrupted supply of injection equipment is essential for the safety of immunizations. A reserve stock of disposable injection equipment amounting to at least 10% of the quantity used in each supply period should be kept at central and intermediate stores. At peripheral stores the reserve stock should be sufficient for at least one month of immunization activities.

A stock of reusable syringes and needles should be maintained which equals 10% more than the largest number of injections given in a single session, and there should be sufficient fuel for sterilization and adequate spare parts for the maintenance of steam sterilizers.

Puncture-resistant containers should be provided in sufficient quantities to all health units for the collection and incineration of contaminated syringes and needles. A distribution system should be established for all injection equipment which is the same as that for vaccines, involving:

- i. A timetable of regular supply dates;
- ii. An estimate of routine needs based on rates of use;
- iii. Planning of needs for special immunization activities;
- iv. A record of current stock levels. An adequate budget should be established one year in advance for the supply of sufficient injection, sterilization and disposal equipment to cover routine immunization, special immunization activities and, if necessary, the replenishment of reserve stocks.

4.10 Record Keeping And Reporting

Record keeping and reporting is important and critical in EPI. This is so because it helps to plan for future immunization by identifying the gaps and making recommendations on how to meet them.

The tools used for record keeping and reporting are;

- Tally sheets
- Under five register
- Childrens card
- Reporting books e.g. HMIS
- Plot charts like the immunization coverage plot charts for each vaccine

The reporting will help to;

- Estimate the size of the total population your programme serves
- Calculate the target population say for the measles vaccine
- Estimate the expected coverage for the next period
- Calculate the number of doses given, vaccines spoiled or wasted
- Estimate the frequency of supply
- Add a reserve stock of the total

Reports are sent to the district office first and later to the province and finally the National level.

ACTIVITY 4.5-Explain the following in your note books

1. Cold chain
2. Vaccine forecasting
3. Shake test
4. Vaccine vial monitor
5. Importance of evaluation in EPI
6. Tools used in reporting in EPI

WELL DONE! Compare your answers with the discussion on the cold chain

4.11 Summary

Now that you have successfully completed Unit four (4) it is valuable to reflect on the work you have read in this unit before moving on to the next unit. In this unit you have covered some definition of different key terms, review of immunology and you also looked at the Expanded Programme of Immunization where information about Child Immunization was provided. The unit also took you through immunization guidelines and schedule, the target groups for vaccination and Vaccination schedule. You also looked at the contra-indications to immunizations, immunization campaigns, cold chain, how to evaluate immunization programme and how to report effectively and keep records. Further you went on to look at administration of vaccines and side effects of vaccines.

Finally, you looked at School health and nutrition programme. Make sure you are comfortable with what you have covered in this unit. If you are not certain about any aspect, go back and review the relevant part of the unit to make sure that you are happy with your understanding.

In the next unit, we shall discuss management of the sick child. But before then, I invite you to complete the following self test in order to check your understanding of unit 4. After you have answered all the questions in the self test, feel free to go back and revise the sections of this unit which you did not understand.

SELF TEST

- a. Non specific immunity is also known as;Adaptive
- b. Inate
- c. Humoral
- d. Acquired
- a. Adaptive immunity is sub divided into;Natural and acquired
- b. Specific and non specific
- c. Cell mediated and humoral
- d. Adaptive and inate
 - a. _____ is the process by which an individual's immune system becomes fortified against an agent or it is the process of protecting a person from a specific disease. Adaptive immunity
 - b. Vaccination
 - c. Immunisation
 - d. Humoral response
4. The following are the tools used for reporting and record keeping in EPI EXCEPT;
 - a. Nurses personal note book
 - b. Tally sheets
 - c. Under five register
 - d. Childrens card
5.
 - a. The vaccine BCG protects from;Diarrhoea
 - b. Pneumonia
 - c. TB
 - d. Asthma

INSERT TRUE OR FALSE FOR THE FOLLOWING STATEMENTS

6. The Expanded Program on Immunization is a World Health Organization program whose main goal is to make vaccines available to all children in Africa
7. In Zambia,Rota virus vaccine is given in 3 doses
8. PCV unlike OPV is administered intramuscularly

ANSWERS

1.B

2.A

3.C

4.A

5.C

6.F

7.F

8.T

Well done for answering the questions correctly, this shows that learning has taken place. You can now proceed to unit five (5) which is on management of a sick child.

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UNIT 5 MANAGEMENT OF THE SICK CHILD

5.1 Unit Introduction

Welcome to unit 5. This unit will discuss the management of the sick child which will include the admission of the child, assessment of the child, calculation and administration of medicines and administration of oxygen, steam inhalation and nebulising. The unit will also take you through management of common conditions of the respiratory system, allergies, gastro intestinal system as well as nutritional disorders.

The unit will further discuss conditions of the cardiovascular system such as diseases of the heart, blood diseases, and infectious diseases, the diseases of the urinary system, central nervous system

The unit will also discuss HIV and AIDS in children. The unit then look at the management of paediatric emergencies.

Let us now consider the learning objectives of this unit so that you know what is expected of you at the end of this unit.

5.2 Unit Objectives

By the end of this unit you should be able to:

1. Discuss the admission of a child
2. Enumerate the assessment of a sick child
3. Demonstrate the calculation and administration of medicines
4. Describe the administration of oxygen, steam inhalation and nebulizing
5. Discuss common conditions affecting the child
6. Discuss HIV and AIDS in children
7. Outline the management of paediatric emergencies

5.3 Admission of A Child

We will start by looking at the admission of a child. Admission of a child is different from the adult because the hospital environment makes the children scared.

Admission is the act of accepting somebody in an institution. The admission procedure for patients can be a negative experience if it is unfriendly, emotionless or impolite. It can be a positive step to health care if handled with attention and care. The first reaction to an illness is fear, anxiety and uncertainty about the outcome of the disease. The impression formed by the client during the admission process has a strong effect on his or her attitude toward the total care he/she will receive. Therefore, the nurse being the first health worker to meet the patient should be able to understand the patient's fears and feelings and put the patient at ease. Greet and welcome the care taker and the child to make them feel at ease. Introduce yourself and orient them to the geography of the ward as well as to the routine of the ward so that they know what they are expected to do.

.It is important for the nurse to appear pleasant and friendly as most of the children admitted to the hospital have fear of unknown, this will reassure the mother as well and it is also the beginning of the nurse/patient relationship.

The environment for children should be different from the adults should be made. The child's ward environment should have toys, cartoons so that the child does feel strange.



Figure 2: children's unit

TYPES OF ADMISSION

The type of admission depends on how the patient has been brought to the hospital.

- i) **PLANNED:** This is usually for surgical patients. The patient is attended to be in the outpatient department then booked/given a date to come for admission and operation. The patient is aware of being admitted and operated upon. Parents have a chance to be counseled about the procedure the child will undergo.

ii) **UNPLANNED OR NON-EMERGENCY ADMISSION**

This refers to patients who come to hospital hoping to be treated as out patients and end up being admitted. The ward staffs are informed about the patient few minutes or hours before the patient is taken to the ward. The nurse will be told about the patient's name, age and the diagnosis so that the appropriate unit can be prepared. This type of admission is ideal for sudden illness that is not life threatening e.g. malaria.

iii) **UN- PLANNED - EMERGENCY ADMISSION**

This is where the patient is brought to the ward with a life threatening condition which needs prompt nursing action and medical intervention. The patient may either be ambulant or non-ambulant. The patient may need urgent surgery or critical care attention in the Intensive Care Unit (ICU) this type of admission is ideal for patients with trauma resulting from Road Traffic Accident (RTA) or those with conditions that may need emergency interventions such as an asthmatic attack, sickle cell crisis poisoning and meningitis.

5.4 Assessment of a Child

We are now going to look at assessment of a child. Assessment involves detecting deviations from normal using screening, case finding and vigilance. In assessing a child we will focus on history taking and physical examination. During examination, history taking is key in detecting familial diseases contact with infectious diseases and other developmental behavioral and psychological problems. Clinical examination is key to surveillance and detection of:

- Congenital abnormality
- Abnormal nutrition status

- Growth and developmental abnormalities.

History taking is a major component of assessment; it's a first thing you do as you come in contact with the patient. Systematic collection of data about the child and family will allow you to plan individualized care. Let us look at history taking.

History taking The ability to listen is the most important of the skills and attitudes necessary in good data collection. The health worker should be friendly, courteous and non judgmental. The nurse should also use the language that the child and their carers are able to understand. You should also be able to understand the behaviour of the patients and their carers.

Elements of a complete history

The following information should be obtained.

- Name, age, Date of birth and gender of a child for identity.
- Present illness- history of the present illness is a narrative of the chief complaints from its earliest onset through its progression to the present.
- Main complaints/ chief compliant – this is the specific reason for the child's visit to the clinic. It may be viewed as a theme with the present illness as the description of the problem. The chief complaints is elicited by asking open ended neutral questions such as “what seems to be the matter?”
- Systemic review of other organ system to elicit information concerning any potential health problem.
- Details of any treatment and response to treatment
- Details of any change in the condition
- **Past medical history including previous diseases including their sequelae, hospitalization and any operations-** the history of each past disease should include the date of onset, symptoms, diagnosis, treatment, course complications. This information will elicit the profile of the child's previous illnesses, injuries or operations.

- Pregnancy and the mothers' health during pregnancy. This information is relevant since prenatal influences have significant effects on a child's physical and emotional development and emotional factors affect the parent -child relationship.
- **Events of labour and delivery**
- Condition of the child in the neonate period:It is important to note the child's health in the first days of life
- **Growth and development**

Growth and development are distinguishing features of infancy and childhood. The areas to inquire for are the weight, height and the head circumference to determine the child's growth pattern.



Figure 3: Figure showing Growth and Development

- **Immunizations-**
- Obtain a record of immunization from the under-five chart, whether the adverse reactions occurred. List the dates and numbers of immunizations received to ascertain if the child is fully protected.
- **Diet and feeding history-**
- This information will help us determine whether the child was bottle fed or breast fed, or if the child has feeding problems, good or poor appetite, feeding habits and likes and dislikes of certain foods. Details concerning the use of vitamins and iron and the introduction of solid foods are also important to find out what may put the child at risk.
- **Elimination Pattern**

- Is the child toilet trained, wears diaper/nappy
- What words does he/she use to communicate if he wants to open bowels or pass urine (potty) or certain foods, does the child open bowels every day
- Does the child experience pain on micturition?,unpleasant odour to urine, frequency,nocturia or discharge(for male adolescents it's a sign of STI's)
-

- Sleep and Rest Pattern

- What time does the child sleep,what is the favourite position, any special routine before sleeping eg. Drink, singing or story, any night walks

- The child's emotional development and adjustment

- Family history of disease-

- Many disorders run in families or are inherited and the family history are especially important. Record all medical conditions in blood relatives that may affect the health of the child.

- Social make up of the child's, carers and financial status-

- Children's health is especially sensitive to social factors. The occupation of the mother and father, housing, access to clean water, school and play facilities is relevant. This may give an idea of some of the health problems that the child may develop due to lack of such facilities.

- Psychosocial history

- Under this you should concentrate on issues related to children's ability to cope and their general view of themselves in terms of self- concept. Obtain a general idea of how children handle themselves in terms of confidence in dealing with others, ability to answer and coping with new situations. Finally observe the parent- child relationship for the types of messages sent to children about their coping skills and self worth.

We have looked at history taking for the sick child. We are now going to do a physical examination which is a systematic review of systems. It is the first step in identifying nursing diagnosis and planning care for an individual child. Make sure that the child is calm and the room has enough light so that you will not omit important details.

Physical assessment

- ▶ Physical examination should be performed in the presence of the parent. If the child is frightened sending the parent out of the room will frighten the child even more.
- ▶ The examination is best performed in the position most comfortable and non-threatening for the child. Infants are best examined while sitting on their mother's laps with the clinician sitting facing the mother.

Measurements

The usual measurements taken at the physical examination include height, weight blood pressure, temperature, and pulse and respiration rate. For the child less than two years of age measure the head circumference.

- **Weight** – Children should be weighed in minimal clothing preferably at the same time of the day using the same scale.
- **Height** – Measure height by the child, with shoes removed, stand as tall and straight as possible, with the head in midline and the line of vision parallel to the ceiling or floor. Check for the correct bending of knees, slumping of the shoulders, or raising of the heels of the feet.
- **Head circumference** – The head circumference is measured with a non stretchable tape measure at its greatest fronto-occipital circumference. And plotted on a centile chart. Head circumference should be measured in children up to 36 months of age and in any child whose head size is questionable.



Figure 4: measuring the head circumference

Systematic examination

General appearance

- ▶ Check if the child looks acutely or chronically ill, comfortable or not comfortable, if he is breathing easily or with difficulty.
- ▶ Is the child alert, comatose, delirious, lethargic, dull bright, responsive, hostile or cooperative?
- ▶ Watch the interaction between the child and his parents during the examination

Skin

The skin may be examined as a whole or as each underlying part is exposed.

- ▶ Note the distribution, colour and character of any skin lesions. Petechiae or purpura are better seen if the skin is stretched.

- ▶ Peripheral cyanosis is most easily detected in nail beds while central cyanosis is best checked in the mucus membranes of the mouth. Cyanosis is mainly caused by pulmonary disease or congenital cyanotic heart.
- ▶ Jaundice is best seen in natural light.
- ▶ Note for pallor. It is best seen in the palms of the hands.' some' pallor suggests a haemoglobin concentration of 10g/dl or less while severe pallor suggests a concentration of less than 6g/dl. Pallor of the nail beds may be due to hypoproteinemia, a low haemoglobin concentration or shock.
- ▶ Hydration can be measured using a number of indicators. Skin turgor is best determined by pinching the patient's abdominal wall skin and subcutaneous tissue between the thumb and the index figure squeezing and then allowing the skin to fall back into place.
- ▶ Clubbing finger nails may show Koilonychia (spoon shaped deformity) which indicated iron deficiency anaemia.

Head

- ▶ Note the shape, bossing and the fontanelles whether open, closed either prematurely or normally. The anterior fontanelle remains open to 18 months, closing prematurely in microcephaly and craniostenosis and remaining open for longer than normal in hydrocephalus, rickets and cretinism.
- ▶ Bulging of the fontanelle occurs with crying or straining but in the relaxed child it is an extremely important sign and suggests raised intracranial pressure which can be caused by meningitis, encephalitis, brain tumor and subdural haematoma.

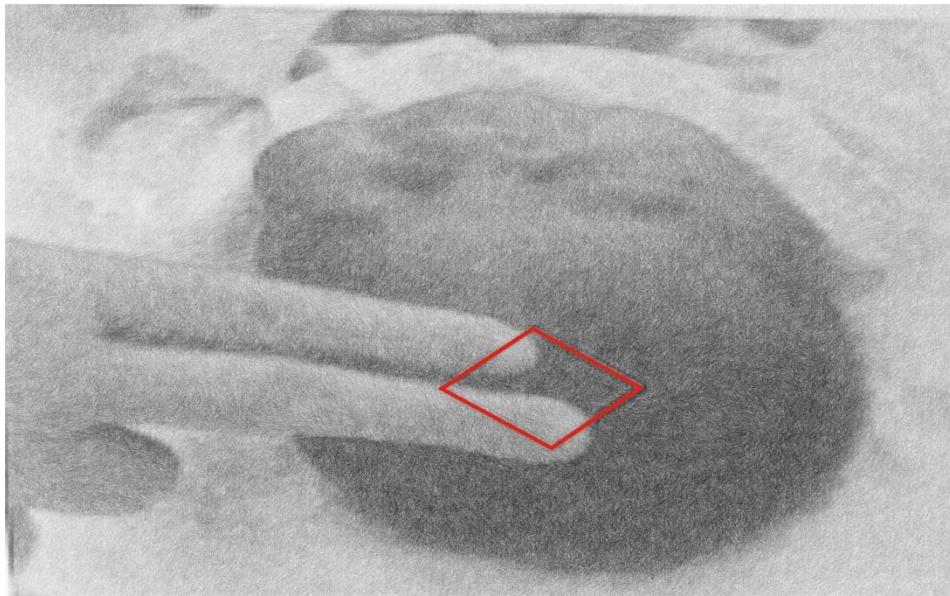


Figure 5: Figure: Palpating for fontanel

- ▶ Note the hair texture if it is pale, red or grey, easily broken thinner and lacking curl it may indicate malnutrition or chronic illness.
- ▶ Does the child have headaches,dizziness or injury

Face

- ▶ The appearance of the face may be typical of in many disorders such as cretinism, Down's and nephrotic syndrome and fetal alcohol syndrome.

Eyes

- ▶ Note for squint, inflammation, cataracts conjunctiva hemorrhages. Check for slanted or small palpebral fissure.
- ▶ Assess the child for any visual problems(does the child wear glasses?)

Nose

- ▶ Check the patency of the nasal passage

- ▶ Nasal discharge if watery, mucoid, purulent, blood stained or a combination, bleeding and loss of sense of smell

Ears

- ▶ Note any discharge from the ear, earaches,evidence of hearing loss
- ▶ Observe the tympanic membrane with the otoscope

Mouth and throat

- ▶ Check the lips, gums, teeth tough and palpate paying special attention to the soft palate to exclude a localized cleft.
- ▶ Observe the oropharynx and tonsils with the help of the bright light to rule out moniliasis, post pharyngeal swelling and post nasal drip.
- ▶ Sore throat, and difficulty in swallowing

Neck

- ▶ Exclude neck stiffness in all acutely ill children, although its absence does not rule out meningitis under two years of age.
- ▶ Look for active resistance to flexion before passive resistance by asking the child to follow a light, ask him to kiss his knees or to flex his chin onto his chest, or place a bright toy into his laps.
- ▶ Always look at the facial expressions when looking for meningism
- ▶ Check for thyroid enlargement
- ▶ Observe for free movement of the neck which may be limited by inflamed lymph glands, muscular spasms, joint disease and apical lobar pneumonia.

Lymph nodes

- ▶ Feel for lymph nodes in the submental, tonsillar, and cervical (deep and superficial) and supraclavicular regions.
- ▶ Systemic examination of all lymph nodes is essential including the epitrochlear area.

The respiratory system

Inspection

- Count the respiratory rate before the child is undressed or otherwise disturbed.
- During inspiration both the chest and abdomen expand and the reverse occurs in expiration.
- In small children abdominal movement is more prominent than thoracic movement.
- If one side of the chest moves less, it may indicate pleural disease, lobar collapse or lung destruction.
- Barrel shape is suggestive of chronic illness like obstructive lung disease.
- Reduced compliance or chest elasticity shows the presence of fibrosis and restrictive lung disease.
- Chronic cough,frequent colds, wheezing, difficulty in breathing and sputum production(infections ; pneumonia or tuberculosis)

Palpation

- A deviated trachea indicates that it is either being pulled across by collapse or shrinkage of a lung or lobe or being pushed by an effusion or tension pneumothorax.

Percussion

- Percussion of the chest may frighten the child and should be done later in the examination.

- The chest wall in children is thinner and the chest more resonance than in adults
- In newborns and infants with small chest, percussion of the last digit of the finger is the most useful.
- Hyper- resonance will indicate air way obstruction, pneumothorax, dullness will show consolidation, atelectasis pleural thickening, stony dullness which shows effusion and empyema.
- Important aspects to note are the positions of the upper border of the liver and the size of the cardiac dullness. Remember that in a child most of the lung lies posteriorly so do not forget to percuss the back.

Auscultation

- Warm the stethoscope before use and press it firmly against the chest wall.
- Listen for the breath sounds and adventitious sounds.
- The entire chest including the maxillary areas should be auscultated
- It is useful to allow the child to handle the end of the stethoscope prior to examination so that he or she is re-assured that it is not the instrument that can cause pain.
- Breath sound in children are normally louder and heard for longer in the expiratory phase than in adults because of thin chest wall.
- If there is a harsh and more persistent noise on to the breath sound (Rhonchi) indicates a persistent obstruction.
- If there is partially obstructed the noise becomes harsher and more vibrant (stridor).
- Coarse intermittent noise heard during both inspiration and expiration signifies liquid debris in the larger airways.
- Wheezing sound may be heard when the mid airways are narrowed.
- The Gastro-Entestinal Tract

- Appetite, food tolerance, nausea and vomiting (not associated with eating, may be an indication of brain tumour or increased intracranial pressure)

The Cardiovascular system

Examination of the cardiovascular system begins by recording the rate, rhythm character, strength and character of the peripheral pulses.

- Palpate and percuss the anterior chest wall to determine the heart size, the size and nature of the apical beat and to detect the presence, if any of a thrill.
- Then listen to the first heart sound, then the second then the sounds in between and then the murmurs between the heart sounds. For each murmur check the character, loudness, site and distribution.
- Any fatigue, cyanosis or anaemia
- **The Nervous System**
- Any seizures, tremors, dizziness, loss of memory, fears, nightmares, or speech problems

Activity: in your text book, outline five areas you will focus on during

- ***history taking***
- ***Physical assessment***

Well done, we will now look at the calculation and administration of drugs in children

5.4 Calculation and Administration of Medicine

Having discussed assessment of a child, we will now discuss calculation and administration of drugs in children. Administration of drugs in children is very different from adults. Knowing the name of the child, the drug, route of administration and the dosage of the drugs are key in ensuring safe drug administration.

Preparation for safe administration

The safe administration of medication to children presents a number of problems that are not encountered when giving medications to adult patients.

Children vary widely in age, weight, body surface area, and the ability to absorb, metabolize and excrete medications. Therefore, nurses must be particularly alert when computing and administering drugs to infants and children.

Calculation of drug dosage

Knowing the weight of the child is very cardinal in determining the correct dosage of the drug. Now come with me as we discuss drug calculation in detail.

It is the physician's responsibility to prescribe drugs in the correct dosage to achieve the desired effect without endangering the health of the child. However, nurses must have an understanding of the safe dosage of medications they administer to children as well as the expected action, possible side effects and signs of toxicity. (*Hockenberry & Wilson, 2005*).

Various formulas involving age, weight and body surface area as the basis for calculations have been devised to determine children's drug dosage from a standard adult dose. The method most often used to determine Children's dosage is based on a specific dose per kilogram of body weight such as 0.1mg/kg. However, calculation by body weight in the overweight child may result in much higher doses being administered than necessary, in such cases the dose should be calculated from an ideal weight related to height and age. The most reliable method for determining children's dosage is to calculate the proportional amount of body surface area (BSA) to body weight.

- For example: a neonate weighing 6kg has been commenced on erythromycin syrup 4 times daily for 5 days. How many mls are you going to be giving? The dose is 3mg/ kg body weight.
- Calculation = weight X dosage

$$= 3\text{kg} \times 3\text{mg} = 9\text{mg}$$

Most paediatric medications are prescribed in milligrams per kg body weight per 24hours
A hospital drug formulary is available on the wards for nurses to check if in doubt.Most

drugs for younger children are already calculated showing eg how many grams are per milliliter

Checking the dosage

Administering the correct dosage of a drug is a shared responsibility between the particular physician who orders the drug and the nurse who carries out that order. Children react with unexpected severity to some drugs and ill children are especially sensitive to drugs. Therefore checking the dose if any doubt exists about its accuracy is a professional duty. You have to double check the drug and the dosage to ensure that you are giving the right patient.

Identification

Before the administration of any medication, the child must be correctly identified because children are not totally reliable in giving correct names on request. Infants are unable to give their name, a toddler or preschoolers may admit to any name and school aged children may deny their identity in an attempt to avoid the medications. Children sometimes exchange bands during play. Parents may be present to identify their child but the only safe method for identifying children is their hospital identification band with the labeled medication or medication card. Two identifiers are required before medication administration. An example of identifiers includes name, medical record number and birth date.

Administration

There are different routes of administering drugs in children. Identifying the name of the drug and the route is very important to ensure safety. You should also understand why drugs are given in different routes. We will look at oral administration, intramuscularly, intravenous and rectal administration of drugs.

Oral administration

Although administering liquids to infants is relatively easy, the nurse must be careful to prevent aspiration. With the infant semireclining position, the medication is placed in the mouth from the spoon, plastic cup, plastic dropper or plastic syringe. The dropper or syringe is best placed

along the side of the infants tongue with the contents administrated slowly in the small amounts, allowing the child to swallow between deposits.

Intramuscularly administration

The volume of medication prescribed for small children and small amount of tissue for injection require that a syringe be selected that measure very small amounts of solution. These syringes with specially constructed needles minimize the possibility of administering incorrect amounts of drugs because of a *dead space* which allows fluid to remain in the syringe and needle after the plunger is pushed completely forward. A minimum of 0.2 ml solution remains in a standard needle hub therefore when very small amounts of two drugs are combined, the ratio of the two drugs can be altered significantly.

The following Measures can minimize the effect of dead space:

- When two drugs are combined in the syringe, always draw them up in the same order to maintain the consistent ratio between the drugs.
- Use the same brand of syringe
- Use one piece syringe unit

Dead space is also an important factor to consider when injecting the medication, because flushing the syringe with an air bubble or parenteral fluid adds an additional amount of medication to the prescribed dose. *Hockenberry & Wilson, 2005*.

Determining the site

Consider the following factors when selecting a site for an intramuscular (IM) injection on an infant or child include:

- The amount and character of the drug to be injected
- The amount and general condition of muscle mass
- The frequency or number of injections to be given during the course of treatment
- The type of medication being given

- Factors that may impede access to or cause contamination of the site
- The child's ability to assume the required position safely.

Sites for injection

- ✚ The preferred site for infant is the *vastus lateralis* (on the thigh).
- ✚ The ventrogluteal site is relatively free of major nerves and blood vessels, it's a relatively large muscle with less subcutaneous tissue than the dorsal site, it also has well defined landmarks for safe site location, less painful than the *vastus lateralis* and is easily accessible in several position.
- ✚ Deltoid muscle(upper arm)

Subcutaneous and intradermal administration

Subcutaneous and intradermal injections are frequently administered to children; the technique differs little from the methods used in adults.

- Examples of drugs administered through subcutaneous route include insulin, hormone replacement, allergy desensitization, and some vaccine like measles vaccine.
- For intradermal, drugs such as Tuberculin(TB) testing, local anesthesia and allergy testing as well as BCG vaccine are frequently administered through intradermal route.

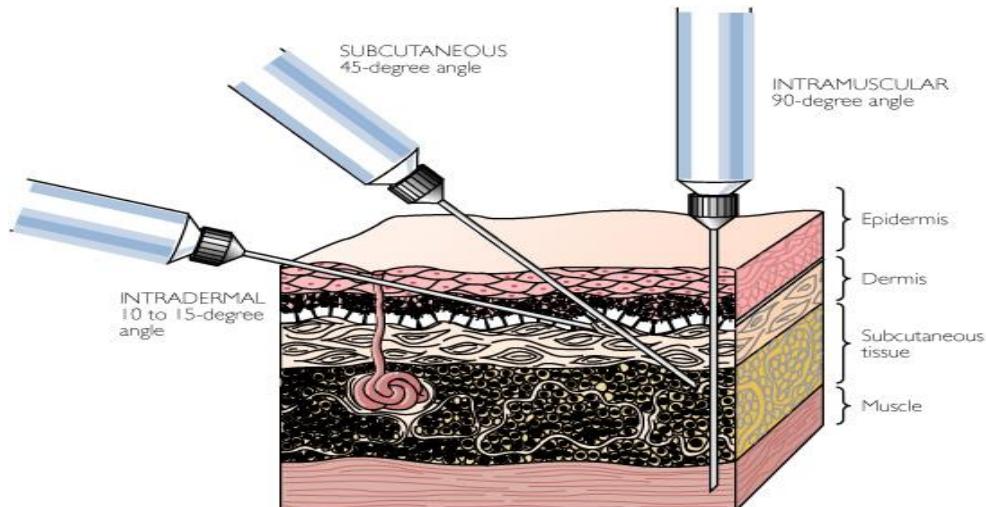


Figure 6: Different sites for injection

Intravenous administration

The intravenous route for administering medications is frequently used in pediatric therapy.

- This method is used for giving drugs to children who have poor absorption as result of diarrhea, dehydration or peripheral vascular collapse.
- It is also useful in children who need a high serum concentration of a drug.
- Children who have resistant infections that require parenteral medication over an extended time
- Children who require emergency treatment.

For some important drugs, it is the only effective route of administration.

The following factors should be considered when preparing and administering drugs to infants and children by the Intravenous route:

- Amount of drug to be administered.
- Minimum dilution of drug and if child is fluid restricted.
- Type of solution in which drug can be diluted
- Length of time over which drug can be safely administered
- Rate of infusion that child and vessels can tolerate safely
- IV tubing volume capacity
- Time different drugs are administered
- Compatibility of drugs that child is receiving intravenously.

Sites of venous access in infants

- Superficial veins of the scalp have no valves and insertion is easy, can be used I infants up to 9months but they should be used only when other site attempts have failed.

- In small infants, the superficial veins of the hand, wrist, forearm, foot or ankle is usually most convenient and most easily stabilized.
- In older children superficial veins of the forearm

Rectal administration

The rectal route for administration is less reliable but is sometimes used when oral route is difficult or contraindicated. Some of the drugs available in suppository form included:

- Acetaminophen
- Sedatives
- Analgesia (morphine)
- Anti emetics

The difficulty in using the rectal route is that unless the rectum is empty at the time of insertion, the absorption of the drug may be delayed, diminished or prevented by the presence of faeces. Sometimes the drug is later evacuated.

[NOTE: Knowing the name of the child, the weight and the route of drug administration is key to safe drug calculation and administration. Type a quote from the document or the

5.5 Administration of Oxygen, Steam Inhalation and Nebulizing

Introduction

Oxygen should be regarded as a drug. Oxygen therapy is the administration of oxygen as a medical intervention, which can be for a variety of purposes in both chronic and acute child care. Oxygen is essential for cell metabolism, and in turn, tissue oxygenation is essential for all normal physiological functions. It is used to increase alveolar oxygen tension and decrease the work of breathing. The concentration of oxygen required varies according to the condition being treated. An inappropriate concentration may have serious or fatal effect.

Indications for oxygen therapy

Oxygen can be used in chronic conditions such as:

- ▶ Chronic obstructive pulmonary disease e.g bronchitis, emphysema and chronic asthma.
- ▶ Severe acute asthma
- ▶ Asphyxia
- ▶ Respiratory distress
- ▶ Pre maturity

Methods of oxygen administration

Oxygen can be delivered through a number of devices dependent on the situation, flow required and in some instances child preference.

Nasal cannula - this is a thin tube with two small nozzles that protrude into the patient's nostrils. It can only comfortably provide oxygen at low flow rates, 2–6 litres per minute delivering a concentration of 24–40%

Give oxygen through nasal prongs or a nasal catheter

■ Nasal Prongs

- Place the prongs just inside the nostrils and secure with tape.



Figure 7: Figure7: oxygen administration of nasal cannular (Source: Morris early childhood center)

- Face mask options, such as the simple face mask often used at between 5 and 8 LPM, with a concentration of oxygen to the child of between 28% and 50%. This is closely related to the more controlled air-entrainment masks also known as Venturi masks, which can accurately deliver a predetermined oxygen concentration to the trachea up to 40%. Oxygen can also be administered through which is a comfortable method.
- Oxygen in infants can be administered through a plastic hood Demand valves or oxygen resuscitators deliver oxygen only when the child inhales, or, in the case of an apnic (non-breathing) victim, the caregiver presses a button on the mask. These systems greatly conserve oxygen compared to steady-flow masks, which is useful in emergency situations when a limited supply of oxygen is

available and there is a delay in transporting the child to higher care. They are very useful in performing CPR as the caregiver can deliver rescue breaths composed of 100% oxygen with the press of a button. Care must be taken not to over-inflate the patient's lungs, and some systems employ safety valves to help prevent this. These systems may not be appropriate for unconscious patients or those in respiratory distress, because of the effort required breathing from them.

Complications of oxygen therapy

High concentration of oxygen can cause;

- ▶ Pulmonary epithelia damage(Broncho pulmonary dysplasia)
- ▶ Convulsions
- ▶ Retinal damage especially in pre-term neonates.
- ▶ Retro lental fibroplasia
- ▶ Blindness due to promotion of overgrowth of new blood vessels in the eye obstructing sight.

Steam inhalation

Steam inhalation is a type of air humidification which is a process of adding water vapor to gas. Humidity keeps the air way moist and helps loosen and mobilize pulmonary secretions. Steam inhalation can be done in several ways:

- Use of humidity tent for infants and children with illnesses such as croup and tracheitis to liquefy secretions and help reduce fever. Children in a humidity tent require frequent changes of clothing and bed linen to remain warm and dry.
- It can be done letting the child sit in a hot steam bathroom or cause with the mother to reduce the risk of scalding.
- For children steam inhalation can be done allowing them sit with the head over a bowl of hot water cover a towel over the head, close the eyes and breathe deeply.
- The steam may help ease your congestion by loosening mucus and making it easier to clear by blowing your nose. Adding menthol, eucalyptus, camphor, thymol or pine oil to the water may help clear the passageways in your nose.

NEBULIZING

Nebulization is a process of adding moisture or medications to inspired air by mixing particles of varying sizes with of air. In medicine, a **nebulizer** (or **nebulizer**) is a drug delivery device used to administer medication in the form of a mist inhaled into the lungs. A nebulizer uses the aerosol principle to suspend a maximum number of water drops or particles of the desired size in inspired air. The definition of an aerosol is a "mixture of gas and liquid particles," and the best example of a naturally occurring aerosol is mist formed when small vaporized water particles mixed with hot ambient air are cooled down and condense into a fine cloud of visible airborne water droplets. The moisture added to the respiratory system through nebulization improves clearance of pulmonary secretions.

Uses

Nebulizers are commonly used for the treatment of:

- ▶ Cystic fibrosis
- ▶ Asthma
- ▶ COPD and other respiratory diseases.

Nebulizers use oxygen, compressed air or ultrasonic, power to break up medical solutions and suspensions into small aerosol droplets that can be directly inhaled from the mouthpiece of the device.

Take note that effectiveness of oxygenation depends on administering the prescribed amount for avoid complications. Never should a child be left alone during steam inhalation.

5.6 Common Conditions

We are now going to discuss the common condition affecting children.

Respiratory System

We will start with the conditions affecting the Respiratory System.

Now compare your answers with what we are going to discuss. The Respiratory system is divided into two parts: upper and lower Respiratory systems. We will start with diseases affecting the Upper respiratory system.

Common Cold

Definition: It is a highly infectious condition comprising of a mild systemic upset and prominent

Activity: Write down 4 common conditions affecting the Respiratory system in children.

Well done.

nasal symptoms. It spreads rapidly from person to person.

Cause

Virus (rhinovirus)

Transmission

Droplet and direct contact

Signs and symptoms

- Running nose
- Sneezing

- Running eyes Sometimes, mild conjunctivitis
- Malaise
- Headache

Treatment

A day or two at home helps to limit the spread of infection to others. Treatment is symptomatic.

Complications

Secondary bacterial infection of the nose (purulent rhinitis)

Sinusitis secondary to rhinitis, Acute otitis media

Pharyngitis

Pharyngitis is the most common throat disorder. It is wide spread in dusty areas or dry environment. It can be caused by excessive use of voice, persistent coughs, allergies and following chronic sinusitis.

It can be acute or chronic;

Acute pharyngitis may precede the common cold or other communicable diseases.

Chronic pharyngitis is commonly an extension of nasopharyngeal obstruction or inflammation.

Causes

Viruses such as influenza virus

Bacterial such as streptococcus

Signs and symptoms

Sore throat

Slight difficulty in swallowing

Sensation of a lump in the throat

Headache, muscle and joint pain if the cause is bacteria

Slight fever

Diagnostic test

Throat culture may identify the bacterial organisms causing the inflammation.

Rapid strep tests generally detect streptococcal infections with group A.

Treatment

For acute pharyngitis, treatment is asymptomatic. It mainly consists of;

Promotion of rest to speed up the healing process

Gargles of normal saline to soothe the throat.. Give the child throat lozenges contain a mild anesthesia, to minimize pain

Offer plenty of fluids

Analgesics as prescribed by the doctor

Give penicillin depending on the severity of the condition if the child can't swallow give injections.

Chronic pharyngitis requires the same supportive measures as acute pharyngitis but with greater emphasis on eliminating the underlying cause such as allergen.

Information education and communication

Explain to the mother on the importance of completing the antibiotic course in acute bacterial pharyngitis to prevent patient resistance to drugs.

For chronic pharyngitis, advise the mother to minimize the sources of throat irritation in the environment by using a bed side humidifier. Patient should avoid excessive exposure to air conditioning.

Complications

- Otitis media due to the spread of infection relating to the anatomic linkage of the ear to the throat.
- Sinusitis
- Mastoditis (inflammation of the mastoid bone)
- Rheumatic fever if the cause is streptococcus
- Glomeruli nephritis.

Laryngitis

It is the inflammation of the larynx.

Cause

- Viruses
- Bacteria
- Trauma (auctioneers, singers, etc)
- Inhalation of irritants gases,
- Chronic nasal infection
- Allergy
- Tumours

Signs and symptom

- Hoarseness of voice
- Dysphasia (difficulties in speech)
- Dry throat

- Non productive cough

Treatment

- Rest in bed in a warm room using a humidifier or a steam kettle to keep air moist
- Minimize speaking
- Give cough mixture (linctus codeine) 5ml tds
- Administer Ammonium chloride (cough expectorant)
- Appropriate antibiotics if cause is bacterial
- Diet should be light with plenty of fluids.

Laryngotracheobronchitis (Croup)

Laryngotracheobronchitis is the most common croup syndrome. It primarily affects children. It may produce mild, moderate, or severe symptoms, which often worsen at night. It is often treated with a single dose of oral steroids occasionally inhaled epinephrine is used in more severe cases. Hospitalization is rarely required.

Causes

- **Viral:** Viral croup or acute laryngotracheitis is caused by parainfluenza virus measles, adenovirus and Respiratory Syncytial Virus (RSV).
- **Bacterial:** Bacterial croup may be divided into laryngeal diphtheria, bacterial tracheitis, laryngotracheobronchitis, and laryngotracheobronchopneumonitis.

Laryngeal diphtheria is due to *Corynebacterium diphtheriae* while bacterial tracheitis, laryngotracheobronchitis, and laryngotracheobronchopneumonitis are usually due to a primary viral infection with secondary bacterial growth. The most common bacteria implicated

are *Staphylococcus aureus* *Streptococcus pneumoniae* *Hemophilus influenzae* and *Moraxella catarrhalis*

Croup is usually deemed to be due to a viral infection.

Others use the term more broadly, to include acute laryngotracheitis spasmodic croup, laryngeal diphtheria, bacterial tracheitis laryngotracheobronchitis, and laryngotracheobronchopneumonitis.

Pathophysiology

The viral infection that causes croup leads to swelling of the larynx, trachea, and large bronchi due to infiltration of white blood cells causing narrowing of the airways. When the airway is significantly narrowed, the child inspires air past the obstruction and into the lungs producing the characteristic inspirations including cough and hoarseness. Swelling produces airway obstruction which, when significant, leads to dramatically increased work of breathing and the characteristic turbulent, noisy airflow known as stridor.

Signs and Symptoms

- Croup is characterized by "barking" cough
- Stridor which is worsened by agitation or crying and if it can be heard at rest, it may indicate critical narrowing of the airways.
- Hoarseness and difficult breathing which usually worsens at night.
- Other symptoms include fever coryza (symptoms typical of the common cold and chest wall indrawing).
- Respiratory distress in infants and toddlers may be manifested by nasal flaring intercostal retraction.
- Drooling or a very sick appearance indicates other medical conditions.

Diagnosis

- Croup is diagnosed on clinical grounds, once potentially more severe causes of symptoms.

- Blood tests
- X-rays

Therapeutic management.

Aim.

Activity; Discuss the common signs and symptoms of the upper respiratory tract conditions.

Good job.

- To maintain the airway and provide adequate air exchange.
 1. Provide humidity with cool mist via a nebulizer
 2. Nebulized epinephrine
 3. Oral steroids or IM dexamethazone to children who are unable to tolerate oral dosing.

Pneumonia

Introduction

Pneumonia is an inflammatory condition of the lung—ffecting primarily the microscopic air sacs known as alveoli. It is usually caused by viruses or bacteria and less commonly other microorganisms, certain drugs and other conditions such as autoimmune diseases.

Globally, pneumonia affects approximately 450 million people per year, seven percent of population, and results in about 4 million deaths. It is mostly in third world countries. Nevertheless, in developing countries, and among the very old, the very young and the chronically ill; pneumonia remains a leading cause of death.

Definition

Pneumonia is an acute inflammation of the lung parenchyma caused by a microbial agent (Lewis *et al*, 2004).

Classifications Of Pneumonia

Pneumonia can be classified in several ways. Based on microbiological etiology, it may be:

- ▶ Bacterial (the most common cause of pneumonia)
- ▶ Viral pneumonia
- ▶ Fungal pneumonia
- ▶ Parasitic pneumonia
- ▶ Chemical pneumonia (ingestion of kerosene or inhalation of irritating substance)
- ▶ Inhalation pneumonia (aspiration pneumonia)

Based on the Location it may be:

- ▶ Lobar pneumonia; if one or more lobe is involved
- ▶ Broncho-pneumonia the pneumonic process has originated in one or more bronchi and extends to the surrounding lung tissue. It involves distal airways and alveoli.

Predisposing factors to pneumonia

Pneumonia is more likely to result when defense mechanisms become incompetent or are overwhelmed by the virulence or quantity of infecting agents.

- ▶ Decreased consciousness depresses the cough and epiglottal reflexes which may allow aspiration of oropharyngeal contents into the lungs.
- ▶ Tracheal intubation interferes with the normal cough reflex and mucociliary escalator mechanism.
- ▶ Air pollution
- ▶ Exposure to smoke, smoke disturbs both mucocilliary and macrophage activity.
- ▶ Viral upper respiratory infection
- ▶ Malnutrition that can alter the functions of lymphocytes and polymorphonuclear leucocytes
- ▶ Chronic Diseases like leukaemia are associated with increased frequency of gram negative bacilli in the oropharynx.
- ▶ Inhalation or aspiration of noxious substances
- ▶ Intestinal and gastric feeding
- ▶ Human Immune Deficiency Virus (HIV)infection

Causes of Pneumonia

- *Bacteria*
- *Viruses*
- *Fungi*
- *Parasites*

Pathophysiology

There are four characteristic stages of the disease process:

Congestion

After the infecting organisms reach the alveoli via droplet or saliva, there is an outpouring of fluid into the alveoli.

The organisms multiply in the serous fluid and infection is spread.

The organism damages the host by their overwhelming growth and interference with lung function.

Red hepatization

There is massive dilatation of the capillaries, and alveoli are filled with cells such as neutrophils, red blood cells and fibrin.

The lung appears red and granular, similar to the liver which is why the process is called hepatization.

Gray hepatization

Blood flow decreases, and leukocytes and fibrin consolidate in the affected part of the lung.

Resolution

Complete resolution and healing occur if there are no complications.

The exudates become lysed and are processed by the macrophages.

The normal lung tissue is restored and the persons' gas exchange ability returns to normal.

Signs and Symptoms

The symptoms of pneumonia vary with age of the child and the causative organism.

Typical symptoms include:

- A cough which is productive of purulent sputum
- Pluritic chest pain that is aggravated by deep breathing

- Sudden onset of shaking chills
- Fever
- Rapid and Difficulty breathing(shallow as the patient attempts to reduce pain)
- Chest in drawing(seen in younger children)
- Nasal flaring
- Orthopnea
- Cheeks are flushed(pale)
- Cyanosis

Rapid pulse(tachycardia)**Investigation**

- History taking will reveal the predisposing factors
- Physical examination will reveal signs and symptoms like nasal flaring, chest in drawing etc .
- Chest x-rays disclose infiltrates, confirming the diagnosis.
- Gram stain of sputum which will show acute inflammatory cells
- Culture of the sputum to isolate the causative organism
- Full Blood Count will reveal leucocytosis in bacterial pneumonia and a normal or low count in viral or mycoplasma pneumonia
- Blood cultures reflect bacteraemia and help determine the causative organism
- Arterial blood gas analysis will reveal the low level of oxygen in the blood
- Bronchoscopy or transtracheal aspiration allows the collection of material for culture
- Pleural fluid culture may also be obtained.
- Pulse oximetry may show a reduced Sao_2 level

Treatment

Antibiotics - depending on the organisms isolated the following drugs can be given:

Benzyl penicillin

- Premature infants and neonates 50mg/kg body weight in 2 divided doses
 - Infants 1-4 weeks 75mg/kg body weight in 3 divided doses
- Amoxicillin can be given in mild cases of pneumonia.
- Dosage 125 mg/ 5mls TDS for 5 days.
- Child of 1 month to 12 years 100/kg body weight in 4 divided doses

Side effects- Anaphylactic shock, urticaria, fever and joint pains

Nursing implication - give a test dose

-Ask for any hypersensitivity reactions

Erythromycin QID (four times a day)

- Child up to two years 125mg every 6 hours for 5 days
- Children 2- 8 years 250mg 6 hourly for 5 days

Side effects- Nausea, vomiting, abdominal discomfort, urticaria, diarrhea reversible loss of hearing.

Nursing implication- To be given with caution to patients with renal or hepatic impairment, pregnant and breast feeding mothers.

- ▶ Bronchodilators therapy- salbutamol 2- 4mg TDS
- ▶ Increased fluid intake
- ▶ Antipyretics such as calpol 125mg TDS for 3 days
- ▶ Humidified Oxygen therapy

Information education and communication

- Emphasize the importance of adequate rest to promote full recovery and prevent relapse.
- Stress the importance of drug compliance even if the child feels better.
- Advise the parents not to use antibiotics indiscriminately (erratically) for minor infections as doing so could result in upper airway colonization with antibiotic resistant bacteria.
- Teach the mother or guardians about chest physiotherapy.
- Explain the postural drainage, percussion and vibration to the mother that it helps mobilize and remove mucus from the lungs.
- Advise the mother to be giving the child plenty of fluids to maintain adequate hydration and keep mucus secretion thin for easier removal.
- Advise the mother to avoid exposing the child to irritants that stimulates secretions such dust and significant environmental pollution.
- Discuss ways of preventing the infection to others with the mother.
- Advise the mother to wash hands thoroughly after handling contaminated tissue.

Complications

1. **Pleurisy** – Inflammation of the pleura due to spread of infection.

Activity: answer this exercise in your note book and compare the answers with the notes:

- 1. Define pneumonia**
- 2. Mention four causes of pneumonia**
- 3. State four signs and symptoms of pneumonia**
- 4. State four complication of pneumonia**

2. **Pleural effusion-** Accumulation of fluids in the pleural cavity
3. **Atelectasis -** Collapsed airless lungs
4. **Lung abscess-** Due to presence of bacteria
5. **Empyema -** Accumulation of purulent exudates in the pleural cavity
6. **Pericarditis –** Results from spread of infecting organism from an infected pleura or via a haematogenous route to the pericardium
7. **Arthritis –** Results from the systemic spread of the organism. The affected joints are swollen; red painful and purulent exudates can be aspirated
8. **Meningitis –** Inflammation of the meninges can be caused by s. pneumonia.
9. **Endocarditis –** This is the inflammation of the inner lining of the heart, endocardium. It can develop when the organism attack the endocardium.
10. **Septic shock-** This comes as a result of septicemia
11. **Respiratory failure -**This is the inability of the respiratory apparatus to maintain adequate oxygenation of the blood, with or without carbon dioxide retention as a result of damage to the lung parenchymal.

Atelectasis

Atelectasis is defined as the collapse or closure of the lung resulting in reduced or absent gas exchange. It may affect part or all of one lung. It is a condition where the alveoli are deflated, as distinct from pulmonary consolidation.

It may be caused by normal exhalation or by several medical conditions. Although frequently described as a collapse of lung tissue, atelectasis is not identical with a pneumothorax (presence of air in the lungs) which is a more specific condition that features atelectasis.

Causes

- Proximal stenosing bronchogenic carcinoma

- Asthma (mucus plugging)
- Inhaled foreign body
- Retention of secretions which may occur as a post-operative complication or as a result of surfactant deficiency.
- Endotracheal tube inserted too far
- In premature neonates, this leads to infant respiratory distress syndrome
- Poor surfactant spreading during inspiration, causing the surface tension to be at its highest which tends to collapse smaller alveoli.
- Atelectasis may also occur during suction, as along with sputum, air is withdrawn from the lungs.
- Obstruction of a bronchus by a foreign body or thick exudates

Classifications

Atelectasis may be classified as an acute or chronic condition.

- In acute atelectasis, the lung has recently collapsed and is primarily notable only for airlessness.
- In chronic atelectasis, the affected area is often characterized by a complex mixture of airlessness, infection, widening of the bronchi (bronchiectasis, destruction, and scarring (fibrosis)).

Signs and symptoms

Atelectasis may have no signs and symptoms or they may include:

- Cough, but not prominent
- Chest pain (not common)
- Breathing difficulty which is fast and shallow
- Low oxygen saturation
- Pleural effusion(transudes type)
- Cyanosis as a late sign
- Increased heart rate.

Diagnosis

- Chest X-ray Post-surgical atelectasis will be bibasal in pattern.
- Computed tomography
- Bronchoscopy

Treatment

Treatment is directed at correcting the underlying cause.

- In Post-surgical atelectasis chest physiotherapy is used focusing on deep breathing and encouraging coughing. An incentive spirometer is often used as part of the breathing exercises.
- Ambulation is also highly encouraged to improve lung inflation.
- The primary treatment for acute massive atelectasis is correction of the underlying cause. A blockage that cannot be removed by coughing or by suctioning the airways often can be removed by bronchoscopy.
- Antibiotics are given for an infection.
- Chronic atelectasis is often treated with antibiotics because infection is almost inevitable.
- In certain cases, the affected part of the lung may be surgically removed when recurring or chronic infections become disabling or bleeding is significant.
- If a tumor is blocking the airway, relieving the obstruction by surgery, radiation therapy, chemotherapy, or laser therapy may prevent atelectasis from progressing and recurrent obstructive pneumonia from developing.

Tuberculosis

Introduction

Poverty, HIV and increasing drug resistance drive the tuberculosis (TB) epidemic. Rigorous attention to case finding, identification of contacts, adherence to therapy and monitoring for drug sensitivity are sufficient to control the pandemic. TB is the most common opportunistic infection in HIV- infection. However v, the majority of children with TB remain HIV- uninfected, and

both HIV –infected and uninfected children suffer a huge burden of disease in endemic areas. Tuberculosis is a chronic communicable disease in which lungs are the primary target, but in which any organ may be infected. The disease is principally caused by *Mycobacterium tuberculosis*. If the tubercle bacilli affect the lungs, the disease is called **Pulmonary Tuberculosis (PTB)**. If the bacilli affect other organs, such as lymph nodes, bones and joints, genitourinary tract, meninges, pleura or intestines, the child has **Extra Pulmonary Tuberculosis**. Most people recover from primary Tuberculosis infection without further evidence of the disease. The infection may stay inactive (dormant) for years. However, in some people it can reactivate. Pulmonary Tuberculosis is the most common form of the disease worldwide.

Definition of terms

- **Pulmonary tuberculosis** (TB) is a contagious bacterial infection that involves the lungs.
- **Ghon focus**- It is the lung lesion of primary tuberculosis infection, usually allocated in the sub pleural area of the upper segments of the lower lobes in the lower segments of the upper lobes.
- **Ghon complex** – Is the combination of the peripheral ghon focus and the involved medialstinal or hilar lymphnodes.

Characteristic of mycobacterium tuberculosis

- Mycobacterium is a rod- shaped non spore forming aerobic bacterium, it grows slowly in culture. it can't tolerate heat but it can live in humid and dry or cold surroundings.

Cause

- Pulmonary tuberculosis (TB) is caused by the bacteria *Mycobacterium tuberculosis* (*M. tuberculosis*).

Mode of spread

- One can get Tuberculosis by breathing in air droplets from a cough or sneeze of an infected person.

Predisposing factors

- Being around people who have Tuberculosis
- Living in crowded or unclean living conditions
- Poor nutrition
- Increase in HIV infections
- Increase in number of homeless people (poor environment and nutrition)
- The appearance of drug-resistant strains of TB

Pathophysiology of tuberculosis

When a person inhales droplet nuclei containing Mycobacterium Tuberculosis, they enter the lungs and travel to small air sacs (alveoli). Inhaled Mycobacterium is deposited in the lower segments of the lower and middle lobes and anterior segments of the upper lobes. After implantation, the bacilli multiply with no initial resistance from the host. The organisms are engulfed by phagocytes (initially neutrophils and later macrophages) and continue to multiply within the phagocytes but resist killing this allows the bacilli to proliferate within the mycrophages, ***this is called TB infection.***

Some mycrophages carry organisms from the lung to regional (Hilar and mediastinal) lymph nodes from which site they may be disseminated by the blood stream to other areas in the body (haematogenous(blood) spread).

Although the macrophages that first ingest the Mycobacterium cannot kill these organisms, they initiate hypersensitivity responses and activate T - lymphocytes and macrophages resulting in granuloma formation. This limits further bacterial replication and disease spread.

The central portion of the lesion (*Ghon tubercle*) undergoes necrosis characterized by cheesy appearance called ***caseous necrosis***. The lesion may also undergo liquefactive necrosis in which the liquid drains into connecting bronchi and produces a cavity. Healing of the primary lesion usually takes place by resolution, fibrosis and calcification. The granulation tissue surrounding the lesion may become more fibrous and form a collagenous scar around the tubercle. A ***Ghon complex*** is formed consisting of the Ghon tubercle and regional lymph nodes. When a tuberculosis lesion regresses and heals, the infection enters a latent period in which it persists

without producing a clinical illness. The infection may develop into clinical disease if the persisting organisms become activated and begin to multiply rapidly if the host's defense mechanism becomes impaired or it may remain dormant for years.

Signs and symptoms

The primary stage of TB does not cause symptoms. When symptoms of pulmonary TB occur, they can include:

- Cough which may or may not be productive of sputum for more than 3 weeks.
- Haemoptysis (coughing up blood) although rare for a child to cough up blood.
- Excessive sweating, especially at night
- Chest pain
- Difficulty in Breathing(dyspnoea)
- Loss of body weight
- Loss of appetite
- Fatigue
- Fever
- Malaise

Investigations

1. History of being exposed or being in contact with an infected person.
2. Physical examination will reveal swollen or tender lymph nodes in the neck or other areas, fluid around a lung (pleural effusion) and unusual breath sounds (crackles).
3. Sputum for Acid Alcohol Fast Bacilli (AAFB) to confirm the diagnosis.
4. Chest x-ray will reveal nodular lesions, patchy infiltrates, cavity formation scar tissue and calcium deposits.
5. Sputum for cultures and sensitivity will show heat-sensitive, nonmotile, aerobic acid-fast bacilli.
6. Skin tuberculin test reveals that the child has been infected with tuberculosis but does not indicate active disease.
7. Bronchoscopy can be of help if the child can't produce adequate sputum specimen.

How to collect sputum samples from the Tuberculosis suspect

Three sputum samples should be collected and sent for direct microscopy within 24 hours

- ***Spot specimen*** should be collected from the child at the time of request “on the spot.”
- ***Morning specimen***, the child is then given one sputum container for collection of an early morning specimen immediately on waking up the next morning. The TB suspect brings this second sample to you at the health facility.
- ***Spot specimen***, as the TB suspect brings the morning specimen, he/she is asked to produce a second specimen on the spot at the health facility.

Treatment

The goal of treatment is to cure the infection with drugs that fight the TB bacteria. Treatment of active pulmonary TB will always involve a combination of many drugs (usually four drugs). All of the drugs are continued until lab tests show which medicines work best. Adherence refers not only to the manner in which the child follows treatment instructions, but equally to the degree to which health workers observe national guidelines for the management and reporting of tuberculosis cases. Adherence is the most important factor influencing response to treatment.

Aims of Ant tuberculosis treatment

- ▶ To rapidly eliminate the actively metabolizing organisms to reduce infectivity and limit morbidity and mortality.
- ▶ To prevent future relapse of disease by killing the dormant metabolizing organisms.
- ▶ To prevent drug resistance achieved by fixed combinations tablets.

There are two categories of treatment. The table below shows the appropriate treatment category for each Tuberculosis case.

Table 1: TB Treatment categories

PAEDIATRICS	
Category I	Category II
<ul style="list-style-type: none"> ▪ All new patients (<i>Smear positive, smear negative and extra pulmonary</i>) 	<ul style="list-style-type: none"> • All previously treated patients including <i>smear positive retreatment, smear negative retreatment, extra pulmonary retreatment, treatment failures, treatment after default and relapse cases</i> • <i>Serious forms of TB</i>

(MOH, Management of Tuberculosis Training for Health Facility Staff 2010)

Case Definition

Table 2: TB case finding

Type of patient	Definition
New	A patient who has never had treatment for TB or who has taken anti-TB drugs for less than 1 month.
Relapse	A patient previously treated for TB who has been declared cured or treatment completed, and is now diagnosed with a fresh episode of TB.
Treatment after failure	A who is started on a re-treatment regimen after having failed previous treatment.
Treatment after default	Tuberculosis in a newly diagnosed child who remains smear –positive 5 months or more after the start of treatment.

(MOH, Management of Tuberculosis Training for Health Facility Staff 2010)

Commonly used drugs include:

- Isoniazid (H)
- Rifampicin (R)
- Pyrazinamide (Z)
- Streptomycin (S)

To ensure efficacy of anti- TB drug, a combination of drugs is used. In Zambia we have, 2, 3 and 4 fixed drug combination.

presentation and side effects of anti tb drugs

1. Isoniazid

- Dosage – 50mg
- Action – Bactericidal with a high potency.
- Side effects include peripheral neuritis, optic neuritis, psychotic episodes, vertigo and steven- johnson syndrome

2. Pyrazinamide

- Dosage- 150mg
- Action – Bactericidal with a low potency
- Side effects include: hepatotoxicity, jaundice, anorexia flushing, dysuria and arthlagia.

3. Rifampicin

- Dosage - 75mg
- Action – Bactericidal with high potency
- Side effects- nausea vomiting diarrhea, orange –red discoloration of urine, saliva and other body fluids.

4. Streptomycin

- Dosage- 15-20mg/kg/daily
- Action – Bactericidal with a low potency
- Side effects include: hypersensitivity reaction, paraesthesia

(*BNF for children, 2005*).

Select treatment category

Paediatrics Category 1(new uncomplicated)

Table 3:Paediatric category I

Intensive Phase		Continuation Phase	
2 months		4 months	
RHZ (60/30/150)		RH- (60/30)	
Weight	No. Tabs	Weight	No. Tabs
5 - 9kgs	1	5 - 9kgs	1
10 - 14kgs	2	10 - 14kgs	2
15 – 19kgs	3	15 – 19kgs	3
20--25kgs	4	20--25kgs	4
>25kgs	Use adult	>25kgs	Use adult HR

(MOH, Management of Tuberculosis Training for Health Facility Staff 2010)

Paediatric Category II (Retreatment and Severe, complicated)

Table 4: pediatric category II

Weight in Kg	Intensive Phase		Continuation Phase
	2 months		10 months
	RHZ (60/30/150)	S	RH (60/30)
5 – 9	1	0.1g	1
10 - 14	2	0.2g	2
15 - 19	3	0.5g	3
20 - 25	4	0.5g	4
>25	Use Adult	0.5g	Use Adult RH

(MOH, Management of Tuberculosis Training for Health Facility Staff 2010)

Advantages of Fixed Dose Combination

1. There is prevention of drug resistance when it is given under Direct Observation Therapy (DOT).
2. There is simplification of treatment
3. There is simplification of drug management
4. There is reduction of misuse of the drugs for treatment of other conditions other than TB.
5. There is increased compliance to treatment

Monitoring progress

Follow clinical response to treatment. The following are signs of progress:

- ▶ Appetite returning with good weight gain. Children should be weighed monthly while on treatment and drug dosages adjusted accordingly.
- ▶ Resolutions of symptoms
- ▶ Follow-up with smear and/or cultures are essential in drug resistant tuberculosis cases.

Nursing Care

Aims of treatment:

- To prevent the spread infection
- To prevent complication

Environment

Nurse the child in isolation to prevent the spread of infection

- The room should be well ventilated to allow free air circulation
- Provide diversional activities and check on the child frequently to prevent boredom.
- Provide toys to the child to make the environment friendly.

Position

- Nurse the child in a semi fowler's position to aid in lung expansion.

Psychological care

Explain the disease process and reinforce the doctors' explanation to the parents to allay anxiety.

Explain to the parents or guardians why you have isolated the patient to allay anxiety and enhance cooperation.

Explain why the visitors are restricted to gain cooperation

Involve the family in the care to promote sense of love

Explain all the procedures done on the child why you are wearing masks to allay anxiety

Explain the procedure of sputum collection

Observation

- Observe the vital signs that is temperature to monitor the response to treatment that is if the temperature remains high then the child is not responding, pulse which may be high or low if high and thread it may mean there is anaemia and respiration to monitor the dyspnoea.
 - Record the child weight weekly to monitor the nutrition status.
 - Observe for adverse side effects of drugs such as peripheral neuritis, optic neuritis hepatitis and red discolouration of urine that may be caused by isoniazid and Rifampicin. .
 - Observe the eating habits of the patient
 - Observe the sputum for colour, amount and consistency
 - Monitor the urinary output to ascertain the renal functioning
- Monitor the skin for rash, Steven- Johnson etc

Hygiene

- Hand washing each time you attend to the patient
- Cover the sputum mug to prevent the spread of infection
- Disinfect the sputum mug in jik1:6
- Ensure Proper disposal of tissue to prevent the spread of infection
- Perform Nail care, bed bath and oral care to raise patient's self esteem

Nutrition

- Provide the child with a well balanced diet containing high calorie foods such as rice, cassava and nsima for energy, high protein such as eggs and milk to replace worn out tissues, vitamins such as oranges, apples to boost the immunity.
- Offer meals in small frequency to promote appetite since child is anorexic.

Elimination

- Monitor the urine output to ascertain the functioning of the kidneys and record on the fluid balance chart
- Observe the bowel movements to check for constipation as well as diarrhea.

Rest /exercises

- Make sure that the child gets plenty of rest to promote the healing process.
- Provide a balance between the periods of rest and activities to promote health as well as conserve energy and reduce oxygen demand.
- Restrict visitors to promote rest

Medication

- Administer drugs as ordered and follow the prescribed regimen
- Monitor for adverse side effects of drug
- Administer isonizid with food as it causes peripheral neuritis
- Record the drugs on the chart to ensure compliance.

Prevention of tuberculosis

- The only definitive means to prevent Tuberculosis is by avoiding contact with tubercle bacilli.
- Maintaining the optimal state of health with adequate nutrition and avoiding fatigue and debilitating infections promote natural resistance.
- Tuberculosis is preventable, even in those who have been exposed to an infected person.
- Prompt treatment is extremely important in preventing the spread of Tuberculosis from those who have active TB disease to those who have never been infected with TB.
- A BCG vaccination will prevent TB.
- Drug adherence to reduce the spread
- Isolation of positive TB cases
- Covering of the mouth when coughing and proper disposal of used tissue
- Avoid over crowding and improve housing conditions
- Drinking only pasteurised milk
- Improving the nutrition status of children
- Advice child spacing in mothers with active open TB
- Early detection and treatment of all TB cases

Complications

1. **Miliary TB**, this may come about if a necrotic ghon complex erodes through a blood vessel, large amounts of organisms invade the bloodstream and spread to all body organs.
2. **Pleural effusion**, this result from the release of caseous material into the pleural space the bacterial containing material triggers an inflammatory reaction and pleural exudates of protein rich fluid.
3. **Bronchiectasis**, bronchial obstruction, and airway stenosis may result from

Activity: write down the answers in your book and compare the answers with the notes.

1. **Define the terms Atelectasis and Tuberculosis.**
2. **List signs and symptoms of Atelectasis**
3. **List four investigations for Pulmonary Tuberculosis**
4. **List the common drugs used in the treatment of TB**

hial disease, though this is much less common in the post-chemotherapy era. It is more common in the presence of extensive parenchymal disease, and is associated with lymph node enlargement with compromise of airway size.

4. **Tuberculosis pneumonia**, this may result when large amounts of tubercle bacilli are discharged from the liquefied necrotic lesions into the lung or lymph nodes.
5. **Pleural disease** is due either to primary progressive disease or reactivation of latent infection. It probably represents an increased immune response a delayed type hypersensitivity reaction to mycobacterium antigens, rather than a diminished one, which is the case in other forms of TB infection.
6. **Pneumothorax** results from the rupture of a peripheral cavity. Can lead to the formation of a bronchopleural fistula.
7. **Draining abscess** due to local spread of infection.
8. **Right middle lobe syndrome** compression of the right middle lobe bronchus by hilar lymph nodes leads to lobar collapse.

You have made a very good progress. Having looked at atelectasis and Tuberculosis as some of the conditions of the lower respiratory tract system, you will now look at Asthma which is a hereditary disorder of the respiratory tract. It is worth noting that Tuberculosis is a Bacterial infection condition of the lower Respiratory tract.

Asthma

Introduction

Asthma is a chronic inflammatory disease of the airways that causes hyperresponsiveness, mucosal edema and mucus production. This inflammation ultimately leads to recurrent episodes of asthma symptoms such as cough, chest tightness, wheezing and dyspnoe. Asthma can occur at any age and it is the most common chronic disease of childhood.

Definition

1. Asthma is a chronic inflammatory disorder of the airways that is characterized by an exaggerated broncho constrictors response to a wide variety of stimuli (Monahan, 2007).

Classifications of asthma

- **Extrinsic asthma:** - This is the type of asthma with a definite external cause. It occurs mostly in atopic individuals who show positive skin-prick reaction to common inhalant allergens. It starts in childhood and is caused by allergens like pollen, dust, animal dander, feathers, foods etc. Patients usually have a history of asthma or allergies in the family, past medical history of eczema or allergic rhinitis is also common.
- **Intrinsic asthma:** - This occurs where no causative agent can be identified. It's non allergic and occurs secondary to respiratory tract infections. It develops in adulthood with no history of asthma in the family.

Common Factors that may trigger an Asthmatic Attack

1. Environmental Factors

- Change in temperature especially cold air
- Change in humidity dry air

2. Atmospheric pollutants

- Cigarette and industrial fumes
- Ozone sulphur dioxide
- Formaldehyde

3. Strong odors

- Perfume

4. Allergens

- Feathers
- Animal dander
- Dust mites
- Mold
- Salads shellfish
- Fresh and dried fruits

5. Exercise- vigorous exercises cause an individual to breathe through the mouth in order to respond to the body's increased oxygen demand. This will allow intake of cold air which will cause muscle spasms.

6. Stress and emotional upset – stress stimulates the Vegas nerve causing increased secretions.

7. Medication

- Nosteroidal anti-inflammatory Drugs(NSAIDS) Aspirin
- Beta blockers
- Cholinergic drugs

8. Chemicals

- Toluene
- Paints
- Rubber
- Plastics

Pathophysiology of asthma

In asthma, the dominant physiological event leading to clinical symptoms is airway narrowing and a subsequent interference with airflow.

When the patient inhales a substance to which he/she is hypersensitive, allergens interact with the Immune Globuline IgE on the mast cells. This causes degranulation of the mast cells in the bronchial walls leading to rupture of mast cells releasing chemical mediators such as histamine, bradykinin, leukotrienes and prostaglandin. These mediators of inflammation lead to bronchoconstriction, increased vascular permeability and leakage contributing to oedema and mucous secretion. Mucosal thickening and airway swelling interferes with air flow. Dyspnoea results as well as wheezing due to mucus secretion and bronchospams.

In persistent asthma a chronic and complex response ensues, which is characterized by an invasion of numerous inflammatory cells, the transformation and participation of airway structural cells and the secretion of an array of cytokins, chemokines and growth factor. This results in the formation of mucus plugs, as well as structural changes such as hypertrophy and hyperplasia of the airway smooth muscles stimulating the mucous membrane to secrete excessive mucus, further narrowing the bronchial lumen.

With increasing severity and chronicity of disease, permanent structural changes can occur in the airway these are associated with a progressive loss of lung function that is not prevented by or fully reversible by current therapy. These structural changes can include thickening of the sub-basement membrane, sub epithelial fibrosis, airway smooth muscle hypertrophy and hyperplasia, blood vessel proliferation and dilation, and mucous gland hyperplasia and hypersecretion. Goblet cells secrete viscous mucus that is difficult to cough up. Mucus fills the lung bases, inhibiting alveolar ventilation. Blood, shunted to alveoli in other lung parts still can't compensate for diminished ventilation leading to respiratory acidosis. Inflammation of the bronchial walls may also injure the epithelium, thereby stimulating nerve endings and initiate neural reflexes that further aggravates and propagate the broncho spasms. This leads to fixed narrowing of the airway and a reduced response to broncho dilators.

Figure 2A. Diagram showing the pathogenesis of the immediate response phase of asthma

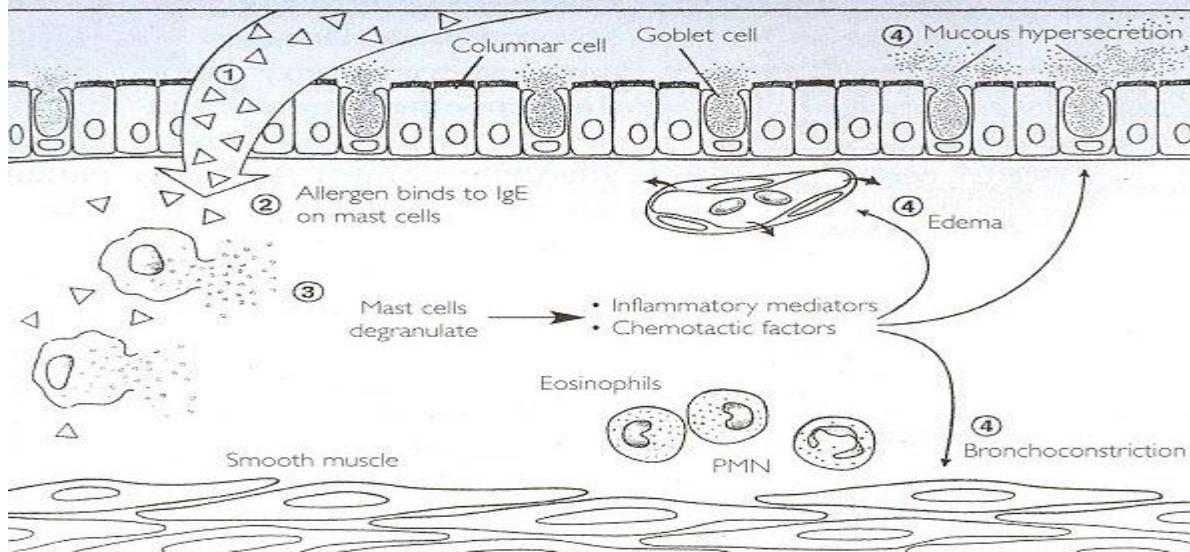


Figure 8: Figure 7: Pathophysiology of immediate response phase of asthma

Figure 1. Diagram showing pathophysiologic processes that cause obstruction in the airways in patients with asthma

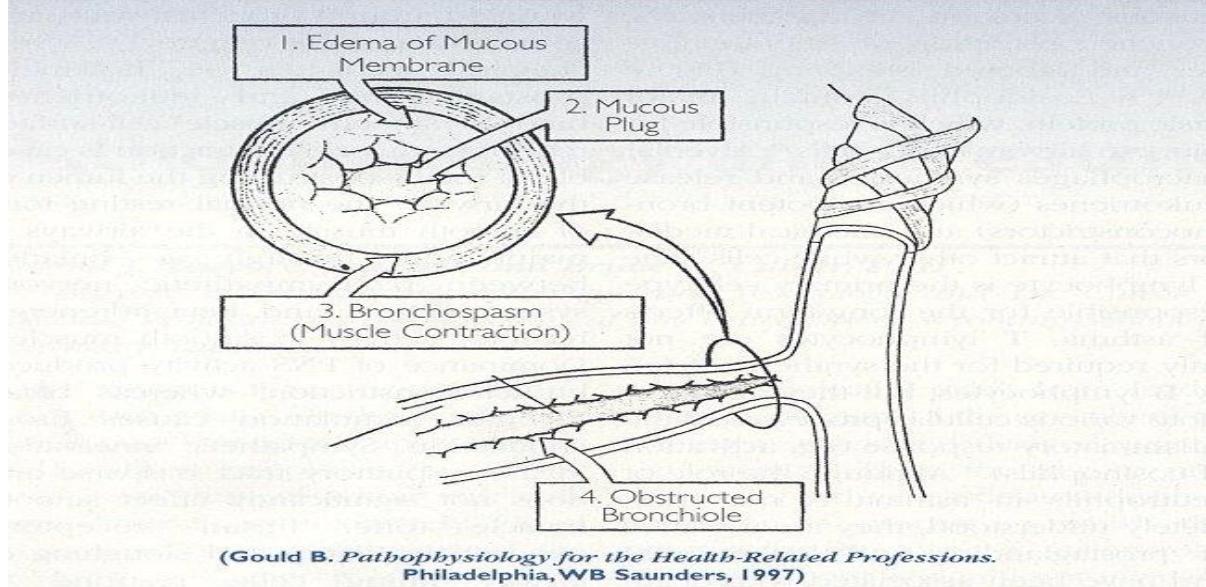


Figure 9: Figure 8: Pathophysiology of chronic asthma

Clinical manifestations

- Wheezing respirations which is whistling sound made during expiration when the airways are blocked or compressed.
- Expiration is forced and prolonged due to broncho spasms, hyper inflated lungs and trapped alveolar air.
- Dry cough or cough which may produce thick, clear or yellow sputum.
- Chest tightness due to bronchial constriction
- Extreme anxiety due to breathlessness.
- Sweating(diaphoresis)- results from labored respiration
- Dyspnoea due to thick mucus, mucosal oedema and smooth muscle spasm causing obstruction of small airways resulting in labored respiration
- Orthopnoea – dyspnoea that is relieved in the upright position. Child fails to lie flat but rather maintain a three point position.
- Peripheral cyanosis which is due to reduced oxygen in the blood and this may indicate the onset of life- threatening status asthmaticus and respiratory failure.
- Hypoxia due to reduced oxygen circulating in the blood as result of reduced gaseous exchange.
- Hypercapnia – greater than normal carbon dioxide in the blood which results from difficulty in expirations as a result of broncho spasm.
- Tachycardia in attempt to compensate for hypoxia and hypercapnoea
- If there is no response to treatment there is exhaustion

Management

Aims

1. To prevent chronic symptoms
2. To maintain near normal pulmonary function
3. To prevent complications.

Investigations

- Typical clinical presentation and past history

- History of exposure to specific allergens
- Lung function test to establish a degree of impairment, degree of obstruction and its reversibility and also to establish baseline ventilator function.
- Chest x-ray will show possible hyperinflation with areas of focal atelectasis.
- Skin sensitivity test done to identify allergen or other triggers responsible for onset of asthma symptoms
- Arterial blood gas analysis- obtained to identify presence of mild to severe hypoxemia and mild to severe respiratory acidosis.

Primary Survey / Care During An Acute Asthmatic Attack

An asthmatic attack should be treated as quickly as possible to open airways.

A – Airway- in an asthmatic attack secretions tend to become viscous and can plug airway.

Intervention – The nursing role in improving breathing patterns and gas exchange, is to help child assume a position of comfort, administer medications as ordered and monitor for both therapeutic and adverse effects of medications.

Child should be nursed in an upright position well supported with pillows or lean forward on the cardiac table. Administer nebulized salbutamol 2.5 -5 gm or a short acting medication such as aminophylline 250mg IV bolus over 10minutes or 750mg in 1 liter 10% dextrose over 8hours, and 50% dextrose to prevent hypoglycaemia as these patients lose a lot of energy due to exhaustion caused by labored breathing. Administer steroids such as hydrocortisone 100mg intravenously to reduce local oedema.

B – Breathing – assess for ventilation by looking at the chest movements associated with breathing and also listen or feel for air being expired through the nose and mouth. Child may present with slow laborious wheezing sound on expiration, there will be use of accessory muscles such as abdominal muscles for breathing. Expiration is always more strenuous and prolonged than inspiration which forces the child to sit upright and use every accessory muscle.

Intervention – Administer humidified oxygen by nasal cannula at 2 liters /minute to ease breathing, later adjust oxygen according to the patient's vital functions and ABG measurements.

C – Circulation will not be altered but the partial oxygen pressure due to altered gaseous exchange in the lungs. The child will have tachycardia due to impaired gaseous exchange in the lungs. The pulse will be fast and thread.

Intervention – commence intravenous fluids to rehydrate the child thus improving circulation continue with oxygen therapy.

Treatment

Beta-adrenergic receptor agonist –are the best drugs for relieving sudden attacks of asthma and prevents attacks that might be triggered by exercise.

- Drugs used include rapid acting bronchodilators such as ;
 - ▶ **Salbutamol** - this is the fastest and most effective, hence remain the drug of choice. It is given through a nebulizer or orally 2gm TDS. Action – selectively stimulate beta receptors producing bronchodilatation.
 - Children 2- 6 years 1-2gm 3- 4 times daily.
 - 6-12years 2mg 3-4 times daily
 - 12- 18 years 2-4 mg 3-4 times daily
 - **Side effects** – tachycardia, Bp changes, nervousness, palpitation, muscle tremors, nausea, vomiting, insomnia, dry mouth, headache.
 - **Nursing implication** – should not be used in patients with angina or cardiac disorders. Encourage the child to take the drug even when feeling well.
 - ▶ **Metaproterenol** – stimulates beta adrenergic receptors, producing bronchodilatation. Increases mucociliary clearance. The rest as above.
 - ▶ **Aminophyline** given intravenously. Action – relaxation of bronchial smooth muscle and improve contractility of fatigued diaphragm.
 - Side effects – tachycardia, Bp changes, arrhythmias, anorexia, nausea and vomiting, nervousness, irritability, headache, muscle twitching, epigastric pain, diarrhea, palpitation, insomnia.
 - Nursing implication- instruct child to lie down if they experience dizziness.
- Corticosteroids

- ▶ **Prednisolone** given orally. Action- it has anti-inflammatory and immunosuppressive effects. Decrease edema in bronchial airway thus decreasing mucus secretion.
- Side effects- skin changes, osteoporosis, increased appetite, obesity, immunosuppression, catabolism, muscle weakness.
- Nursing implication – Advise child to take drug on alternative days as it reduces side effects; drug should be taken with food or milk in the morning as it causes peptic ulcers.
- Long acting bronchodilators- epinephrine given subcutaneously, usually in emergency treatment of an acute reaction. Dose 0.2- 0.5 as a single dose. Side effects- headache, dizziness, palpitation, tremors, restlessness, hypertension and tachycardia.
- Oxygen therapy 4-6 liters
- Fluid therapy
- Antibiotics such as Amoxicillin 125- 250mg TDS for 5 to 7 days.

Subsequent Care

Environment Nurse child in a quiet, clean environment near to Nurse's bay for ease observation. The room should be well ventilated and free from dust. It should contain all resuscitative equipment such as oxygen cylinder; suctioning machine in case of child needs resuscitation..

Position Place the child in the semi fowler's position for maximum lung expansion and encourage diaphragmatic breathing to allow enough air intakes.

Psychological care Create a therapeutic relationship with the child so that the child can have confidence in you. Reassure the parents or guardians during an asthmatic attack to allay anxiety. Provide comfort by being with the patient. Explain the disease process, the cause of the wheezing and labored respiration to the mother to allay anxiety. Allow the child to verbalize his fears to allay anxiety if the child is old enough. Explain to the parents or guardians every procedure and machines that are being used to promote cooperation. Explain the use the oxygen machine to allay fear and anxiety. Involve the relative in the care and explain what is happening to the child to promote the sense of belonging.

Hygiene Wipe the child frequently to remove sweat as the child sweats a lot due to labored breathing to promote comfort. Change linen whenever soiled to make child comfortable and prevent bad odour**Fluids and nutrition-** Give plenty of fluids to combat dehydration and loosen secretions.

Elimination Monitor the urine output to ascertain the renal function. Observe the bowel movement to rule out constipation.

Exercises/Rest Help the child's family to perform diaphragmatic breathing to allow enough air intake. Encourage the child to perform relaxation exercises as needed. Plan activity and rest to minimize patient's energy expenditure as activity increases metabolic rate and oxygen requirements.

Medication Administer drugs as prescribed and observe for any adverse effects.

Information Education and Communication

- Teach the mother how to use an oral inhaler and caution her about the possible adverse reactions associated with the medications he is receiving.
- Show child how to breathe deeply. Instruct him how to cough secretions accumulated overnight.
- Teach the child and the family to avoid known allergens and irritants such as smoking, dust perfumes, fur and cold weather etc.
- Emphasize the importance of taking only prescribed drugs as certain drugs such as aspirin may precipitate an asthmatic attack.
- Give the child plenty of fluids at to help loosen secretions and maintain hydration.
- Encourage the mother to be giving the child well balanced diet to prevent respiratory infection and fatigue.
- Explain the importance of review dates so that the child can be monitored.
- Teach the mother signs and symptoms of an impending asthmatic attack and encourage them to seek medical attention as soon as possible.

Complication

1. ***Status asthmaticus***- This is a severe asthmatic attack which cannot be controlled with usual medications. This arises when impaired gas exchange and heightened airway resistance increase the work of breathing. Symptoms of acute asthmatic attack continue despite measures to relieve them.
2. ***Respiratory*** failure- This is the impairment of the lung's ability to maintain balance between oxygen and carbon dioxide.
3. ***Tension pneumothorax*** -This occurs due to rupture of the sub pleural bleb
4. ***Cardiac arrest***- Occurs secondary to respiratory failure
5. ***Emphysema*** –Irreversible accumulation of air in the alveolar spaces due to repeated asthmatic attacks which results in decrease in total breathing capacity.
6. ***Atelectasis***- lung collapse due to accumulation of air in the alveoli.

NOTE: Asthmatic attack is always an emergency. Information education and communication is key to preventing asthmatic attacks.

Allergies

An allergy is an overreaction of the immune system to a substance that's harmless to most people. But in someone with an allergy, the body's immune system treats the substance (called an **allergen**) as an invader and overreacts, causing symptoms that can range from annoying to serious or life threatening.

In an attempt to protect the body, the immune system of the allergic person produces antibodies called immunoglobulin E (IgE). Those antibodies then cause mast cells and basophils (allergy cells in the body) to release chemicals (including histamine) into the bloodstream to defend against the allergen "invader."

It's the release of these chemicals that causes allergic reactions, affecting a person's eyes, nose, throat, lungs, skin, or gastrointestinal tract as the body attempts to rid itself of the invading allergen. Future exposure to that same allergen will trigger this allergic response again. This

means that every time the person eats that particular food or is exposed to that particular allergen, he or she will have an allergic reaction.

Allergies can be seasonal (happening only at certain times of the year, like when pollen counts are high) or can occur any time someone comes in contact with an allergen.

Causes

The tendency to develop allergies is often hereditary, which means it can be passed down through the genes. But a few children have allergies even if no family member experiences allergies. And a child who is allergic to one substance is likely to be allergic to others. Let us now look at the common causes of allergies in children:

Common Airborne Allergens

- **Dust mites** are one of the most common causes of allergies. These microscopic insects live all around us and feed on the millions of dead skin cells that fall off our bodies every day. Dust mites are the main allergic component of house dust, which is made up of many particles and can contain things such as fabric fibres and bacteria, as well as microscopic animal allergens.
- **Pollen** is another major cause of allergies (most people know pollen allergy as hay fever or rose fever). Trees, weeds, and grasses release these tiny particles into the air to fertilize other plants. Pollen allergies are seasonal, and the type of pollen someone is allergic to determines when symptoms will occur. **Pollen counts** measure how much pollen is in the air and can help people with allergies determine how bad their symptoms might be on any given day. Pollen counts are usually higher in the morning and on warm, dry, breezy days, and lowest when it's chilly and wet.
- **Molds**, another common allergen, are fungi that thrive both indoors and outside in warm, moist environments. Outdoors, molds can be found in poor drainage areas, such as in piles of rotting leaves or compost piles. Indoors, molds thrive in dark, poorly ventilated places such as bathrooms and damp basements, and in clothes hampers or under kitchen

sinks. A musty odor suggests mold growth. Although molds tend to be seasonal, many can grow year-round, especially those indoors.

- **Pet** allergens from warm-blooded animals can cause problems for kids and parents alike. Pet dander (tiny flakes of shed skin, fur, or feathers) can lead to allergies. Animal saliva also can be an allergen, when a pet licks someone, or licks him or herself. When pets lick themselves, the saliva gets on their fur or feathers. As the saliva dries, protein particles become airborne and work their way into fabrics in the home. Cats are the worst offenders because they tend to lick themselves more than other animals as part of grooming. Pet urine also can cause allergies in the same way when it gets on airborne fur or skin, or when a pet urinates in a spot that doesn't get cleaned.
- **Cockroaches** are also a major household allergen, especially in inner cities. Exposure to cockroach-infested buildings may be a major cause of the high rates of asthma in children.

Common Food Allergens

Children are affected by food allergies, and there are eight foods: cow's milk, eggs, fish, shellfish, peanuts, tree nuts, soy, and wheat.

- **Cow's milk (or cow's milk protein).** Between 2% and 3% of infants are allergic to the proteins found in cow's milk and cow's milk-based formulas. Most formulas on the market are cow's milk-based. Cow's milk protein allergy means that someone has an abnormal immune system reaction to proteins found in the cow's milk used to make standard baby formulas, cheeses, and other milk products. Milk proteins also can be a hidden ingredient in many prepared foods. Many kids outgrow milk allergies.
- **Eggs.** One of the most common food allergies in infants and young children, egg allergy can pose many challenges for parents. Eggs are used in many of the foods kids eat — and in many cases they're "hidden" ingredients. Kids tend to outgrow egg allergies as they get older.
- **Fish and shellfish.** Fish and shellfish allergies are some of the more common adult food allergies and ones that people usually don't outgrow. Fish and shellfish are from different families of food, so having an allergy to one does not necessarily mean someone will be allergic to the other.

- **Peanuts and tree nuts.** Peanut allergy is another common food allergy in kids, with the number of those who are allergic on the rise. (Peanuts are not a true nut, but a legume — in the same family as peas and lentils, although most people with peanut allergy don't have allergies to other legumes.) Another common allergy is to tree nuts, such as almonds, walnuts, pecans, hazelnuts, and cashews. Most people do not outgrow peanut or tree nut allergies.
- **Soy.** Like peanuts, soybeans are legumes. Soy allergy is more common among babies than older children. Many infants who are allergic to cow's milk are also allergic to the protein in soy formulas. Soy proteins are often a hidden ingredient in prepared foods.
- **Wheat.** Wheat proteins are found in many foods, and some are more obvious than others. Although wheat allergy is often confused with [celiac disease](#), there is a difference. Celiac disease is caused by sensitivity to gluten, which is found in wheat, rye, and barley. It can cause someone to feel ill and lead to damage in the small intestine. An allergy to wheat not only can make someone feel ill, but, just like other food allergies, it also can cause a life-threatening reaction.

Other Common Allergens

- **Insect stings.** For most children, being stung by an insect means swelling, redness, and itching at the site of the bite. But for those with insect venom allergy, an insect sting can cause more severe symptoms.
- **Medicines.** Antibiotics (used to treat infections) are the most common types of medicines that cause allergic reactions. Many other medicines, prescription and over-the-counter, also can cause allergic reactions. If your child reacts to a medicine, talk to your doctor before assuming the reaction is a sign of allergy.
- **Chemicals.** Sometimes, cosmetics or laundry detergents can cause an itchy rash. Usually, this is because someone has a reaction to the chemicals in these products. Dyes, household cleaners, and pesticides used on lawns or plants also can cause allergic reactions in some people.

Signs and Symptoms

The type and severity of allergy symptoms vary from allergy to allergy and child to child. Allergies may show up as itchy eyes or an itchy nose, sneezing, nasal congestion, throat tightness, trouble breathing, vomiting, and even faintness or passing out. Severe allergic reactions (called anaphylaxis) can be fatal if not treated in time.

Airborne Allergy Symptoms

Airborne allergens can cause something known as allergic rhinitis, which occurs in about 7% to 10% of Americans. It usually develops by 10 years of age and reaches its peak in the teens or early twenties, with symptoms often disappearing between the ages of 40 and 60.

Symptoms can include:

- Sneezing
- Itchy nose and/or throat
- Nasal congestion
- Coughing

These symptoms are often accompanied by itchy, watery, and/or red eyes, which is called **allergic conjunctivitis** (When dark circles are present around the eyes, they're called allergic "shiners.") Those who react to airborne allergens usually have allergic rhinitis and/or allergic conjunctivitis. Those who have asthma may have wheezing and shortness of breath from airborne allergens.

Symptoms of Food, Medicines, or Insect Venom Allergies

- Wheezing
- Difficulties in breathing
- Coughing
- Hoarseness
- Throat tightness
- Stomach ache
- Vomiting

- Diarrhea
- Itchy, watery, or swollen eyes
- Hives
- Red spots
- Swelling
- A drop in blood pressure, causing light headedness or loss of consciousness

Allergic reactions can differ. Sometimes the same person can react differently at different times. Some reactions are mild and involve only one system of the body, like hives on the skin. Other times the reaction can be more severe and involve more than one part of the body. A mild reaction in the past does not mean that a future reaction will also be mild

Diarrhoeal Diseases

Introduction

Diarrhoea is one of the main causes of increased morbidity and mortality rates in Zambia especially among children under the age of 5. Most diarrhoea diseases are communicable which can be prevented with measures like hand washing, and keeping surroundings clean free from flies.

Definition of Terms

Diarrhoea: Diarrheal is the passing of three or more watery stools, with or without blood within 24 hours

Dehydration: the condition that results from excessive loss of body water [Dorland, 2004].

Oral rehydration salt solution (ORS): a sugar salt solution given to replace lost fluids or counteract dehydration [CBoH-ITG, 2002].

Causes

Most episodes of acute diarrhoea are caused by intestinal infections. The organisms responsible include the following:

Viruses, mostly rotavirus (neonates mostly affected)

Bacteria which include:

- entero pathogenic : Escherichia coli (E-coli)
- Enterotoxigenic E-coli
- Campylobacter jejuni
- Shigella
- Salmonella
- Vibrio cholera
- Staphylococcus

Protozoa which includes cryptosporidium and giardia.

Chemicals like medications or poison.

Radiation injury as in radiotherapy or nuclear accidents.

Lactose intolerance, attracting fluids into the intestinal lumen leading to excessive loss of fluids.

Granulomatous process of the bowel wall that causes non-infectious type of diarrhoea.

Predisposing Factors

These are the factors that make a child prone to developing diarrhoea, these include:

- Unsafe drinking water,
- Erratic water supply
- Poor sanitation
- Poor personal and domestic hygiene due to inadequate or lack of water supply.
- Non availability and adequacy of isolation facilities.
- Unvaccinated children, especially against measles are prone to developing measles associated diarrhoea.

Types of Diarrhoea

The following are the types of diarrhoea:

1. **Acute watery diarrhoea** and this can be more than 3 stools per day. It lasts for less than 14 days and there is no blood in stools
2. **Persistent diarrhoea** and this lasts 14 days or more. Persistent diarrhoea is common in children with HIV infection. For this reason, a child who has persistent diarrhoea should be checked for HIV infection.

3. **Dysentery** : This is a diarrhoea with blood in stool. It is commonly caused by shigella in the under fives. Amoebic infection can also cause bloody diarrhoea, but is common cause in young children.
4. **Diarrhoea with severe malnutrition:** Any diarrhoea with signs of severe malnutrition

Classification of Diarrhoea

Diarrhoea can be classified as non-inflammatory or inflammatory diarrhoea.

Non inflammatory: it is caused by microorganisms that have the site of action in the upper small intestines, where they adhere to the mucosa. Diarrhoea is produced through the mechanism of osmotic and secretory. The enterocytes are stimulated to secrete fluids into the gut lumen e.g. viruses like rota and adeno viruses, bacteria like vibro cholerae and salmonella.

Typhoid fever: a bacterial infection caused by salmonella typhi, which is harboured in human excretes. Water and food is contaminated through poor sanitation, flies and dirty fingers. The ingestion of shell fish can also cause typhoid fever and these are infected from shore sewerage which are disposal depots.

Transmission is faecal- oral and organisms invades the wall of the GIT. And chiefly located in the mesenteric lymph nodes and the masses of lymphatic tissue in the mucus membrane of the intestinal wall. Patients presents with fever [ladder like], rose spot rash, enlarged spleen, slow pulse, hepatomegally intestinal bleeding.

Cholera: highly infectious water borne disease that causes severe dehydration. It is caused by vibrio cholerae organism which is not invasive exerts effects by means of an enterotoxin. It is also a faecal – oral transmission.

It is characterised by severe watery diarrhoea leading to dehydration, electrolyte imbalance and death may occur within few hours if not corrected. Watery diarrhoea contains shred of mucous membrane from the intestinal wall- typical “rice water stool”. Treatment lies in the urgent relief of the usual intense dehydration by use of intravenous fluids.

Inflammatory diarrhoea: the type of diarrhoea where microorganisms have the site of action in the colon and distal end of the ileum and they produce disease by destroying parts of the enteric mucus membrane leading to an inflammatory response.

This in turn leads to the excretion of neutrophils and erythrocytes in faeces. There is some overlap of some disease causing inflammatory and non-inflammatory diarrhoea. The causative

organisms for inflammatory diarrhoea are E.coli, shigella spp, entamoeba histolytica and salmonella spp. And a good example is dysentery.

Dysentery: an enteric infection caused by the protozoa entamoeba histolytica and shigella. This amoebic parasite produces inflammation and ulceration of the colon, it leads to the passage of severe bloody diarrhoea and mucus in stools. The infection is usually spread through the ingestion of contaminated fruits, vegetables water and other foods, particularly where sewage disposal is inadequate or where the water supply is not protected. The disease is characterised by pain on the right lower quadrant of the abdomen, nausea and vomiting, weakness and expels fowl smelling stool containing blood.

Pathophysiology

Regardless of the cause of diarrhoea the Pathophysiological causes of increased stool liquid include the following common mechanisms:

- Osmotic diarrhoea
- Secretory diarrhoea
- Increased bowel motility diarrhoea
- Decreased surface area diarrhoea
- Mucosal invasion diarrhoea

Osmotic diarrhoea

This occurs when excess non-absorbable solutes are present in the bowel and they retain water in the lumen. It occurs with indigestion, gastro-intestinal transport defects, digestion of non-absorbable solutes e.g. magnesium sulphate, sodium sulphate etc, in lactose and other sugar intolerances e.g. lactase deficiency, glucose and galactose malabsorption and laxative abuse. This diarrhoea stops during fasting.

Secretory diarrhoea:

This occurs when the large and small intestines secrete rather than absorb electrolytes and water. Increased intestinal fluid secretion leads to the output of greater than 500mls with plasma and this persist during fasting. This is basically a problem of reduced absorption and increased secretion. Examples include the diarrhoea due to cholera, toxigenic E. Coli.

Increased bowel motility (altered intestinal transit) diarrhoea:

This occurs due to reduced transit time when food passes the bowel more quickly. Examples of this type include diarrhoea due to irritable bowel syndrome and thyrotoxicosis. Infection may contribute to increased bowel activity.

Decreased surface area diarrhoea

In this condition there is reduced functional capacity with malabsorption e.g. in short bowel syndrome, sprue, coeliac disease, rotavirus enteritis and giardiasis.

Mucosal invasion diarrhoea

When bacteria or parasites invade the mucosal lining of the bowel this causes inflammation of the mucosa with decreased caloric absorption and increased bowel motility. This type of diarrhoea can be caused by salmonella, shigella, amoebae, Yersinia and campylobacter and results in bloody mucoid stools with WBCs on microscopy.

Loss of water and electrolytes causes isotonic dehydration with reduced blood volume. Potassium depletion results into acidosis.

However, dysentery caused by shigella dysenteriae results from damage to epithelial cells of the large intestines, it also accompanies an increased secretion of fluids and electrolytes into the lumen.

Signs and symptoms

The signs and symptoms are based on three conditions which are:

- Dehydration.
- Dysentery.
- Persistent diarrhoea.
- These characteristics present in the following patterns:
- There may be pain, urgency, perineal discomfort and incontinence.
- Low blood volume, painful bloody stool as in dysentery.
- Vomiting, diarrhoea, abdominal cramps and fever.
- Mucus in stool.
- Sunken eye ball, irritability, dizziness, poor skin turgor, headache, dry or cracked mucus membranes, pallor, hypotension, cardiac arrhythmias and cool clammy skin (signs and symptoms of dehydration).
- Lethargy, apnoea, atria tachycardia and shallow breathing due to bicarbonate build up secondary to vomiting.

Assessment of dehydration in diarrhoea

Persistent pattern of diarrhoea with dehydration is classified in three, commonly used in children:

1. **No dehydration:** In this class the child presents with no enough signs to classify as some dehydration or severe dehydration.
2. **Some dehydration:** Assess if child presents with two or more of the following signs:
 - Restlessness or irritability.
 - Sunken eyes and fontanel
 - Drinks eagerly and is very thirsty.
 - Skin pinch on the abdomen goes back slowly.
3. **Severe dehydration:** In this class assess if the child [child] presents with two or more of the following signs:
 - Lethargy or unconsciousness.
 - Sunken eyes and fontanel.
 - Unable to drink or drinks poorly.
 - Skin pitch on the abdomen goes back very slowly.

Fluid and electrolyte disturbance in diarrhoea

In order to understand the fluid and electrolyte disturbances in diarrheal diseases in children, it is necessary to understand the fluid requirements of a healthy child. A normally functioning body requires a certain amount of fluid in the daily diet.

Oral daily fluid requirements for a healthy child feeding normally on breast or cow's milk or solid foods:

- **Premature:** 200 ml/kg (gradual increase during the first week of life).
- **Children up to 10 kg:** 150ml/kg (with a maximum of 1000ml/day).
- **Bigger children:** 100 ml/kg (with maximum of 200 ml/day).

The above figures indicate the daily oral fluid requirement (amount of milk) for babies.

Fluid and Electrolyte Balance In Diarrhoeal Diseases

Children are particularly dependent on a proper fluid balance. Their normal daily fluid turnover per kilogram body weight is about five times as much as in adults.

Fluid turnover means that a certain amount of fluid is passing through the body every day. It can be measured by checking the amount of fluid that is taken into the body (intake) and the amount of fluid that leaves the body (output).

Management of Diarrhoea

Management of diarrhoea is aimed at reversing fluid and electrolyte losses and prevents dehydration and acidosis therefore, the following guidelines should be followed:

- Prevent dehydration
- Replacement of initial electrolyte deficit
- Maintenance of hydration
- Proper feeding
- Treat the cause if identified
- Health education

Management of Diarrhoea According to Classification of Dehydration

There are three possible classifications for dehydration in a child with diarrhoea which are:

- No dehydration: Manage the child with plan A
- Some dehydration: Manage the child with plan B
- Severe dehydration: Manage the child with plan C

Management of diarrhoea with no dehydration in children

Plan A: Treat diarrhoea at home. Use this plan to teach care takers to;

Continue to treat child's current episode of diarrhoea at home. Give early treatment for future episodes of diarrhoea. Explain the three rules of treatment of diarrhoea at home.

Give child more fluids than usual to prevent dehydration, use recommended home fluids including salt and sugar solution, ORS, food based fluids such as soup, natural yoghurt and plain water. Give as much of these fluids as the child will take, and use the amount below as ORS guide. Continue until the diarrhoea stops. Give the child plenty of food to prevent malnutrition. Continue breast feeding frequently. If not breast feeding give the usual milk. If the child is six months or older or already taking solids, give cereal or another type of starchy food mixed, vegetables and meat or fish. Encourage the care taker to take the child to health centre if the child does not get better in five days or develops any of the following.

- Many watery stools.
- Eating or drinking poorly.
- Fever.
- Marked thirsty.
- Blood in stool

Plan B: This plan is used to treat some dehydration.

When diarrhoea is mild, moderate [some dehydration] dietary modification and increase in fluid intake may compensate for losses.

Give in clinic recommended amount of ORS over 4 hour period see the table below:

Approximate amount of ORS solution to give in the first four [4] hours

If the child wants more ORS than shown, give more.

Mother should continue breast feeding if the child is still breastfeeding.

Check from time to time if there are problems, if the child's eyelids become puffy, stop ORS and give plain water or breastfeed. If the care taker must leave before completing plan B: Give enough packets and show how to mix or prepare, and show the amount to be given. Explain to her the three rules of plan A for treating her child at home which are:

- Give extra fluid
- Continue feeding
- Tell the care taker when to return

Plan C: This plan is used to treat severe dehydration quickly.

Start intravenous fluids immediately.

If the child can drink, give ORS by mouth while the drip is set up.

Give 100mls / kg ringers lactate solution.

Reassess the child every one to two hours, if hydration is not improving, increase the rate of flow.

Give ORS as soon as the child can drink.

After six hours in infants or three in older children, evaluate the child using the assessment table.

In diarrhoea with severe dehydration, the objective of treatment is to replace fluid lose and correct electrolyte imbalances. Initially, fluid and electrolytes may be given parentally and as diarrhoea decreases, they may be offered orally.

The concentration of oral fluids is increased gradually. Monitor and balance fluid intake and output accurately in order to maintain hydration, normal electrolyte levels and prevent over dehydration.

Management of Infectious Diarrhoea

Isolation

Children who are admitted to the hospital with diarrhoea should be isolated until the cause of diarrhoea is determined. E.g. child with cholera are nursed in cholera centres to prevent the spread of infection. In dysentery the child is nursed in isolation and there should be proper disposal of stool by flushing or disinfecting before disposal.

Isolation techniques should be observed and recommended solutions for disinfection put in each room e.g. Jik 1:6, savlon, and if available protective clothing adhered to strictly. Particular attention is given to the washing of hands after defecation and before handling food.

Health personnel should practice or observe scrupulous hand washing procedures after handling bed pans and before caring for the sick child.

Prevent skin breakdown by ensuring that it remains dry all the time especially the buttocks and wash the perineum if possible after each stool and apply protective ointment if available, and linen should be changed and disinfected regularly.

Pharmacological therapy

In general acute diarrhoea is best managed without antibiotics, however, if there is evidence of systemic spread as a result of microorganisms e.g. cholera and dysentery then antimicrobial will shorten the course of diarrhoea and improve its effects e.g. in cholera tetracycline or ciprofloxacin decreases the duration of diarrhoea and shedding of bacteria and metronidazole is valuable in the treatment of giardiasis or amoebic dysentery.

Complications of Diarrhoea

Let us now look at some complications of diarrhoea:

1. **Dehydration** due to loss of water and electrolytes such as sodium, potassium, magnesium and chloride through diarrhoea and vomiting. If large amounts of fluids and electrolytes are lost blood pressure can drop enough to cause fainting [syncope], heart rhythm abnormalities [arrhythmias] and other serious disorders.
2. **Metabolic acidosis** acid – base imbalance in the blood due to loss of bicarbonates.
3. **Rectal prolapse** due to protrusion of rectal mucosa through the anal opening because of rapid propulsion of intestinal contents. This can be managed by gently pushing back the rectal prolapse using sterile surgical gloves or a wet cloth. Alternatively, prepare a warm solution of saturated magnesium sulphate compresses to reduce the prolapse by relieving the oedema.
4. **Haemolytic uraemic syndrome** – it is suspected in diarrhoeal patients with easy bruising, pallor, altered consciousness and low or no urine output. Always rule out this by making a diagnosis of haemolytic – uraemic syndrome on the basis of the blood smear showing fragmented red blood cells reduced or absent platelets or both and an elevated blood urea, nitrogen or serum creatinin indicating renal failure.
5. **Renal failure:** due to reduced blood volume which leads to impairment of kidney function.
6. **Malnutrition** due to malabsorption caused by intestinal disease or diarrhoeal diseases, this leads to failure to thrive in infants.

Worm Infestations

Roundworms, or nematodes, are parasites that can infect people. They usually live in the intestines. There are different species of worms that can cause infection, and worms can range in length from 1 millimeter to 1 meter. Most often, eggs or larvae live in the soil and get into the body when a person gets them on his or her hands and then transfers them to the mouth. Some can also get into the body through the skin.

Like other parasitic diseases, roundworm infections are more common in warm, tropical climates. We are going to discuss two round worms that are common in children and these are Ascariasis and Enterobiasis (pin worm). Ascariasis is the most common roundworm infection, and affects as many as 1 billion people worldwide.

Ascaris Lumbricoides

Ascaris lumbricoides is the **giant roundworm** of humans, belonging to the phylum. Ascariasis is prevalent worldwide and more so in tropical and subtropical countries. It can reach a length of up to 35 cm.

Transmission

- Transmission is through ingestion of unwashed fruit, uncooked vegetables or eating food without washing hands after handling soil contaminated with ascaris lumbricoides ova.
- Eating poorly washed raw vegetable grown in contaminated soil or undercooked vegetable.

Etiology

Larvae hatched from ingested eggs enter the venous system and migrate through the lungs to the oesophagus. Fertilized eggs from adult worms in the intestines are passed with feces to contaminate soil; the cycle recurs when they in turn are ingested

Life cycle

Ascaris lumbricoides, infection happens when man swallows water or food contaminated with larva. The larvae hatches in the duodenum penetrate the walls of the duodenum and enter the blood stream. When a larva hatches out it migrates through the walls of the small intestines and are carried by the lymphatic system to the liver and heart, and enters pulmonary circulation to break free the lungs there it passes through the capillaries into the alveoli, where it grows and molts. Acute tissue reaction occurs when several worms get lost during this migration and accumulate in other organs of the body. The juveniles migrate from the lung up the respiratory

tract to the pharynx where they are swallowed. Fertilization can now occur and the female produces as many as 200,000 eggs per day for a year. They begin producing eggs within 60–65 days of being swallowed. These fertilized eggs become infectious after 2 weeks in soil; they can persist in soil for 10 years or more. The eggs have a lipid layer, which makes them resistant to the effects of acids and alkalis as well as other chemicals. These are produced within the small intestine where the organism matures.

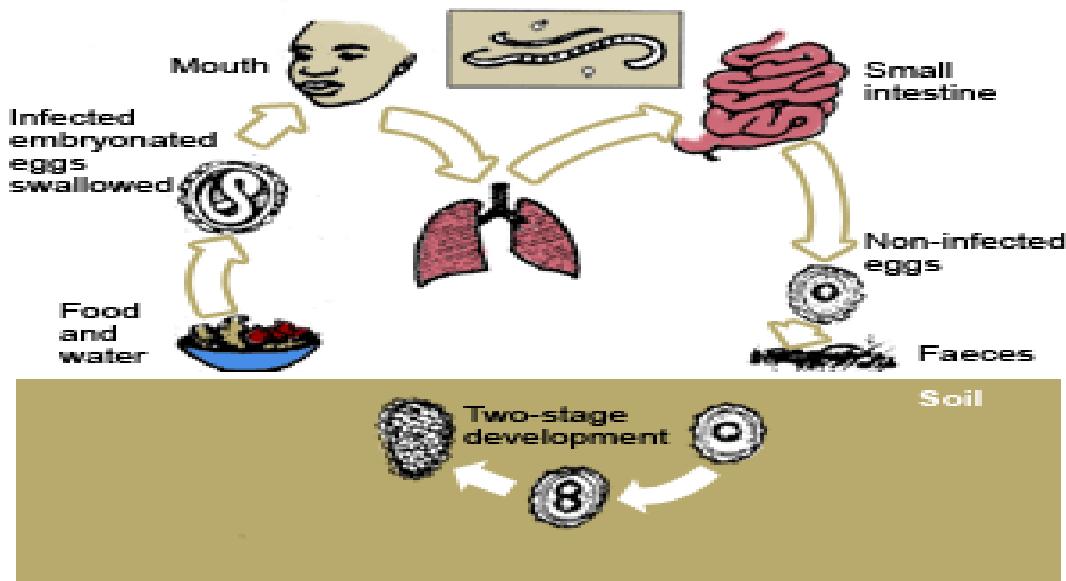


Figure 10: Figure showing Life cycle of Acariasis

Symptoms

- Cough
- Shortness of breath
- Abdominal pain
- Abdominal distension

- Disturbed sleep
- Restlessness
- Impaired growth
- Nausea and diarrhea
- Blood in the stool
- Weight loss
- Fatigue
- Presence of worm in vomit or stool

Management

Diagnosis

- Diagnosis is usually made when the host passes a worm in the stool
- Stool samples for ova and parasites will demonstrate ascaris eggs
- Larva may be found in gastric or respiratory secretions in pulmonary disease

Treatment

1. The treatment of choice is Mebendazole (vermox)
 - Dose -500mg start or 100mg OD for 3days.
 - Action- The drug functions by binding to tubulin in the worms' intestinal cells and body-wall muscle.
2. Albendazole: for children 2-5 years a single dose of 200mg. for older children and adult's one dose of 400mg.
3. Parantel pamoate (Combantrin) a single dose of 10mg/kg body weight
4. Levamisole: a single dose of 2.5mg/kg body weight
5. Piperazine
6. Thiabendazole
7. Santonin
8. Flubendazole

Prevention of Ascaris lumbricoides

- Teach the community on the importance of eating properly washed vegetables when improperly processed human feces of infected people are used as fertilizer for food crops.
- Properly hand washing as Infection may occur when food is handled without removing or killing the eggs on the hands, clothes, hair, raw vegetables/fruit, or cooked food that is infected by handlers.
- Advise women especially pregnant women to avoid eating soil
- Proper fecal disposal
- Educate the community not to defecate in places other than the toilets
- Advise the farmers not to use human excreta as manure in agriculture

Complications

- Intestinal obstruction
- Inflammation of the intestines or gall bladder
- Kidney disease
- Perforation
- Peritonitis this is the inflammation of the peritoneum following perforation
- Anaemia
- Jaundice due to biliary obstruction by the worm
- Appendicitis if the appendix gets obstructed by the worm

Pinworm (Enterobiasis)

The pinworm also known as threadworm (in the United Kingdom) or seat worm is a nematode (roundworm) and a common human intestinal parasite, especially in children. The medical condition associated with pinworm infestation is known as enterobiasis.. The pinworms are one of the most common intestinal nematodes. Pinworm, which is commonly spread in day care centers, schools, and camps, affects as many as 1/3 Americans.

Transmission

There are four possible methods of transmission:

- Direct transmission from the anal and perianal region to the mouth by the finger nails.
Pinworms spread through human-to-human transmission, by ingesting infectious pinworm eggs. The eggs are hardy and can remain viable in a moist environment for up to three weeks
- Dust containing eggs can become airborne and widely dispersed when dislodged from surfaces, for instance when shaking out bed clothes and linen. Consequently the eggs can enter the mouth and nose through inhalation, and be swallowed later.
- Exposure to viable eggs on soiled bed linen and other contaminated objects in the environment.
- Although pinworms do not strictly multiply inside the body of their human host, some of the pinworm larvae may hatch on the anal mucosa, and migrate up the bowel and back into the gastrointestinal tract of the original host. This is called retro-infection.

Life Cycle

The life cycle begins with eggs being ingested. The eggs hatch in the duodenum. The emerging pinworm larvae grow rapidly to a size of 140 to 150 micrometers in size, and migrate through the small intestine towards the colon. During this migration they molt twice and become adults. Females survive for 5 to 13 weeks, and males about 7 weeks. The male and female pinworms mate in the ileum where after the male pinworms usually die, and are passed out with stool. The gravid female pinworms settle in the ileum, caecum, appendix and ascending colon, where they attach themselves to the mucosa and ingest colonic contents. Almost the entire body of a gravid female becomes filled with eggs. The estimations of the number of eggs in a gravid female pinworm range from about 11,000 to 16,000. The egg-laying process begins approximately five weeks after initial ingestion of pinworm eggs by the human host. The gravid female pinworms migrate through the colon towards the rectum at a rate of 12 to 14 centimeters per hour. They come out from the anus, and while moving on the skin near the anus, the female pinworms deposit eggs either through (1) contracting and expelling the eggs, (2) dying and then

disintegrating, or (3) bodily rupture due to the host scratching the worm. After depositing the eggs, the female becomes opaque and dies. The reason the female emerges from the anus is to obtain the oxygen necessary for the maturation of the eggs. Gravid female worms migrate nocturnally outside the anus and oviposit while crawling on the skin of the perianal area.

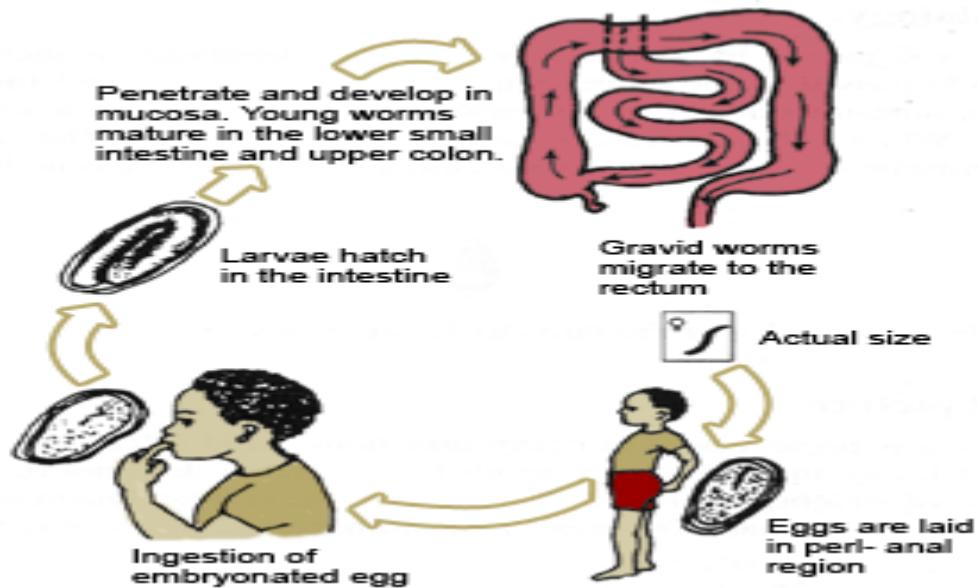


Figure 11: Figure 10: Life Cycle of a pin worm

Signs and symptoms

Although pinworms are usually asymptomatic inhabitants of the intestine, when they do cause symptoms there can be a spectrum of complaints including:

- Nocturnal anal itching,
- Poor appetite
- Impaired growth
- Hyperactivity
- Nervousness,

- Irritability
- Insomnia
- Bed-wetting
- Stomach aches
- Nausea and vomiting

Diagnosis

- Microscopic examination of perianal swab
- Sellotape slide/cellophane slide or Scotch tape to confirm the presence of eggs/larvae.
- Eggs are not found in stools.



Figure 11: Gravid worms crawling to the perianal region to lay eggs

Treatment

- ▶ Mebendazole 500mg start or 100mg OD for 3 days.
- ▶ Pyrantel pamoate are the most commonly prescribed drugs which are usually given
- ▶ Thiabendazole Mintezol
- ▶ Albendazole

Preventive measures

- Clean everything the infected person has come into contact with, which includes mopping floors to avoid kicking up dust that may contain worm eggs.
- Keep hands always clean. Trim nails. Wash hands after a toilet visit.
- Wash hands before preparation/consumption of food.
- Any anti-bacterial soap will usually insure a worm-free existence. Remember to wash hands after visiting public places like schools, gyms, public transport, cinema halls and any large institution.
- Discourage thumb sucking/nail biting of children.
- Keep hands away from buttocks on all other occasions
- De worm regularly or as directed by your primary physician
- Avoid sharing underwear

Complications

There are several possible complications associated with roundworm infections. These include:

- Inflammation of the intestines or gall bladder
- Pus accumulation in the liver
- Inflammation of the pancreas
- Appendicitis
- Peritonitis, inflammation of the sac surrounding the abdomen

Constipation

Overview

Constipation is a common condition in which bowel movements are unusually infrequent, hard, or dry. There is considerable variation in bowel habits that are considered "normal" but physiologists believe that ideally a person should have a bowel movement within an hour after each meal, as the enteric nervous system that controls movement of the bowels produces a strong wave of peristalsis in response to the incoming bolus of food.

Signs and Symptoms of constipation

- Extended time between bowel movements.
- Painful defecation. In children, clenching buttocks, rocking up and down on toes, and turning red in the face are signs of trying to hold in a bowel movement.
- Feeling of incomplete evacuation, bloating, or abdominal fullness.
- Hard, dry stools.
- Paradoxically, fecal impaction can lead to a thin watery stool as small quantities of freshly formed watery or soft stool leak around the impaction.
- Nausea, vomiting, headaches, and loss of mental clarity due to accumulation of toxins.

Constipation is characterized by bowel movements that look like types 1 to 3 on the Bristol Stool Form Scale, as shown below [Lewis1997].

Bristol StoolForm Scale		
Type	Description	Example
1	Separate hard lumps	
2	Sausage-like but lumpy	
3	Sausage-like but with cracks in the surface	
4	Smooth and soft (ideal)	
5	Soft blobs with clear-cut edges	
6	Fluffy pieces with ragged edges	
7	Watery, no solid pieces	

Etiology

Delayed bowel transit time is often cited as the cause of constipation, because the fecal contents remain in the large intestine for a longer time. This allows more of the water in the stool to be absorbed, resulting in a hard, dry stool that is difficult to pass.

However, this begs the question of why the bowel transit time is delayed. Many factors may combine to lead to constipation, and these include the following:

- Inadequate fiber intake (recommended 20 - 35 g/day)
- Inadequate fluid intake (recommended 64 oz/day, more or less depending on climate and activity).
- Inadequate exercise.
- Hypothyroid.
- Ignoring or suppressing urge to defecate. This may be a self-perpetuating cycle - constipation may produce painful defecation, to which the patient responds by suppressing the call to stool. Other reasons for ignoring the call to stool may include distaste for the available facilities, or being too busy.
- Training: cases have been reported in which it appears that the gut can be trained to follow a habitual schedule independent of eating schedule.
- Stress: sympathetic fight-or-flight arousal suppresses intestinal activity.
- Mechanical obstruction (tumor, congenital, adhesions, or impaction).
- Disruption of nerve supply to the colon: multiple sclerosis, spinal nerve impingement, Parkinson's disease, stroke, diabetes, Hirschsprung's disease, iatrogenic (surgical).
- Excessive anal sphincter tone.
- Laxative or enema abuse leading to dependence.
- Pregnancy (hormonal or due to compression of intestines by the gravid uterus).
- Drugs that reduce peristalsis: opiate pain relievers, antidepressants, anticonvulsants, antispasmodics (muscle relaxants).
- Drugs that promote water loss: diuretics.
- Iron supplements, aluminum-containing antacids.
- Lupus, scleroderma, uremia, amyloidosis.
- Diverticulosis.

- Constipation in children may be due to any of the above factors, but may also be a consequence of the potty training process, in which the child either lacks confidence to potty in the absence of a parent or associates pottying with negative experiences (Freud calls this anal-retentive behavior, and has developed elaborate psychological theories based on this process).

Diagnosis

In most cases, the cause of constipation can be determined by a careful case history and physical examination. Alarm signs such as blood in stools, recent changes in bowel movements, or weight loss merit particularly close scrutiny.

Digital rectal examination can be used to assess anal sphincter tone, while referral for more sophisticated anorectal manometry can be used to evaluate anal sphincter muscle function, and can be used to evaluate a recommendation for biofeedback training.

Sigmoidoscopy can be used to examine the rectum and lower colon (sigmoid colon). The night before a sigmoidoscopy, the patient usually has a liquid dinner and takes an enema in the early morning. A light breakfast and a cleansing enema an hour before the test may also be necessary. Depending on the age of the patient and the level of suspicion, a referral for a complete colonoscopy may be indicated.

Referral for barium enema X-ray study may be indicated in cases with alarm signs.

Referral for defecography (an X-ray study of the defecation process) may be needed to assess anorectal dysfunction.

Differential diagnosis

- Irritable bowel syndrome (IBS).
- Opiate drug use.
- Neoplasm.
- Hypothyroidism (slows peristalsis and reduces secretions) [Hertoghe1914; Starr2005, pg 143].

Treatment

- Increase fiber and fluid intake.
- Increase exercise.
- Laxatives: The laxatives include the following:
 - **Bulk-forming (fiber):** A variety of over the counter preparations are available. Ensure adequate fluid intake or else these products may be counterproductive (form concrete-like impactions). E.g. Metamucil, Citrucel, Konsyl, and Serutan.
 - **Stimulating:** Increases peristalsis. E.g. phenolphthalein, Ex-Lax, Correctol, Dulcolax, Purge, Feen-A-Mint, and Senokot. (Phenolphthalein may be associated with increased cancer risk).
 - **Stool softeners:** E.g. Colace, Dialose, and Surfak.
 - **Lubricating:** E.g. mineral oil.
 - **Osmotic agents:** E.g. Milk of Magnesia, Citrate of Magnesia, Haley's M-O, Epsom salt in water (may cause severe cramping).
 - **Purgatives:** E.g. castor oil (may cause severe cramping).

Note: use of laxatives is contraindicated if mechanical obstruction cannot be ruled out. Laxatives can be dangerous to children and should be given only with a doctor's approval.

- Treat hypothyroidism
- Treat underlying systemic diseases.
- Modify drug therapy protocol or eliminate drugs by resolving underlying diseases being treated.
- Colon hydrotherapy, colonic irrigation or enemas.
- Biofeedback.
- Stress reduction.

Prevention

- Increase fiber and fluid intake.
- Increase exercise.

- Heed the call to stool.

Complications

- Delayed emptying of the waste products in the intestines can lead to increased reabsorption of toxins that the liver eliminated from the blood.
- Straining to expel hard stool may cause hemorrhoids.
- Expelling hard stool may tear the skin of the anus, resulting in anal fissures.

Nutritional Disorders

Nutrition disorders can be caused by an insufficient intake of food or of certain nutrients, by an inability of the body to absorb and use nutrients, or by overconsumption of certain foods.

Examples include obesity caused by excess energy intake, anaemia caused by insufficient intake of iron, and impaired sight because of inadequate intake of vitamin A. Nutrition disorders can be particularly serious in children, since they interfere with growth and development, and may predispose to many health problems, such as infection and chronic disease. One of the conditions that we are going to look at is protein energy malnutrition (PEM).

[http://www.who.int/topics/nutrition disorders/en/](http://www.who.int/topics/nutrition_disorders/en/)

Be attentive as we discuss PEM in the following sub topic.

Protein Energy Malnutrition

Definition of malnutrition

The world health organization (WHO) in 2005 defined Severe malnutrition, as a weight-for-height measurement of 70% or more below the median, or minus three(3) standard deviation (SD) or more below the mean National Centre for Health Statistics reference values (NCHS) or Mid- upper arm circumference (MUAC) less than 110 mm (in 6 to 60 month old children).

It is a nutritional disorder where the amount of nutrients taken are less than body requirement characterized by weight loss and retarded growth.

Prevalence

Malnutrition is a major public-health problem throughout the developing world and is an underlying factor in over 50% of the 10–11 million children under 5 years of age who die each year of preventable causes (WHO 2007).

The Zambia demographic health survey in 2007 reported that the prevalence of underweight children nationally is 15 percent, and the prevalence of severely underweight children is 3 percent.

Causes of malnutrition

- Worm infestation
- Infections
- Bad traditional practices
- Failure to increase the amount of food to correspond with the child's growth
- Lack of knowledge on preparation and combination of food.
- Early weaning with no proper replacement feeds.
- Early or sudden separation of the child from the mother e.g. by death.
- Diarrhoea
- Poverty

Classification of malnutrition

Malnutrition can be classified in the following forms:

- Marasmus
- Kwashiorkor
- Marasimic kwashiorkor (presents with a combination of the above two)

Let us now look at each form one by one in detail,

Marasmus

Definition

It is a severe form of protein energy malnutrition which occurs in children due to inadequate intake of primarily carbohydrates however there may also be inadequate proteins and fats intake and it is characterized by severe weight loss, and stunted growth.

Marasmus usually develops between the ages of six months and one year in children who have been weaned from breast milk or who suffer from weakening conditions like chronic diarrhoea, tuberculosis, HIV and AIDS, etc.

Pathophysiology

The inadequate intake of carbohydrates leads to reduced availability of nutrients to the body tissues. This makes the body to initiate reductive adaptation. (Body slows down its metabolic activities). By so doing it makes the most efficient use of the available resources, which ensures survival amid inadequate intake. The adjustment occurs in the following ways:

The production of thyroxin is decreased in order to reduce the metabolic rate so that less energy is required (This account for the hypothermia).

The production of insulin reduces to try and maintain blood sugar level. As a result growth is suspended, this accounts for the retardation that is seen in malnourished child.

To meet the nutritional requirements, the body starts to break down the fats and muscle tissues to generate energy so that the essential metabolic activities are kept going despite the inadequate carbohydrate intake.

This accounts for the severe wasting and risk of hypothermia seen in a Marasimic child

This efficient use of body resources means that serum levels of proteins, glucose and amino acids remain normal in a Marasimic child, however this is maintained at the expense of body tissue decomposition. The body literally digests itself to maintain the serum levels. As a result there is progressive loss of fat and muscle tissue therefore; the child appears emaciated

Cell-mediated immunity, phagocytic function, and the complement system are highly compromised which renders the child prone to infection which may further worsen the condition. Reductive adaptation causes the body not to respond in the usual way to presence of infection in form of inflammation and fever hence masking the infection that may be present.

The heart becomes weak and less able to withstand excess fluid, this renders the child prone to heart failure when IV fluids are liberally given in malnutrition

Signs and symptoms of marasmus

- Severe wasting due to body fat and tissue decomposition. (Child looks a little old man or a monkey)

- Ribs are visible due to emaciation
- Skin is thin flaccid, dry and wrinkled and seems to be too big for the body (at the back child appears like wearing baggy pants)
- Child may have good appetite though emaciated.
- The child looks alert and may cry at the sight of food
- Child may also have diarrhoea due to infection and impaired absorption
- There is stunting due to inadequate intake of carbohydrates
- There can be superficial foamy spots on the conjunctiva (Bitot's spot) usually due to Vitamin A deficiency

Kwashiorkor

Definition

It is a type of protein Energy malnutrition which usually occurs after 12 months and is due to inadequate or low proteins intake and is characterized by edema, stunted growth, apathy and moon shaped face. (G.T. Heikens and M. Manary 2006)

This condition usually appears at the age of about 12 months when breastfeeding is discontinued, but it can develop at any time during a child's formative years.

Pathophysiology of kwashiorkor

The inadequate intake of proteins leads to reduced available nutrients to the body tissues. This makes the body to initiate reductive adaptation (Body to start a downward metabolic adjustment). By so doing it makes the most efficient use of the available resources, which ensures survival amid inadequate intake. The adjustment occurs in the following ways:

- The production of thyroxin is decreased in order to reduce the metabolic rate so that less energy is required (This account for the hypothermia).
- The production of insulin reduces to try and maintain blood sugar level
- As a result growth is suspended this accounts for the retardation that is seen in malnourished child.
- To meet the nutritional requirements, the body starts to break down the fats and muscles tissue to generate energy so that the essential metabolic activities are kept going despite the inadequate intake.

- Insufficient intake of protein will lead to poor tissue replacement and development.
- There will also be reduced synthesis of digestive enzymes and plasma proteins.

Lack of digestive enzymes leads to GIT upset, atrophy of mucosa lining and intestinal villi where absorption takes place, leading to mal-absorption which in turn leads to diarrhea. Diarrhea will in turn lead to loss of electrolytes such as potassium.

In the liver protein content is reduced while fat is increased, therefore the liver increase in size leading to hepatomegaly. However the liver is less able to make plasma protein leading to hypoproteinemia which further contributes to the edema. Reduced plasma protein leads to reduced oncotic pressure which leads to fluid shift from the intravascular spaces to the extra vascular spaces causing edema. This will lead to the seepage of K⁺ from the inside of the cell into the extra cellular space and Na⁺ leaks into the cell causing electrolyte imbalance

Signs and symptoms of kwashiorkor

- Pitting oedema of the feet, ankles and eventually spreading to the rest of the body due to reduced plasma protein
- The child has apathy and is anorexic due to inadequate food intake and impaired gastro intestinal mucosa respectively
- Child has a moon shaped face due to oedema
- The hair is dry, thin, sparsely distributed, brownish red and easily pulled out due to lack of protein which is essential for formation of hair.
- Dermatosis: There is hyper pigmentation of the skin with patches and in some cases there is epidermis peeling leaving a tender wet skin which may become infected.
- The temperature may be normal and sometimes hypothermic in the presence of infection due to low immunity and reduced metabolic rate
- Weight loss due to under nourishment
- Stunted growth due to inadequate intake of food needed to facilitate growth.
- Impaired immunity due to lack of protein which is needed for normal functioning of the immune system.

General principles of care

There are ten essential steps in caring for the child with malnutrition. These are:

1. Treat/prevent hypoglycaemia
2. Treat/prevent hypothermia
3. Treat/prevent dehydration
4. Correct electrolyte imbalance
5. Treat/prevent infection
6. Correct micronutrient deficiencies
7. Start cautious feeding
8. Achieve catch-up growth
9. Provide sensory stimulation and emotional support
- 10 .Prepare for follow-up after recovery

These steps are accomplished in two phases: an initial **stabilisation phase** where the acute medical conditions are managed; and a longer **rehabilitation phase**. Note that treatment procedures are similar for marasmus and kwashiorkor.

Admission criteria

Stabilization phase

Immediately the child is admitted you need to stabilize him/her. In this phase a cautious approach is required because of the child's fragile physiological state and reduced homeostatic capacity. Feeding should be started as soon as possible after admission and should be designed to provide just sufficient energy and protein to maintain basic physiological processes. The essential features of feeding in the stabilisation phase are:

- Small, frequent feeds of low osmolarity and low lactose
- Oral or nasogastric (NG) feeds (never parenteral preparations)
- 100 kcal/kg/d
- 1-1.5 g protein/kg/d
- 130 ml/kg/d of fluid (100 ml/kg/d if the child has severe oedema)

- If the child is breastfed, encourage to continue breastfeeding but give the prescribed amounts of starter formula to make sure the child's needs are met. The suggested starter formula and feeding schedules (see below) are designed to meet these targets.

Milk-based formulas such as starter F-75 containing 75 kcal/100 ml and 0.9g protein/100 ml will be satisfactory for most children (see Appendix 5 for recipes). Give from a cup. Very weak children may be fed by spoon, dropper or syringe recommended schedule in which volume is gradually increased, and feeding frequency gradually decreased is:

Days	Frequency
------	-----------

Vol/kg/feed	
-------------	--

Vol/kg/d	
----------	--

1-2	2-hourly 11 ml
-----	----------------

130 ml	
--------	--

3-5	3-hourly 16 ml
-----	----------------

130 ml	
--------	--

6-7+	
------	--

4-hourly 22 ml	
----------------	--

130 ml	
--------	--

For children with a good appetite and no oedema, this schedule can be completed in 2-3 days (e.g. 24 hours at each level). Appendix 6 shows the volume/feed already calculated according to body weight. Appendix 7 gives the feed volumes for children with severe oedema. Use the Day 1 weight to calculate how much to give, even if the child loses or gains weight in this phase f, after allowing for any vomiting, intake does not reach 80 kcal/kg/d (105 ml starter formula/kg) despite frequent feeds, coaxing and re-offering, give the remaining feed by NG tube (see Appendices 6 and 7 (Column 6) for intake volumes below which NG feeding should be given). Do not exceed 100 kcal/kg/d in this phase.

Monitor and note:

- Amounts offered and left over
- Vomiting
- Frequency of watery stool
- Daily body weight

During the stabilisation phase, diarrhoea should gradually diminish and oedematous children should lose weight. If diarrhoea continues unchecked despite cautious re-feeding, or worsens substantially, see section C4 (continuing diarrhoea)

Monitor during the transition for signs of heart failure:

- Respiratory rate
- Pulse rate

If respirations increase by 5 or more breaths/min and pulse by 25 or more beats/min for two successive 4-hourly readings, reduce the volume per feed (give 4-hourly F-100 at 16 ml/kg/feed for 24 hours, then 19 ml/kg/feed for 24 hours, then 22 ml/kg/feed for 48 hours, then increase each feed by 10 ml as above).

After the transition give:

- frequent feeds (at least 4-hourly) of unlimited amounts of a catch-up formula
- 150-220 kcal/kg/d
- 4-6 g protein/kg/d
- If the child is breastfed, encourage to continue (Note: breast milk does not have sufficient energy and protein to support rapid catch-up growth).

Monitor progress after the transition by assessing the rate of weight gain:

- weigh child each morning before feeding. Plot weight (Appendix 9 provides example)
- Each week calculate and record weight gain as g/kg/d³

If weight gain is:

- Poor (<5 g/kg/d), child requires full reassessment (see Section D)
- moderate (5-10 g/kg/d), check whether intake targets are being met, or if infection has been overlooked
- Good (>10 g/kg/d), continue to praise staff and mother

Transition phase

Discharge phase

During rehabilitation, preparations should be made to ensure that the child is fully reintegrated into the family and community after discharge. The family must be prepared to prevent recurrence of severe malnutrition. If possible, the home should be evaluated by a social worker or nurse before discharge to ensure an adequate environment. If the child is abandoned or conditions at the home are unsuitable, a foster home should be sought.

Therapeutic feeds

Therapeutic foods are foods designed for specific, usually nutritional, therapeutic purposes as a form of dietary supplement. They are used for emergency feeding of malnourished children. Therapeutic foods are usually made of a mixture of protein, carbohydrate, lipid and vitamins and minerals. Therapeutic foods are usually produced by grinding all ingredients together and mixing them.

The World Health Organization's standards for the treatment of malnutrition in children specify the use of two formulas during initial treatment, F-75 and F-100. These formulas contain a mixture of powdered milk, sugar, and other ingredients designed to provide an easily absorbed mix of carbohydrates and essential micronutrients. They are generally provided as powdered mixes which are reconstituted with water. The WHO recommends the use of these formulas, with the gradual introduction of other foods, until the child approaches a normal weight.

The standard treatment of childhood malnutrition is administered in two phases. Phase one usually deals with children who are severely malnourished and very ill as a result. The therapy used in this phase is F-75, a milk-based liquid food containing modest amounts of energy and protein (75 kcal/100 mL and 0.9 g protein/100 mL) and the administration of parenteral antibiotics. When an improvement in the child's appetite and clinical condition is observed, the child is entered into phase two of the treatment. This phase uses F-100. F-100 is a "specially formulated, high-energy, high-protein (100 kcal/100 mL, 2.9 g protein/100 mL) milk-based liquid food". The child is in phase two until he/she is no longer wasted. Phase two starts while the child is in the hospital but is usually completed after the child goes home. The parent is then responsible for feeding the child a flour supplement made of cereal and legumes as a

replacement for the milk-based foods used in phases one and two. An example of therapeutic food is Ready-to-use therapeutic food abbreviated as RTUF. The most common RUTFs are made of four ingredients: sugar, dried skimmed milk, oil, and vitamin and mineral supplement (CMV). Other qualities that RUTFs should have included a texture that is soft or crushable and a taste is acceptable and suitable for young children. RUTFs should be ready to eat without needing to be cooked. A subset of therapeutic foods, ready-to-use therapeutic foods (RUTFs), are energy-dense, micronutrient-enriched pastes that have a nutritional profile similar to the traditional F-100 milk-based diet used in inpatient therapeutic feeding programs and are often made of peanuts, oil, sugar and milk powder.

Children who are 6–59 months of age with severe acute malnutrition who present with either acute or persistent diarrhoea, can be given ready-to-use therapeutic food in the same way as children without diarrhoea, whether they are being managed as inpatients or outpatients. Because ready-to-use therapeutic food does not contain water, children should also be offered safe drinking water to drink at will. Breastfeeding should be continued.

Cardiovascular System

Congenital Heart Disease

INTRODUCTION

Some infants are born with mild types of congenital heart disease, but most need surgery in order to survive. Patients who have had surgery are likely to experience other cardiac problems later in life.

Most types of congenital heart disease obstruct the flow of blood in the heart or the nearby vessels, or cause an abnormal flow of blood through the heart.

GENERAL OBJECTIVES

At the end of the lecture, students should be able to demonstrate an understanding of congenital heart disease and its management.

SPECIFIC OBJECTIVES

At the end of the lecture, students should be able to:

Define congenital heart disease

- Outline the predisposing factors to congenital heart disease
- Explain the classifications of congenital heart disease
- Describe the management of congenital heart disease

DEFINITION

Congenital heart disease, also called congenital heart defect, includes a variety of malformations of the heart or its major blood vessels that are present at birth.

Causes

The real cause is not known, but there are predisposing factors.

Predisposing Factors

- Family history
- Chromosomal defects
- Drugs such as retinoic acid
- Chemicals
- Alcohol
- Infections such as rubella during pregnancy
- Poorly controlled blood sugar in women who have diabetes during pregnancy

Classification of Heart Diseases

- There are several ways of classifying congenital heart diseases but in this document which are going to use the following classifications:
- Left to right lesions
- Right to left lesions
- Obstructive lesions

Left to Right Lesions:

- Ventricular Septal Defect
- Atrial Septal Defect
- Patent Ductus Arteriosus
- Atrioventricular Canal Defect

Right to Left Lesions

- Tetralogy of Fallot
- Transposition of the Great Arteries

- Double Outlet Right Ventricle
- Tricuspid Atresia

Obstructive Lesions

- This includes the following;
- Pulmonary Stenosis
- Aortic Stenosis
- Coarctation of the Aorta

Left to right lesions

Ventricular Septal Defect (VSD)

- Ventricular septal defect is an abnormal opening between the right and left ventricle which allows blood to shunt from left to right side and to the pulmonary circulation and increases the vascular load.
- Such opening in the septum may undergo a spontaneous closure in the first year of life or may lead to heart failure, may require surgical closure or may be accompanied by pulmonary vascular disease

Clinical manifestations

- Tachypnea is typically the first presenting symptom.
- Dyspnoea
- Failure to thrive.
- Hepatomegaly may be present.

Clinical Manifestations Cont.....

- The murmur of VSD is due to left-to-right shunting at the ventricular level. The murmur of a VSD is heard best at the left lower sternal border.

Investigations

Electrocardiography

- The electrocardiogram is typically normal or there is left valve hypertrophy (LVH) due to volume overload.
- There may be right ventricular hypertrophy and left atrial dilatation.

Chest Radiography

- The chest x-ray shows cardiomegaly with increased pulmonary blood flow. The picture below shows an X – Ray of an enlarged heart.

Inesrt picture

- **Investigations Cont.....**

Echocardiography

- It determines the number of defects

Investigations Cont.....

Cardiac Catheterization

- Cardiac catheterization may be indicated to further delineate the anatomy of the VSD although this is becoming unnecessary nowadays due to echocardiography.

Treatment

- Surgical repair of ventricular septal defects is done in infants less than six months of age only when the child is not gaining weight due to congestive heart failure.

Patent Ductus Arteriosus (PDA)

- This is failure of the fetal ductus arteriosus (artery connecting the aorta and pulmonary artery) to close within the first weeks of life.
- The continued patency of this vessel allows blood to flow from the higher-pressure aorta to the lower-pressure pulmonary artery, causing a left-to-right shunt.
- Large patent ductus arteriosus could cause pulmonary vascular obstructive disease as early as ten months but is not usually encountered until after two years of age.

Clinical Manifestations

- The symptoms are those of congestive heart failure secondary to increased Pulmonary bloodflow.

A continuous systolic and diastolic murmur is audible over the left subclavicular and left upper sternal border.

- **Investigations**

Electrocardiography

- The ECG shows in large patent ductus arteriosus, left ventricular hypertrophy and when the pulmonary artery pressure is elevated there will be biventricular hypertrophy pattern.

Chest Radiography

- The chest x-ray shows an enlarged aorta and left atrium as well as left ventricle.
- There is also dilatation of the pulmonary arteries in severe cases.
- ***Echocardiography***
- The ductus arteriosus could be seen in the parasternal short axis and the suprasternal views.
- Colour flow Doppler will show blood flow across the ductus.

Treatment

- The treatment of choice for patent ductus arteriosus is coil occlusion if possible.
- Indomethacin treatments used in premature babies with significant patent ductus arteriosus is usually given within the first 48 hours of age at a dose of 0.2 mg/kg as a first dose and repeated a second and third time after 12 hours if the patent ductus arteriosus is still open.
- In premature babies a smaller dose of 0.1 mg/kg is given because of poor renal maturity at that age.
- 80% of patent ductus arteriosus in premature babies close with Indomethacin therapy.

Atrial Septal Defect (ASD)

- This is an abnormal opening between the atria allowing blood from the higher pressure left atrium to flow in the lower pressure right atrium vascular load on the right side of the heart.

Clinical Manifestations

- Asymptomatic when atrial septal defect is small.
- Larger defects will cause pulmonary edema and congestive heart failure (CHF) causing easy fatigability and shortness of breath.
- Auscultation reveals a prominent first heart sound. Second heart sound is split wider than normal.

Investigations

Electrocardiography

- The right atrium is enlarged due to volume overload.

Echocardiography

- The atrial septal defect is seen.

Chest Radiography

- This will review cardiomegaly

Treatment

- Cardiac surgery

Right to Left Lesions

Tetralogy of Fallot

- Tetralogy of Fallot is an abnormality of the heart with combination of four (4) separate cardiac defects, which include;
- Ventricular septal defect
- Pulmonic Stenosis
- Overriding aorta
- Right ventricular hypertrophy
- Tetralogy of Fallot Cont.....
- This causes altered pressure gradients and either left to right or right to left shunting depending on the severity of the Pulmonic Stenosis and size of the ventricular septal defect.
- Shunting of de - oxinated blood into the left ventricle and aorta causes cyanosis and hypoxemia.

Clinical Manifestations

- The right ventricular outflow tract obstruction may be minimal in the beginning leading to significant left-to-right shunting at the VSD with symptoms and signs of congestive heart failure.
- Clinical Manifestation Cont....
- The right ventricular outflow tract obstruction may be minimal in the beginning leading to significant left-to-right shunting at the VSD with symptoms and signs of congestive heart failure.
- Clinical Manifestation Cont....
- Due to deformity of the pulmonary valve there may be a single second heart sound.

- When continuous murmurs are auscultated this might indicate the presence of a PDA or collateral vessels.

Investigations

Electrocardiography

- There is typically right ventricular hypertrophy with right axis deviation.

Cardiac Catheterization

- In straight-forward, clear tetralogy of Fallot there may not be a need for cardiac catheterization.
- However, if the peripheral pulmonary arterial anatomy is unclear then cardiac catheterization may be indicated to evaluate the peripheral pulmonary arteries and collateral circulation.

Echocardiography

- Echocardiography will show the cardiac defect including the VSD, right ventricular outflow tract obstruction and pulmonary stenosis.

Chest Radiography

- The media sternum is narrow due to small pulmonary arteries.
- The left ventricular apex is uplifted due to right ventricular hypertrophy.
- These two features give the boot shaped heart.
- The picture below indicates the chest X – ray of a patient with Tetralogy of Fallot.

Treatment

- Treatment is surgery.

OBSTRUCTIVE LESIONS

AORTIC STENOSIS

- This is the narrowing or stricture of the aortic valve, causing resistance to blood flow in the left ventricle, decreased cardiac output, left ventricular hypertrophy and pulmonary vascular congestion.

Clinical Manifestations

- 75% of patients are males.
- They are typically asymptomatic.
- The murmur detected is typically at a routine physical examination.

- In the minority of patients they complain of chest pain which is angina-like with syncope particularly during exercise.
- Clinical Manifestations Cont.....
- Physical examination reviews a palpable thrill particularly over the suprasternal notch as well as the right second intercostal space.
- On auscultation the first heart sound is normal. The second heart sound is also normal except with severe aortic stenosis where the aortic valve is closed.

Investigations

Electrocardiography

- Changes on the electrocardiogram reflect the daily strain (i.e. chronic) of the myocardium

Echocardiography

- The short axis reveals the aortic valve ring which should be assessed.

Cardiac Catheterization

- With angina, to evaluate left ventricular pressures and coronary blood flow.
- Ectopy, to evaluate left ventricular pressures.
- Fainting spells, to evaluate left ventricular outflow tract.

Investigations Cont.....

Chest Radiography

- Mild cardiomegaly with a prominent aortic arch. Below is the chest X – Ray of a child with aortic stenosis.

Treatment

- Treatment is surgery. In infants with critical aortic stenosis the aim is to improve cardiac output.
- In older children the aim is to preserve the myocardium against irreversible damage.

Coarctation Of The Aorta

- This is the localised narrowing of the aorta near the origin of the subclavian artery.
- It causes increased pressure proximal to the defect (circulation to head and upper extremities) and decreased pressure distal to the defect (circulation to the lower extremities).

- Blood pressure between upper and lower extremities is markedly different.
- Infants with aortic coarctation may have very sudden onset of heart failure, cardiovascular collapse and severe metabolic acidosis as the ductus closes and distal perfusion is compromised.

Treatment

- Surgical repair is the standard of care in native coarctation of the aorta with end-to-end anastomosis with or without use of subclavian artery flap.

Assessment Of A Child With Heart Diseases

- **Pre-natal & Neonatal History**
- Ask for the health history of the mother. The following conditions may predispose the infant to congenital heart disease.

Current health problem

- Ask for;
- Shortness of breath
- Easy fatigability & failure to thrive (children with respiratory distress and poor cardiac output due to heart disease cannot feed well as it requires considerable effort to suckle resulting in easy fatigability and failure to thrive).
- Syncope: Loss of consciousness may occur secondary to neurological or cardiac reasons.
- Palpitation; Indicates abnormal heart rhythm which may be too slow, too fast or just irregular.
- Children may complain of chest pain when they are actually experiencing arrhythmias.

Physical Assessment

- When performing cardiovascular examination in children one should follow the usual sequence of assessment:
- Inspection
- palpation
- then auscultation.
- Percussion has no significant role in paediatric cardiovascular assessment, particularly in infants and young children.

INSPECTION

- First, the general appearance of the baby or child should be assessed. The examiner should ask him or herself the following:
- Is the child too ill?
- Is there significant respiratory distress?
- Is there cyanosis?
- Inspection Cont.....
- Does the child have syndromic features, such as Down's syndrome, etc?
- Cyanosis is caused by an increase in the level of de-oxygenated haemoglobin which has a blue colour in contrast to oxygenated haemoglobin which has a pink colour.
- Inspection Cont.....
- A level of 2 g/dl of de-oxygenated haemoglobin in the blood is required before cyanosis is noticeable.

Oedema

Unlike congestive heart failure in the adult population, oedema is not a common feature of CHF in children.

- When present it is best detected over the sacral region, particularly in babies.

Clubbing of Digits

- Clubbing of the digits occurs because of hypoxia.
- Peripheral tissues are most vulnerable to hypoxia

PALPATION

- Peripheral perfusion: Normally is 1-2 seconds in duration. Prolonged capillary refill time indicates poor cardiac output.
- Femoral and brachial arterial pulses should be felt simultaneously to assess their strength and timing. In coarctation of the aorta the femoral pulsation is weaker and delayed in timing when compared to the brachial arterial pulse.
- Palpation Cont.....
- Peripheral pulses also give a sense of the cardiac output, systolic and diastolic pressures. Poor cardiac output results in low systolic and high diastolic blood pressure, hence a narrow pulse pressure.

- On the other hand, a low diastolic BP, such as with PDA or aortic regurgitation will cause a wide pulse pressure.
- Hepatomegaly, and rarely hepato - spleenomegally is seen in CHF due to elevated central venous pressure.
- A palpable thrill over the precordium or suprasternal notch indicates significant murmur.

AUSCULTATION

Lungs

Rarely crackles are heard in pulmonary oedema since breathing sounds in children is bronchial in nature and not alveolar as heard in adults.

- Therefore, even significant oedema may not cause audible pulmonary changes.

Heart

- Murmurs; Grade: 1-6, one being the softest and six being the loudest.
By definition grade four murmurs are associated with a palpable thrill.

SURGICAL MANAGEMENT

- **TYPES OF CARDIAC SURGERY**
- There are 2 basic approaches to cardiac surgery. These are open and closed heart surgery.
- **Open Heart Surgery:**
 - This is a procedure in which the heart is opened up to correct the defects.
 - Cardio-Pulmonary bypass is used to provide extracorporeal circulation while surgery is being performed on the heart. (Billings and Stokes 1982)
- **Closed Heart Surgery**
 - In closed heart surgery, the myocardium is not invaded and cardiac circulation is not interrupted.

Pre operative investigations

- Arterial blood gases,
- Haemoglobin estimation,
- Blood grouping and cross matching.

PROBLEMS IDENTIFIED PRE-OPERATIVELY

- Activity intolerance
- Risk of acquiring infection.

- Risk of aspiration during operation
- Altered nutritional status.
- Knowledge deficit
- Anxiety

NURSING CARE PLAN

PROBLEM 1

- Activity intolerance

Nursing Diagnosis.

- Activity intolerance related to insufficient oxygenation secondary to decreased cardiac output and pulmonary congestion manifested by weakness, fatigue, shortness of breath and tachycardia.

Goal

- To rest the patient so as to promote oxygenation within two hours of hospitalization.

NURSING CARE PLAN CONT...

• *Rationale/Intervention*

- Assess and monitor patient responses to activity by checking pulse rate, respiration B/P in order to plan appropriate intervention.
- Plan the rest periods between activities to conserve energy and decrease cardiac demands
- Organise care to minimise unnecessary disturbance to enable client to rest.
- Provide direct care to allow rest for the child.

• *Evaluation*

- The client demonstrates activity tolerance evidenced by stable pulse rate and respirations.

PROBLEM 2

- Risk of acquiring infection.
- **Nursing diagnosis**
- Risk of acquiring infection related to inadequate pre-operative care and poor aseptic technique during and post operatively.

Goal

- To prevent infection through out patient's hospitalization.

- **Rationale/intervention**
- Ensure that aseptic technique is maintained during the operation to prevent contaminating the incision site.
- Ensure equipments are well sterilized before use.
- Sterile dressings should be available for dressing the operational site.
- Bath child on the morning of surgery.
- Gown the child in theatre gown to reduce transferring micro-organism in to theatre.
- Use aseptic techniques during wound dressing.

Evaluation

- The patient free from would infection through out his hospitalization.

Problem 3

- Risk of aspiration during operation
- **Nursing diagnosis.**
- Risk of aspiration during operation related to anaesthesia

Goal

- To prevent aspiration in the intra – operative period.
- **Rationale/Intervention**
- Ensure that the child will be starved for 4-6 hours prior to surgery to prevent vomiting during the operation which may lead to complications of aspiration.
- The client should have a Naso-gastric tube inserted which will prevent vomiting.

Evaluation

- There's no aspiration observed during the intra – operative period.

Identified Problems Post Operatively

- Ineffective gas exchange
- Pain on the operational area.
- Fluid volume deficit
- Risk of injury
- Altered thermoregulation.
- Altered nutritional status
- Risk of wound infection

IEC

- **Parental Advice**
- **Wound Care**
- Clean the wound twice daily and keep the wound dry.
- No showering or tub bath should be done to prevent water from going on the incision area.

Exercises

- The nurse needs to discuss exercises and play restrictions (avoid vigorous exercises like bike riding, tree climbing etc).
- The child should not be in school until the first postoperative evaluation by the surgeon, this should be in 2 to 3 weeks after discharge.

Medication

- Reinforce continued infective endocarditis prophylaxis if indicated.
- Medications should be continued to ensure recovery.

Diet

- Discuss with the caretakers on the diet to take after discharge for example a balanced diet for quick healing of the wound and low sodium and increased protein intake for 4-6 weeks.
- Encourage parent to treat child as normal.
- Emphasise that overprotection leads to lack of independence and poor self-image.

Complications of Congenital Heart Disease

Retarded development: The child may take long to start walking or talking due to poor oxygen supply during early development.

- **Respiratory tract infections** such as pneumonia lung oxygenation: This may be related to poor lung oxygenation or secondary infections from other parts of the body.
- **Endocarditis:** This is related to secondary infections from other parts of the body.
- **Pulmonary hypertension:** For example o defects such as aortic stenosis because the heart will pumping against resistance.

- **Heart rhythm problems such as atria fibrillation:** Due scaring following surgery.
- **Heart failure:** Because of the seriousness of the defect which makes the heart fail to pump enough blood to meet the body's demands.
- **Cyanosis:** Because of mixing of oxygen poor and oxygen rich blood.
- **Cerebral vascular accident:** Because of clot formation following surgery.
- **Emotional problems:** Because of their size, activity restriction and learning difficulties.
- **Sudden cardiac death:** This is related to the severity and progress of the condition.

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Rheumatic Heart Disease

Definition

This is an inflammatory reaction or disorder of the heart which follows repeated attacks of Rheumatic fever (caused by group A beta haemolytic streptococci), it involves the endocardium (inner lining including valves), myocardium (muscle) and pericardium (outer covering).

Signs and Symptoms of Rheumatic Heart Disease

Dyspnoea or difficulties in breathing as a result of congestion of the lungs with fluids (pulmonary congestion). Since the heart is inflamed, it would fail to function well, so there would be back flow of blood which would eventually congest the lungs. .

Gaseous exchange is impaired thereby causing dyspnoea.

Orthopnoea- this is difficulties in breathing when laying flat unless in a sitting position. When someone is sitting up, blood pools to the lower limbs. However, when a person lies flat, blood returns to the lungs which is already congested to congest it more causing dyspnoea.

Paroxysmal nocturnal dyspnoea- This is difficulties in breathing that occurs at night. During the day, the patient usually has been sitting up with the feet and legs in dependent position and this causes blood to flow to the lower limbs. However at night patient lays down, this leads to an

increase in the venous return to the lungs causing congestion. There is dyspnoea that awakens a patient from sleep and forces her to sit up in bed to catch a breath.

Cough- which may be productive with frothy sputum. The cough is due to irritation of the lung tissue by large amounts of fluid that has accumulated there.

Oedema-This is due to back flow of blood from the heart which accumulates in body tissues. Initially it may be of the lower limbs then generalized including pulmonary oedema, ascites, etc.

Hepatomegaly and abdominal pains- as the liver becomes congested with venous blood, it enlarges. Thus stretching the capsule surrounding the liver causing pain and discomfort. The patient may constantly complain of pain in the upper quadrant.

Cardiomegaly- This is enlargement of the heart due to the heart being overworked to try and push blood to the lungs (right ventricle) or to the other parts of the body (left ventricle).

Fatigue/tiring on slight exertion- this is due to reduced cardiac output leading to reduced oxygen supply to the tissues (this results in reduced metabolic rate) thus the fatigue.

Cyanosis- this is a bluish appearance of the skin and mucous membrane as a result of reduced oxygen levels in the blood. This will be as a result of reduced cardiac output. In addition, it is as a result of reduced oxygen perfusion in the lungs due to congestion with fluids.

Cerebral anoxia- with the decrease in cardiac output, the amount of blood carrying oxygen to the brain also reduces. This results in cerebral anoxia characterized by irritability, restlessness, etc.

Decreased renal function- when the cardiac output is reduced, the amount of blood reaching the kidneys is reduced; this triggers an increase in the secretion of aldosterone that increase the reabsorption of sodium together with water thereby even increasing in the oedema.

Tachycardia- this is an increase in the pulse rate. It is the compensatory mechanism of the heart to overwork in order to try and meet the body's demands of oxygen and nutrients.

Distended jugular or neck veins- this is due to venous congestion.

Management

diagnosis/Investigations

History- diagnosis can be made from the signs and symptoms such as dyspnoea

Physical examination- on inspection, can be able to observe oedema and distended neck veins. On auscultation, abnormal heart sounds are heard.

Electrocardiogram- this test can show abnormal electrical activities of the heart. **Echocardiogram**- this test uses ultrasound waves to create an image of the heart structures such as endocardium (which can reveal inflammation of the endocardium or scarring of the valves, etc), myocardium which can reveal enlargement of the myocardium, etc.

Chest x-ray- may reveal enlarged heart

Blood for urea and nitrogen (BUN) - maybe elevated because of renal failure.

Treatment

Digitalis eg digoxin- which strengthens the contractility of the ventricular muscles and slows down the conducting power of the atrioventricular bundle thereby enabling ventricles to beat more effectively.

Dosage- 0.25mg orally per day. It may be administered intramuscularly or intravenously when patient's condition is life threatening.

Side effects- Digoxin slows down the pulse rate.

You need to check the pulse rate before administering digoxin. If pulse rate is less than 60 beats per minute, do not give this drug.

Duiretics- for example frusemide, can be given to help in excretion of sodium and water.

Dosage- 2mg/kg once daily

Side Effects- Hypokalemia

Anti-Inflammatory- e.g. hydrocortisone 100mg tds intramuscularly can be given to relieve the inflammation.

Oxygen Therapy-Oxygen therapy is used to decrease work of breathing by increasing alveolar oxygen tension and 0.5 to 1litre per minute will be administered when patient is dyspnoeic.

Antipyretics-Such as paracetamol 100mg tds to reduce the high temperature.

Antibiotics: Antibiotics such as Benzathine penicillin- can be given for treatment against Group A beta hemolytic streptococcal infection which predisposes to Rheumatic Heart Disease. Usually patients who are over 18years with history of Rheumatic Fever and even Rheumatic

Heart Disease are given Benzathine penicillin every 6months as prophylactic treatment against Group A beta hemolytic streptococcal infection, this prevents recurrent attacks.

Nursing Care

AIMS: Some of the aims for nursing care of a patient with Rheumatic heart disease are as follows:

- To relieve the dyspnoea
- To treat the inflammation
- To prevent complications such as heart failure

Environment

The child will be nursed in acute bay near the nurses' table for easy observation. He/she should be nursed on a cardiac bed with backrest and cardiac table to help prop up the patient in bed. These accessories (backrest and cardiac table) should be available. There should also be source of oxygen since patient may be dyspnoeic and require oxygen. The environment should also be clean and well ventilated for the comfort of the patient.

Position

The patient is propped up in bed with the help of backrest or cardiac table (on which the patient will lean). This helps with lung expansion, promotes gaseous exchange and prevents pulmonary congestion. Patients with rheumatic heart disease are usually unable to lie flat as this causes congestion of fluids in the lungs thereby leading to dyspnoea. If pedal oedema is present, can slightly elevate the limbs using a pillow to relieve the oedema.

Rest

Nurse the patient on complete bed rest especially in acute stage to reduce the workload on the heart as well as demand of the tissues for oxygen. Bed rest promotes a decrease venous return thereby reducing pulmonary congestion and dyspnoea. Ensure that the environment is quiet in order to promote rest. Do procedures in blocks to give adequate time for the patient to rest. If patient is dyspneic administer oxygen to relieve dyspnoea thereby promoting rest. Keep the child's toys close to him/her to prevent straining as this can cause stress. Offer a bedpan to the

patient whenever he/she wants to open bowels or pass urine to minimize movements as this can increase oxygen and glucose demand.

Observation

Monitor and maintain strict intake and output using the fluid balance chart to avoid overloading the patient with fluids as this can put further strain on the heart. In acute stage observe the degree of oedema by weighing the child daily to see whether the oedema is increasing or subsiding. In acute stage monitor vital signs half hourly, hourly, and two hourly and this should include temperature, pulse, respirations and blood pressure. Observe the breathing pattern to rule out dyspnoea which is usually secondary to pulmonary congestion. Check the number of respirations per minute as they may be high in pulmonary congestion. Check pulse to rule out tachycardia as it may be high especially when the heart is being overworked. When the patient is on digoxin it is important to check pulse before administering the drug to rule out bradycardia. If pulse is below 60 beats per minute, do not administer digoxin. Check blood pressure as this can be high especially when there is too much retention of fluids and overwork of the heart. Observe the patient's general condition; whether improving or worsening. You need to observe for the side effects of the drugs such as bradycardia which is caused by digoxin and intervene by not administering the drug hence; prevent complications to the patient.

Psychological Care

Explain the disease process to the patient depending on the age or to the parents in order to allay anxiety and promote co-operation during treatment. Reassure the patient that the dyspnoea can be relieved by position, administration of oxygen and diuretics to reduce pulmonary congestion. Explain to the patient the reasons for fluid and sodium restrictions; that is to reduce fluid retention which puts strain on the already diseased heart. Allow significant others to visit the patient to maintain family ties and also for the patient to feel cared for. Explain all procedures done on the patient to allay anxiety.

Hygiene

Give bed baths especially in acute phase when patient is on complete bed rest to remove dirt and promote blood circulation. As the condition improves, give patient an assisted bath to stimulate self-esteem. Provide oral toilet to stimulate appetite and prevent bad breath especially that the

patient may be on oxygen therapy that can cause dry mouth. Change linen whenever soiled to promote patient's comfort as well prevent breakage of the skin that can lead to pressure sores.

Exercises

In acute stage do passive exercises on the patient to promote blood circulation and improve muscle tone. As the patient's condition improves encourage him/her to do mild exercises such as moving of the limbs and turning in bed later he/she can change to active exercises, but they should not be too vigorous to strain the heart.

Nutrition

Give a mixed diet which is high in proteins to help in healing of worn out tissues and boost the immunity which is low. The diet should be high in vitamins to help in healing and boost the immunity. Give high roughage to prevent constipation which can lead to overworking the heart. Offer small frequent meals that are easily digestible as heavy meals put strain on the already congested gastro-intestinal tract. Also give diet low in salts and restrict fluid intake to reduce fluid retention.

Elimination

Give diet which is high in roughage to prevent constipation because this causes straining during opening bowels and this can cause strain on the already diseased heart and worsen the condition.

Information, Education And Communication

The following points should be covered when educating the patient:

Nutrition, importance of seeking medical advice early, importance of coming for review, Position, medication

Nutrition

Information Education and Communication should be given to the patient on the importance of taking a diet low in salt to minimize on fluid retention since there is already edema and we do not want to worsen the situation. Advise patient to reduce on fluid intake so as to reduce on fluid retention. The patient should be taught on the importance of taking roughage in the diet and this is to prevent constipation thereby preventing straining the heart.

Importance of seeking medical advice early

Give Information Education and Communication (IEC) on the importance of seeking treatment early when patient has throat infection as this may be caused by group A beta haemolytic

streptococci which can lead to rheumatic fever. Educate patient and parents that if he/she has repeated attacks of rheumatic fever the condition may worsen leading to complications.

Position

Advise the patient to assume the sitting up position or semi sitting especially when dyspnoeic to help in lung expansion and prevent dyspnoea. Advise patient to elevate lower extremities with a pillow when there is oedema of the lower extremities to promote venous return and reduce oedema.

Importance of coming for review

Advise patient/guardian on the importance of coming for review as ordered by the doctor in order to monitor the progress of the disease.

Medication

Give Information Education and Communication on the importance of continuing with prescribed treatment to help in controlling the condition and prevent resistance to drugs especially antibiotics.

Chorea

BLOOD DISEASES

Anaemia

Definition: It is a type of anemia in which there is iron deficit in which the blood hemoglobin and the red blood cell count are below normal levels.

Or it is a type of anemia which results for inadequate supply of iron for optimal function of RBCs which produces small (microcytic) cells with less colour staining.

Causes of anaemia

- Inadequate dietary intake
- Gastrointestinal blood loss
- Worm infestation

Signs and symptoms of anaemia

- **Pallor** due to reduced oxygen supply to the tissues.
- **Fatigue** due to reduced oxygen supply to the muscles which is needed for formation of energy.
- **Dyspnea-** difficulty in breathing: This happens because of reduced oxygen supply to the lung tissue hence making it difficult for the lungs to function properly.
- Fatigability
- Breathlessness
- Cardiac palpitation
- Sore of the tongue
- Nail brittle-spoon shaped

MEDICAL MANAGEMENT

OBJECTIVES:

- To identify the specific cause and treat
- To prevent complications like renal failure

Diagnostic Examinations:

- Complete Blood count – first test to check the levels of the parts of the blood (red blood cells, white blood cells, platelets)
- Reticulocyte count - The test shows whether your bone marrow is making red blood cells at the correct rate.
- Peripheral smear – To check whether the red blood cells look (microcytic) smaller and (hypochromic) paler than normal
- Serum iron markedly decreased
- Serum ferritin decreased: *Ferritin – a protein that binds with iron in the body making it easier to be transported.

Drugs

1. Oral supplements of iron (Ferrous Sulphate)

2. Treat the cause
3. Parenteral Iron – for children with iron malabsorption or chronic hemoglobinuria
4. Transfusion – indicated for severe anemia cases of severe infection, cardiac dysfunction

NURSING MANAGEMENT

Environment

Nurse patient in a clean well ventilated room to prevent infections and for the comfort of the patient

POSITION

Prop patient in bed with support of pillows if dyspnoea is present. This allows easy breathing and prevents congestion on the lungs. Tell the mother to assist in the care and maintenance of the patient's position.

OBSERVATIONS

Vital signs observation of temperature, pulse, respirations and blood pressure should be done $\frac{1}{4}$ hourly, $\frac{1}{2}$ hourly, 1 hourly, 2 hourly & 4 hourly as the condition improves. Check temperature for pyrexia in case infection has set in which may be due to a lowered immunity system.

Check pulse for tachycardia and if present, infuse fluids as ordered like normal saline to increase blood volume. Observe respirations to rule out dyspnoea and if present put patient in a prop-up position.

Observe for pallor if severe there may be need to transfuse blood depending on the Doctor's order .

Observe urine for i.e consistency, colour, smell and output to assess the kidney functions.

Record the findings on the fluid balance chart.

Observe the mouth for any lesions as they are prone to sores. Observe the skin, if very dry then it means there is severe anaemia. Observe the eating pattern of the patient as they usually have anorexia, help the child by giving appetising, small frequent meals.

PSYCHOLOGICAL CARE

Explain the disease process to the patient i.e definition, causes, signs and symptoms and its management to allay anxiety, tell the patient that in children iron deficiency anaemia is mostly caused by inadequate dietary intake and worm infestation because of eating soil. Explain each and every procedure that is going to be done on the patient such as, blood collection for haemoglobin, cross-match and grouping, oral care etc so as to gain patient's cooperation and understanding.

REST

In severe anaemia the patient is usually pyrexial, which puts him/her at risk of going into cardiac failure at the slightest strain, therefore the care should be that which prevent strain and restore good health. Ensure that patient takes some rest as it is essential in lowering patient's oxygen requirement for reducing strain on the heart and lungs.

Nutrition

Offer a well-balanced diet rich in proteins and iron

HYGIENE

Mostly if severe anaemia bed rest is recommended, therefore bed bath should be done daily to promote comfort, prevent infection of the skin and promote peripheral circulation. Oral care should be done before meals to promote appetite reduce risk of infections such as gingivitis, stomatitis and prevent halitosis. Nail care to prevent auto infection and injury to themselves.

Information Education and Communication

- Diet
- Deworming
- Medication

- Review date
- Prevention of malaria

Sickle cell disease

Sickle cell disease

Definition

Sickle cell disease is a genetic disorders characterized by formation of abnormal hemoglobin which is Hbs instead of HbA and the abnormality is in the beta chain of Hb due to valine which is replaced by glutamic at 6th position.

or

Sickle cell disease is a hereditary blood disorder characterized by erythrocytes that contain HB-S.

This disease occurs into two forms which are;

TYPES OF ANAEMIA

1. Sickle cell trait (HETEROZYGOUS)
2. Sickle cell anaemia(HOMOZYGOUS)

Individual inherits only one HB –S gene from one parent. These persons do not usually manifest signs and symptoms of sickling except in very stressful situations

SICKLE CELL ANAEMIA

The individual inherits an abnormal haemoglobin gene HB –S from both parents. Disease affects both males and females .It occurs exclusively in blacks.The HB –S is less soluble

PATHOGENESIS

When RBCs deoxygenated, Hbs molecules undergo aggregation and polymerization.

Initially, the red cell cytosol converts from a freely flowing liquid to a viscous gels as Hbs aggregates form. With continued deoxygenation, aggregated Hbs molecules assemble into a long needle – like fibers within red cells, producing a distorted sickle or holly – leaf shape. Sickling of red cells is initially a reversible phenomenon; with oxygenation, Hbs depolymerizes and the cell shape normalizes. However, with repeated episodes of sickling, membrane damage occurs. The cells become irreversibly sickled, retaining their abnormal shape even when fully deoxygenated. The precipitation of Hbs fibers also causes oxidant damage, not only in irreversibly sickled cells

but also in normal appearing cells. With membrane injury, red cells become loaded with calcium, which is normally excluded rigorously. Calcium ions activate a potassium ion channel, leading to the efflux of potassium and water, intracellular dehydration, and an increase in mean cell hemoglobin Concentration.

Additionally, lesions produced by repeated episodes of deoxygenating render sickled red cells abnormally sticky causing micro vascular

PATHOGENESIS

In heterozygotes, 40% of haemoglobin is Hbs, the rest being HbA which interacts only weakly with HbS when deoxygenated

Both the relatively low concentration of HbS and the presence of interfering HbA act to prevent efficient HbS aggregation and polymerization

Both the relatively low concentration of HbS and the presence of interfering HbA act to prevent efficient HbS aggregation and polymerization

, and thus red cells in heterozygous individuals do not sickle except under conditions of severe hypoxia and are termed to have sickle cell trait and are asymptomatic carrier.

NOTE:-Haemoglobin other than the normal HbA also influence the aggregation and polymerization of HbS and thus the severity of sickle cell anemia profoundly. ;Foetal hemoglobin (HbF) inhibits the polymerization of HbS, and hence new born do not manifest the disease until they are 5 to 6 months of age, when the amount of HbF in the cells falls to adult levels.

SICKLE CELL CRISIS: This is an acute exacerbation episodes of painful

PRECIPITATING FACTORS

- Infections may aggravate haemolysis
- Hypoxia; may aggravate hemolysis and due to deoxygenating of red blood cells with large amount of Hbs when they are exposed to low oxygen condition. So the cells clamp together and obstruct blood flow leading to hypoxia and ischaemia in affected areas

- Dehydration; the rate of HbS polymerization is strongly dependent upon the hemoglobin concentration per cell, that is, the mean corpuscular haemoglobin concentration (MCHC). Higher HbS concentration increase aggregation and polymerization will occur during a given period of deoxygenation. Thus, intracellular dehydration, which increases the MCHC, facilitates sickling and vascular occlusion.
- High altitude , for example people living in high mountain
- venous stasis secondary to surgery or blood loss due to any reasons
- Reduced environmental or body temperature
- Strangeous exercises
- Anaesthesia decrease in PH reduces the oxygen affinity of hemoglobin, thereby increasing the fraction of deoxygenated HbS at any given oxygen tension and augmenting the tendency for sickling.

TYPES OF SICKLE CELL CRISIS

There are three types of crisis

Haemolytic Crisis

This results from massive destructions of RBCS. It is associated with infections, acidosis or dehydration. There is sickling within the blood vessels throughout the body

Vaso-Occlusive Crisis (Pain Crisis)

This is characterized by painful episodes due to ischaemia caused by obstruction of blood. It represent episodes of hypoxic injury and infarction associated with severe pain in the affected region such as the bones, liver, brain, spleen, and penis. It is precipitated by dehydration and acidosis

Aplastic Crisis (Acute Splenic Crisis)

This is as a result of failure of the bone marrow to produce adequate number of red blood cells.Besides, since the children with the S.C .A will have continuing haemolytic anaemia, they must produce / increase the number of new RBCs each day which actually suppress the bone marrow leading to a life threatening anaemia termed as aplastic anaemia resulting in aplastic crisis. This commonlyoccurs after infection or as a result deficiency of iron or folic acid

COMMON SIGNS AND SYMPTOMS

- Pallor or cyanotic skin
- Pain in long bones and joints and this pain is severe during vaso –occlusive crisis
- Jaundice which is secondary to haemolysis RBCs and is more evident.
- Patients manifest with strokes (CVA)
- They have delayed growth so they look small /have small have small stature. .Pallor or cyanotic skin
- Bossing due to enlargement of the bones of the face and skull as a result of hyperplasia of red bone marrow.
- Prone to developing leg ulcers, abdominal pains
- Enlarged spleen and liver
- Individuals usually has symptoms free periods alternating with exacerbation and continuous destructions of RBCS resulting in low HB 7 – 10g %, high bilirubin in the blood , reticulocytosis, and hyperplasia of bone marrow.

NOTE: The symptoms do not usually occur in the 1st 6 months because the baby is protected during this time by HbF (FOETAL HAEMOGLOBIN)

COMPLICATIONS

- Hyposthenuria due to chronic hypoxia which damage the kidneys which causes an increased propensity for dehydration
- Autosplenectomy due marked tissue hypoxia, thrombosis, infarction, and fibrosis in the spleen.
- Cor pulmonale due to infarction secondary to vascular occlusion and anoxia occurring in pulmonary vessel
- Cor pulmonale due to infarction secondary to vascular occlusion and anoxia occurring in pulmonary vessel
- Children are prone to infection such as hepatitis B, and HIV/AIDS due to blood transfusion
- Pathological fractures due to vascular occlusion to bones
- Osteomyelitis

- Ischaemia
- Cardiac failure due to work load of the heart in order to meet the demands of the body
- Splenomegally

MANAGEMENT

Investigations

1. **HISTORY TAKING:** Parents will give history of sickle cell anemia in the family or history will reveal a family member who experiences the same problem.
2. **PHYSICAL EXAMINATION:** On inspection the patient will have bossing head, long extremities, thin short trunk, narrow shoulders and hip. All this will give a clue to the disease. On palpation of the abdomen there will be splenomegaly.
3. **DIAGNOSTIC TESTS;**
 - Take blood for full blood count, HB estimation, haematocrit, and electrophoresis and for sickling test.
 - Do x –ray of the long joints which will reveal joint necrosis and flattening of the bones.

Drugs

- Administer blood depending on haemoglobin levels
- Administer fluids of ringers
- Administer Oxygen
- Administer fluids such as ringers lactate
- Administer folic acid
- Antibiotics depending on culture and sensitivity such as amoxicillin or benzyl penicillin.
- In certain settings, you may find drugs used such as Hydroxurea. This helps in reducing sickling and increases the HB production.

NURSING CARE

Aims;

- To relieve pain
- To treat the underlying precipitating factors
- To restore the damaged red blood cells

- To reduce oxygen demand
- To prevent complications

ENVIRONMENT

Admit patient in warm environment to prevent sickling

Mop before sweeping

Ensure that the environment is quiet so that the patient can rest. If there is any radio ensure that it is tuned at an acceptable volume.

OBSERVATION

Observe for pain intensity and assess whether in patient is in severe pain or not

Observe Vital signs. Observe for pallor whether increasing or not.

Observe for any new signs of renal insufficiency as a result of occlusion of renal artery.

Observe for urinary output, measure it and record to aid you monitor renal function

POSITION

Let patient attain a position of comfort which can aid reduce pain. Provide pillows where necessary to reduce pain

RELIEF OF PAIN

Ensure minimal handling of the patient to reduce pain and promote comfort. Provide a bed cradles to prevent pressure on the swollen and painful limbs and body from the linen. Give prescribed analgesics

DIET AND FLUIDS

Give prescribed plenty of fluids such as ringers lactate and half – strength Darrows to combat dehydration. Maintain intake and output chart to prevent circulatory overload.

Give a highly nutritious, well balanced and easily digestible to boost the immunity.

ELIMINATION

Check and ask how many times patient has opened the bowels and voided. Take note the character, consistency, amount, and color of both stool and urine should be monitored and recorded to assess bowel motility and renal function respectively

I.E.C

- Parent are advised on the nature of the disease that it is a hereditary disorder which require prophylactic care during remission and factors that precipitate the crisis
- Advise patient on the importance of preventing the factors that can precipitate the attack such as infection, strenuous exercises e. t. c
- Advise family and significant other on the importance of letting the patient live a normal life as possible .Child should continue going to school, but authority should be informed about child's condition.

LEUKAEMIA

Definition

This is cancer of the blood which affect the bone marrow and is characterised by bleeding tendencies. The two primary types of childhood leukemia are acute lymphocytic leukemia (ALL) and acute myelogenous leukemia (AML). These two acute forms of leukemia can develop over a short period of days to weeks. A third chronic form, called chronic myelogenous leukemia (CML), is rare among children.

Types of Leukaemia

- Acute lymphocytic leukemia (ALL) — Also called lymphoblastic or lymphoid leukemia, ALL accounts for about 75 to 80 percent of childhood leukemia cases.
 - In this form of the disease, the lymphocyte cells, which normally fight infection, are affected.
 - The bone marrow makes too many lymphocyte cells that do not mature correctly.
 - The lymphocyte cells overproduce, crowding out other blood cells.
 - Immature blood cells don't work properly to fight infection.

Chromosome abnormalities, or extra chromosomes and structural changes in the chromosome material, are present in the majority of ALL patients.

- Acute Myelogenous Leukemia (AML) — Also called granulocytic, myelocytic, myeloblastic or myeloid leukemia, AML accounts for about 20 percent of childhood leukemias.

- In patients with AML, too many granulocytes — a type of white blood cell that normally fights infection — are produced in the marrow and they don't mature correctly.
- The immature blood cells don't work properly to fight infection.

The excessive number of these abnormal cells crowd out other healthy blood cells. Children with certain genetic syndromes, including Fanconi anemia, Bloom syndrome, Kostmann syndrome and Down syndrome, have a higher risk of developing AML

- Chronic Myelogenous Leukemia (CML) — CML is the more slowly developing form of myelogenous leukemia and is rare among children.
- It may develop over a period of months or years.
- Children with CML have a chromosome rearrangement: Part of the ninth chromosome breaks off and attaches itself to chromosome number 22, creating an exchange of genetic material.
- This rearrangement changes the position and function of certain genes, causing uncontrolled cell growth.

Other chromosome abnormalities also can occur

Signs and Symptoms

- Like all blood cells, leukemia cells travel throughout the body. Depending on the number of abnormal cells and where these cells collect, patients with leukemia may have a number of symptoms, including:
- Anemia — Children with leukemia often have fewer than normal healthy red blood cells and platelets.
- They lack enough red blood cells to carry oxygen through the body, which causes a condition called anemia.
- Children with anemia may look pale, feel weak and tired and bleed and bruise easily.

Recurrent Infections —

- Although children with leukemia may have a high number of white blood cells, these white blood cells are immature and don't fight infection. Children may experience repetitive viral or bacterial infections. They often have symptoms of infection such as fever, runny nose and cough.
- Bone and Joint Pain — Pain in bones and joints is another common symptom of leukemia. This pain is usually a result of the bone marrow being overcrowded and "full."

- Abdominal Distress — Abdominal pain also may be a symptom.
- Leukemia cells can collect in the kidney, liver and spleen, enlarging these organs.
- Pain in the abdomen may cause a loss of appetite and weight.
- Swollen Lymph Nodes — Lymph nodes under the arms, in the groin, chest and neck may become swollen when leukemia cells collect in the nodes.

Lymph nodes are small bean-shaped structures that filter the blood

- Difficulty Breathing or Dyspnea — With T-cell acute lymphocytic leukemia, leukemia cells tend to clump together around the thymus gland.
- This mass of cells present in the middle of the chest can cause pain and difficulty breathing.
- Wheezing, coughing or painful breathing requires immediate medical attention.

Investigations

- Blood tests — Blood tests are done frequently to monitor the possible side effects of chemotherapy and radiation therapy.
- Because the results can influence treatment decisions, these tests often are done before treatment.
- Cultures — If your child has a fever or other signs of infection, one or more samples of blood, urine or stool, throat secretion or pus may be taken to check for infection. To confirm an infection, any organisms contained in these samples are allowed to grow in a culture for several days.

To get a head start at fighting the infection, however, antibiotics may be prescribed before your child's doctor has the final results of the culture

- [Bone Marrow Biopsy](#) — Cells are removed from the spongy network of tissues inside the bones, called bone marrow, to check for signs of cancer.
- Depending on the diagnosis, this procedure may be done periodically throughout your child's treatment to determine if cancerous cells have spread to the bone marrow.
- Leukemia is the most common type of cancer found in the bone marrow.
- A bone marrow aspiration and biopsy usually takes 15 to 20 minutes to complete.
- [Spinal Tap](#) — A clear fluid called cerebrospinal fluid (CSF) surrounds the brain and spinal cord.

- Sometimes a sample of this fluid is removed and examined for cancer cells or signs of infection.
- Another name for a spinal tap is lumbar (lower spine) puncture or LP.

This procedure takes about 15 minutes

- [Bone Scan](#), [Gallium Scan](#) and [MIBG Scan](#) — Evaluation and treatment of a child with cancer may involve specialized nuclear medicine scans of organs, tissues or bones to check for disease or infection.

The three most common types of scans are bone scans, gallium scans and MIBG scans.

- MIBG stands for meta-iodobenzylguanidine.
- Both gallium and MIBG are radioactive substances that enable doctors to detect cancerous cells in the scans.
- [Computerized Tomography \(CT or CAT\) Scan](#) — CT scans use computers and X-rays to create pictures with more detail than conventional X-rays.
- X-rays are sent through the body in thin cross sections to create images. These scans often supplement other diagnostic X-rays.
- [Magnetic Resonance Imaging \(MRI\)](#) — MRI uses magnets, rather than X-rays, to produce detailed images of the body.
- An MRI machine sends radio waves into the body and then measures the response with a computer.

The computer makes an image or picture of the body's internal organs. MRIs are used for certain types tumors in certain locations of the body because they can produce a better image than X-rays

- [Echocardiogram](#) — Because certain types of chemotherapy can affect heart muscle, tests may be done periodically to detect changes in your child's heart to help identify problems before they become serious.
- An echocardiogram is used to record the echoes of sounds sent through the heart.
- This test shows the size of the four heart chambers, as well as how the heart muscle functions.
- Your child may need to remove clothing above the waist for this test.

- **Ultrasound** — An ultrasound exam or sonogram uses high frequency sound waves to create images of organs in the body.
- No radiation is used.
- Sound waves bounce off tissue using the same principles as sonar.
- The echoes that return to a transducer are used to draw the images on the screen.

Treatment

Chemotherapy

ALL

- **Phase I**: *Objective*-to induce remission and achieve consolidation i.e further reduce residual leukaemia and minimise the development of cross-resistance.
- *Intensive*

L-asparaginase or

Methotrexate iv +mercaptopurine

- **Phase II**
- *CNS prophylaxis*
- Methotrexate intrathecally + Hydrocortisone + ara-c
- **Phase III**
- *Maintenance*
- Methotrexate weekly + Mecarptopurine
- **AML**
- More toxic regime than ALL treatments
- Daunorubicin + Cytosine with or without other agents.
- Radiation Therapy
- Radiation therapy uses X-rays or other high-energy rays to kill cancer cells and shrink tumors.
- Radiation for acute lymphocytic leukemia (ALL) usually comes from a machine outside the body, called external beam radiation therapy.

- Bone Marrow Transplant
- The first step of bone marrow transplant (BMT) involves high doses of chemotherapy, sometimes with radiation, to destroy all of your child's bone marrow.
- Healthy marrow from a donor, whose tissue is the same as or almost the same as your child's, is transplanted into your child.
- The donor may be a twin, who is the best match; a brother or sister; or other person not related.
- The healthy marrow from a donor is given to your child intravenously through a needle in a vein to replace the marrow that was destroyed.
- This process, involving marrow from a donor, is called an allogeneic bone marrow transplant.
- Biological Therapy
- Biological therapy attempts to stimulate or restore the ability of your child's immune system to fight cancer.
- It uses substances produced by your child's body, or made in a laboratory, to boost, direct or restore the natural defenses against disease.
- Biological therapy is sometimes called biological response modifier therapy or immunotherapy.

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BLEEDING DISORDERS

Bleeding or Hemorrhagic disorders are characterized by uncontrolled bleeding; it involves a rapid loss of a large amount of blood either internally or externally. Hemorrhage may be arterial, venous or capillary. Common hemorrhagic disorders include but not limited to, allergic purpuras,

hereditary haemorrhagic telangiectasia, thrombocytopenia, idiopathic thrombocytopenia purpura, and haemophilia and Prothrombin deficiency. However in our discussion we are going to focus on thrombocytopenia, Prothrombin deficiency, and haemophilia.

Thrombocytopenia

Thrombocytopenia is the most common cause of haemorrhagic disorders; it is characterized by a deficient number of circulating platelets, or reduced platelet count. Because platelets play a vital role in coagulation, this disease poses a serious threat to homeostasis (body balance). Thrombocytopenia may be congenital or acquired. In either case it usually arise from one of the following;

1. Decreased production of platelets within the bone marrow
2. Excessive platelet consumption after their release into the circulation
3. Platelet sequestration (loss) in an enlarged spleen

Decreased platelet production

Thrombocytopenia due to Decreased platelet production may arise from any of the following conditions:

- Leukaemia, there is infiltration of the bone marrow causing reduced production of platelets.
- Bone marrow tumors, there is reduction in the production of cells , platelets inclusive
- Aplastic anaemia results from damaged stem cells causing reduced platelets
- Infections
- Drugs that directly influence platelets production such as chloramphenicol, alcohol and hormones.
- Nutrition deficiency(vitamin B12 , folic acid)
- Radiation can also destroy the stem cells
- Viral infection such as measles, mumps, parvovirus and AIDS can decrease the platelet count

Increased peripheral destruction (outside marrow)

A low platelet count may also occur if the bone marrow makes enough platelets but the body destroys its own platelets due to the following;

- Prematurity due to poor developed immunity
- Cirrhosis of the liver
- Disseminated intravascular coagulation, in this condition small clots form in small blood vessels and the blood clots use up many of the blood clots.
- Drug sensitivity such as quinine, antibiotics that contain sulfa, may confuse the body and cause it to destroy its platelets.

Increased consumption of platelets

- Disseminated intravenous coagulation where there is accelerated clotting causing small blood vessel occlusion.
- Idiopathic thrombocytopenia
- Viral infection such as Epstein- barr-virus, HIV
- Bacterial infections- gram negative septiceamia
- Hypersplenism-exaggerated splenic activity or splenomegaly.
- Liver disease

Signs and symptoms

- Bleeding and petechiae (small spots of blood under the skin)
- Ecchymoses (an effusion of blood under the skin causing discoloration)
- Nasal or gingival bleeding
- Excessive menstrual bleeding
- CNS bleeding
- GIT bleeding
- Malaise
- Fatigue
- General body weakness

Investigations

- Full blood count test results will show low platelet count
- Bone marrow study can determine the number, size and maturity of the megakaryocytes (the bone marrow cells that release mature platelets), this information may identify ineffective platelet production may also rule out malignancies such as carcinoma.
- Bleeding time will be prolonged
- Blood film may help diagnose leukaemia

Medical treatment

- Removal of the underlying cause either discontinuing the suspected drugs
- Treat the cause if its leukemia give platelet transfusion, if tumors treat solid tumors
- Corticosteroids such as prednisolone may be given to reduce the rate of platelet destruction and thus increasing platelet production.
- Folate may be used to stimulate bone marrow production of platelets
- Platelet transfusion can be used to stop episodes of abnormal bleeding.

Nursing care

- **Environment** – quiet, clean and free from injurious objects to prevent injury that cause bleeding, it should also be quiet and clean to promote rest and prevent infection.
- **Psychological care**- explain the cause of the bleeding and the procedures done, reassure the patient that the symptoms will disappear as the condition resolves, and encourage patient to verbalize his concerns about the condition.
- **Observation** – observe for any febrile reaction during platelet transfusion
- **Hygiene** – use of soft toothbrush to avoid injury, keep short nails and care of the skin

Information education and communication

- Emphasis should be made on the importance of avoiding medicines that may affect platelets and increase the risk of bleeding example aspirin and ibuprofen. Patient should avoid over the counter medicines.
- Educate the patient on the importance of avoiding injuries that can cause bruising and bleeding. Contact sports such as boxing, football may be avoided as they are likely to cause injuries that can lead to bleeding.

- In cases of splenectomy, patient may be susceptible to certain types of infections, teach the patient signs of infection like fever so that they can be on the lookout.

Prothrombin Deficiency

Prothrombin deficiency is a bleeding disorder that slows the blood clotting process. This results from Low Prothrombin levels circulating in the blood (hypothrombinemia). People with this condition often experience prolonged bleeding following an injury, surgery or after tooth extraction. Prothrombin is a complex globulin protein produced in the liver and usually found in the blood. For Prothrombin synthesis to take place vitamin K (fat soluble vitamin) must be present in the liver to act as a catalyst. However this condition is very rare and it is estimated to affect 1 in 2million people in the general population.

Causes of Prothrombin deficiency

1. Vitamin K deficiency due to:
 - Improper diet
 - GIT disorders that interfere with absorption
 - Liver damage
 - Prolonged use of sulphonamides and antibiotic therapy
2. Use of drugs that prevent clotting (anticoagulant such as warfarin).

Pathophysiology

Mutation in the Factor II gene causes Prothrombin deficiency. This factor is responsible for Prothrombin formation which plays an important role in the formation of blood clots in response to injury. Prothrombin is the precursor (originator) to thrombin, a protein that initiates a series of chemical reactions to form a blood clot. Clots protect the body by sealing off damaged blood vessels and preventing further blood loss. When there is a defect at Factor II, there is a reduction in the amount of Prothrombin in the cells which prevents clots from forming correctly in response to injury. This results in bleeding.

Signs and symptoms

- Ecchymoses (bruise or an infusion of blood under the skin causing discolouration)
- Epsitaxis
- Post operative haemorrhage
- GIT bleeding
- Prolonged bleeding from vein puncture

Diagnosis

Prolonged Prothrombin time (21 -15sec)

Treatment

- Treat the cause
- Frozen plasma infusion
- Transfusion therapy
 - Prothrombin concentrates
 - Factors II concentrate may be given
- If the cause is lack of vitamin K, give vitamin K by mouth, IM or IV.

Haemophilia

Hemophilia is an X- linked recessive disorder of blood clotting that result in spontaneous bleeding particularly into joints, muscles and internal organs. Or it's a bleeding disorder related to deficiency of a clotting factor. There are two types of hemophilia based on the deficient clotting factor: Hemophilia A and B.

Hemophilia A (classic hemophilia) which affects more than 80% of all hemophilic patients results from a deficiency or defective factor VIII.

Hemophilia B (Christmas disease which was named after the surname of the first patient who was examined in detail) affects 15% of hemophiliacs'; it results from deficiency of factor IX.

Genetics

Hemophilia A and B are inherited as X-linked genetic recessive traits, as a result, female carriers have a 50% chance of transmitting the gene to each daughter who would then be a carrier and a 50% chance of transmitting the gene to each son who would be born with hemophilia. The gene that controls the production of involved clotting factors is located on the X chromosome. Since women have two X chromosomes, each child of a carrier female has a 50/50 chance of receiving the affected X.

Pathophysiology

The normal individual has more than 10 different clotting factors that work together to form a clot. Clotting factors are produced by the liver and found in the plasma. Three mechanisms work together to facilitate healing when a blood vessel is injured.

- The blood vessel constricts to limit the volume of blood that is lost
- Circulating platelets form a plug(close) at the site of injury
- The blood undergoes coagulation (clotting)

A number of clotting factor proteins must be activated in sequence for coagulation to take place. This process allows the platelet plug to be stabilized by a fibrin matrix that is formed over its surface, thereby ensuring that the vessel wall can heal. Factor VIII and IX are only two of the 13 proteins that are involved in the cascade process of coagulation. If there is an absence or deficiency of any of these proteins, the coagulation process will be initiated but not completed. The platelet plug will remain unstable and bleeding will continue over a prolonged period of time. Factor VIII deficiency leads to the disruption of the normal intrinsic coagulation flow resulting in spontaneous haemorrhage in response to trauma.

Signs and symptoms

- Ecchymoses (bruises)
- Epistaxis (nosebleed)
- Hematuria(blood in urine)
- Hemarthrosis (bleeding into the joints)

Diagnosis

- A positive family history
- Specific coagulation factor assays diagnose the type and the severity of hemophilia

Distinguishing findings in hemophilia A are:

- Factor VIII assay 0% to 25% of normal
- Prolonged activated partial thromboplastin time
- Normal platelet count and function, bleeding time and Prothrombin time

Distinguishing findings in hemophilia B;

- Deficient factor IX assay

Treatment

Hemophilia is not curable but treatment can prevent crippling (harmful) deformities and prolong life.

- IV administration of the missing factor
- In hemophilia A, cryoprecipitated antihemophilic factor VIII is given through a blood filter
- In hemophilic B, administration of Factor IX concentrate during episodes of bleeding increases the level of factor IX levels.

Nursing care

Psychological care

Provide emotional support and listen to the patient's fears and concerns. Reassure the patient that his feeling is normal and that you are doing everything possible to reduce the bleeding episodes. Point out the areas of his life that need adjustment. Also arrange for others with the same problem to speak with the patient and the family.

Prevention of injury

Ensure that the room is free from objects that can injure the patient. Make sure that the patient nails are short, use of soft tooth brush and proper bed making. Restrict activities that can

increase the risk of injury. Avoid IM injection because they can cause hematoma at the site of injection.

Drugs

Only administer prescribed drugs. Aspirin and aspirin containing drugs are contraindicated.

Relief of pain

Apply cold compress or ice bags and raise the injured part. Also apply elastic bandages to alleviate pain. Give analgesic for pain associated with hemarthrosis.

Information education and communication

- Teach the patient the benefits of regular exercises, and that strong muscles help to protect the joints thus reducing the incidence of hemarthrosis.
- Emphasis should be made on the importance of avoiding activities such as heavy lifting because they increase the risk of injury.
- Teach patient to avoid the medications that induces bleeding such as aspirin and brufen
- Stress the importance of good dental care including regular careful tooth brushing to prevent the need for dental surgery.

Precaution in case of trauma

- Apply slight pressure to the wound
- Avoid nasal packing
- Use splints to prevent further injury
- Avoid injections at all cost
- Patient should wear identification

The Urinary System

Urinary tract infections

Urinary Tract Infections

Introduction

Urinary tract infection is very common in children, but in the vast majority of the cases it is mild and easily treated. Infections of the urinary tract may appear as a variety of disorders. These infections may be broadly classified as upper and lower urinary tract infections depending on the patients presenting symptoms. Lower urinary tract infections involve the urinary bladder (cystitis), urethra (urethritis) and prostate gland (prostatitis). Upper urinary tract infections may involve the kidney and renal pelvis (pyelonephritis).

Definition

Urinary tract infection is the presence of organisms in the urinary tract which is usually sterile.

Causative organisms

- Bacteria such as:
 - E. coli
 - Staphylococci
 - Enterococci
 - Proteus
 - Pseudomonas
 - Candida (usually associated with catheterization)
 - Klebsiella
 - Mycobacterium Tuberculosis
 - Enterobacter
- Viruses
- Fungi

Predisposing factors

- **Female sex:** Females have a shorter urethra than males. In addition, the female urethra is in close proximity to the vagina and anal area. This can easily cause infections of the vagina and anal areas to ascend to the urethra.
- **Instrumentation, for example, catheterization or diagnostic procedures:** In both procedures sterility can be lost leading to introduction of infection into the urinary tract.

- **Failure or delay in emptying the bladder completely:** Regular emptying of the bladder helps to keep the urinary tract sterile by flushing away bacteria. Holding urine promotes bacteria growth.
- **Anatomical abnormality of the urinary tract:** These can be congenital or acquired. For example, bladder diverticulum (a pouch or sac protruding from the wall of a tube or hollow organ), cystocele or urethral stricture. These do not allow urine to leave the body normally or may cause backward flow of urine.
- **Vesicoureteric reflux:** Reflux of urine into the ureters or kidney during micturition is abnormal and can predispose to urinary tract infection or can cause infection to ascend to the kidneys much more easily.
- **Chronic diseases such as diabetes mellitus:** Sugar is a good media for micro-organisms. In addition, diabetes mellitus lowers an individual's immunity making him susceptible to contracting infections.
- **Kidney stones:** Special enzyme secreting bacteria that eliminate the ammonia level found in urine may cause urinary tract infections leading to kidney stones. The presence of stones anywhere in the urinary tract makes infection more likely, and also renders it much harder to eliminate.
- **Inadequate fluid intake:** This makes urine concentrated, increases irritation and burning, and causes stasis of urine which promotes multiplication of bacteria in the urinary tract.
- **Chronic constipation:** When the bowel is full of hard stool, it presses against the bladder neck, blocking the flow of urine and allowing bacteria to grow

Pathophysiology

In normal circumstances urine produced in the kidneys flows through the urinary tract without obstruction. Urine reaches the urethra as a sterile unit. Most urinary tract infections result from gram negative organisms, such as E. coli, klebsiella, Proteus or pseudomonas that originate in the person's own intestinal tract and ascend through the urethra to the bladder. During micturition urine may flow back to the ureters (vesicoureteral reflux) and carry bacteria from the bladder up through the ureters to the kidney pelvis. Whenever urinary stasis occurs, such as with incomplete emptying of the bladder, renal calculi or genitourinary obstructions, the bacteria have greater a

opportunity to grow. Urinary stasis also promotes more alkaline urine which facilitates bacterial growth.

Clinical manifestations

- Frequency because of incomplete emptying of the bladder.
- Urgency because of the presence of inflammation.
- Dysuria as a result of urethritis
- Cloudy or foul-smelling urine due to progression of the infection.
- Suprapubic discomfort due to irritation of urine to the mucous lining of the bladder.
- Haematuria as a result of inflammation of the bladder and urethra.
- Bacteriuria because of the presence of infection.
- Upper urinary tract infections and pyelonephritis are associated with
 - Fever because of the presence of infection.
 - Flank pain because of the spread of infection to the kidneys.
 - Nausea vomiting because of the presence of toxins that irritate the gastro-intestinal tract.

Management

Diagnosis

- Urine microscopy, culture and sensitivity to isolate the causative organism and for specific antibiotics.
- Urinalysis
- In advanced cases, ultra sound scans. This is very helpful in acute pyelonephritis to exclude obstruction.
- Intravenous urography (IVU) to exclude the possibility of a functional or structural abnormality of the kidneys or urinary tract.
- Cysto-urethroscopy to exclude problems or infections of the bladder and urethra.

Treatment

Antibiotic therapy

- Antibiotics are given according to the culture and sensitivity results. For example, Cefotaxine 50mg/kg bwt six hourly for 7-14 days to combat infection.
- Ceftriaxone 50mg/kg bwt 12 hourly for 7-14 days.
- Ampicillin 50mg/kg bwt six hourly and gentamycin 5mg/kg bwt for 7-14 days.

Analgesics

- Paracetamol 100-250mg tds for 3-5 days to relieve pain, lower the fever and suppress inflammation.

Anticholinergic

- Propantheline bromide 15 mg/kgbwt to decrease bladder spasms. Administer the drug one hour before meals

Additional treatment

- Increasing fluid intake unless contra-indicated. Increased fluid intake helps to dilute the urine, lessens irritation and burning, and provides a continued flow of urine to minimize stasis and multiplication of bacteria in the urinary tract.
- Sitz baths may provide comfort for the individual urethritis.
- Regular intake of vitamin C to reduce bacterial growth due to ascorbic acid.
- Lemon juice may be provided to increase ascorbic acidity thereby preventing growth of bacteria.

IEC

- Educate the patient and community on the symptoms of urinary tract infections and the need for prompt medical attention when symptoms occur.
- Educate on the need to complete treatment even if symptoms subside to ensure complete eradication of the infection.
- Maintenance of fluid intake to help flush bacteria out of the urinary tract.

- Educate on the need to avoid bubble bath, powders and strong soaps in the perineal area as these may cause irritation and promote growth of bacteria.
- Educate on the need to wear cotton pants as nylon and synthetic materials do not allow ventilation and may facilitate bacterial growth.
- Advise to avoid wearing tight fitting pants that may irritate the urethra.
- For women, educate on the importance of wiping the perineal area from front to back to prevent introducing bacteria into the urethra.
- Educate on the need to have a shower bath for patients with recurrent urinary tract infections.
- Educate on the need to avoid urinary stasis by voiding approximately every 2-4 hours.
- Educate on the need for regular intake of vitamin C or lemon juice to prevent urinary tract infections.

Complications of urinary tract infections

- Recurrent infections
- Permanent kidney damage due to untreated urinary tract infections.
- Pyelonephritis due to severity of the infection and this can result in damage and scarring of the kidney tissues.
- Urethritis which can lead to stricture and damage of the urethra.
- Kidney stones: Special enzyme secreting bacteria that eliminate the ammonia level found in urine may cause urinary tract infections leading to kidney stones.
- Chronic renal failure due to progress of the infection.

Conclusion

Urinary tract infection is one of the commonly diagnosed bacterial infections in children. When treated promptly, urinary tract infection rarely leads to complications, but if left untreated or if not treated promptly, it can lead to serious complications.

Acute Glomerulonephritis

Overview of Acute Glomerulonephritis

Acute glomerulonephritis (AGN) is active inflammation in the glomeruli. Each kidney is composed of about 1 million microscopic filtering "screens" known as glomeruli that selectively remove uremic waste products. The inflammatory process usually begins with an infection or injury (e.g., burn, trauma), then the protective immune system fights off the infection, scar tissue forms, and the process is complete.

There are many diseases that cause an active inflammation within the glomeruli. Some of these diseases are systemic (i.e., other parts of the body are involved at the same time) and some occur solely in the glomeruli. When there is active inflammation within the kidney, scar tissue may replace normal, functional kidney tissue and cause irreversible renal impairment.

The severity and extent of glomerular damage—focal (confined) or diffuse (widespread)—determines how the disease is manifested. Glomerular damage can appear as subacute renal failure, progressive chronic renal failure (CRF); or simply a urinary abnormality such as

Acute Glomerulonephritis is also called acute streptococcal glomerulonephritis, it is relatively common.

This disorder is a bilateral inflammation of the glomeruli, follows a streptococcal infection of the respiratory tract or, less often, a skin infection such as impetigo.

Most common in boys' ages 3 to 7, but it can occur at any age.

Up to 95% of children and 70% of adults recover fully; the rest especially elderly patients, may progress to chronic renal failure within months. (Mary Ann et al 1992).

Causes

Acute post streptococcal glomerulonephritis results from the entrapment and collection of antigen- antibody complexes (produced as an immunologic mechanism in response to a group A beta-haemolytic streptococcus) in the glomerular capillary membranes, inducing inflammatory damage and impeding glomerular function. Sometimes the immune complement further damages the glomerular membrane.

The damaged and inflamed glomeruli lose the ability to be selectively permeable, allowing red blood cells and proteins to filter through as the glomerular filtration rate (GFR) falls.

Pathophysiology

When there is acute glomerulonephritis the immune complexes are deposited in the glomerular basement membrane.

The glomeruli become oedematous and infiltrated with polymorphonuclear leukocyte, which occlude the capillary lumen. The resulting decrease in plasma filtration results in an excessive accumulation of water and retention of sodium that expands plasma and interstitial fluid volumes, leading to circulatory congestion and edema.

The cause of the hypertension associated with AGN cannot be completely explained by fluid retention. Excess rennin may also be produced.

Clinical MANIFESTATION

Clinical manifestations may include;

- Edema ; especially periorbital edema, facial edema is more prominent in the morning and spreads during the day to involve extremities and abdomen
- Anorexia
- Urine; cloudy, smoky brown (resembles tea or cola) severely reduced volume
- Pallor
- Irritability
- Lethargy
- Child appears ill
- Child seldom expresses specific complaint
- Older children may complain off; headaches, abdominal discomfort and dysuria
- Vomiting possible
- Mild to moderately elevated blood pressure

Management

Medical Care

Investigations/Diagnosis

History taking: In most cases, acute post streptococcal glomerulonephritis begins within 1 to 3 weeks after an untreated streptococcal infection in the respiratory tract.

The patient or the patient's parent- may report decreased urination, smoky or coffee- coloured urine, and fatigue.

Physical assessment: The patient also may experience shortness of breath, dyspnoea, and orthopnea. These symptoms of pulmonary edema point to congestion heart failure (CHF) resulting from hypovolemia.

Assessment findings may show oliguria (with output less than 400ml/24 hour) and mild to moderate peri-orbital edema.

Findings also may reveal mild to severe hypertension resulting from either sodium or water retention (caused by decreased GFR) or inappropriate rennin release.

Diagnostic Test

The diagnostic tests that can be done include the following;

- **Urinalysis** –during acute phase will show proteinuria and hematuria
- Microscopic examination of the sediments
- **A throat culture** may show group A beta- haemolytic streptococci.
- **X-ray** shows bilateral kidney enlargement
- **Renal biopsy** to confirm or assess renal tissue status.

Treatment

Therapy aims to relieve symptoms and prevent complications.

Vigorous supportive care include; bed rest, fluid and dietary sodium restrictions, and correction of electrolyte imbalances (possibly with dialysis, although this seldom is necessary).

Treatment may include loop diuretics, such as metolazone or furosemide, to reduce extracellular fluid overload, and vasodilators, such as hydralazine or nifedipine.

If the patient has a documented staphylococcal infection, antibiotics are recommended for 7 to 10 days; otherwise their use is controversial.

Nursing Care

You need to assess the patient and come up with some problems that you would want to solve for the patient in order to make him/her comfortable. Therefore; the nursing diagnosis is very

important for you to put up some interventions properly. The following are some of the nursing diagnosis that can be made on the patient with acute glomerulonephritis:

Nursing Diagnosis

- Altered nutrition: less than body requirements
- Altered role performance
- Decreased cardiac output
- Fatigue
- Fluid volume excess
- High risk for infection
- High risk for injury
- Impaired gas exchange
- Impaired physical mobility
- Pain
- Self-care deficit

Nursing Intervention

Acute glomerulonephritis usually resolves within 2 weeks, so nursing care primarily is supportive

Provide bed rest during the acute phase. Perform passive range of motion exercise for the patient on bed rest. Allow the patient to resume normal activities gradually as symptoms subside.

Check the patient's vital signs and electrolyte values. Assess renal function daily through serum creatinine and BUN levels and urine creatinine clearance tests. Immediately report signs of acute renal failure (oliguria, azotemia, and ketoacidosis).

Monitor intake and output and daily weight. Report peripheral oedema or the formation of ascites

Consult the dietitian about a diet high in calories and low in protein, sodium, potassium, and fluids.

Protect the debilitated patient against secondary infection by providing good nutrition and good hygiene technique, and preventing contact with infected people

Provide emotional support for the patient and his concerns about his inability to perform in his expected role. Assure him that the activity restrictions are temporary.

Patient TEACHING

Stress to the patient, that follow- up examinations is necessary to detect chronic renal failure.

Emphasise the need for regular blood pressure, urine protein, and renal function assessments during the convalescent months to detect recurrence.

Explain that after acute post-streptococcal glomerulonephritis, gross hematuria may reoccur during nonspecific viral infections and abnormal urinary findings may persist for years. If the patient is scheduled for dialysis, explain the procedure fully

Advise a patient with a history of chronic upper respiratory tract infections to report signs and symptoms of infection, such as fever and sore throat, immediately.

Explain to the patient if he is taking diuretics that he may experience orthostatic hypotension and dizziness when he changes positions quickly.

Complication

Complications of acute glomerulonephritis include:

- Renal failure
- Congestive heart disease
- Nephritis

Chronic Glomerulonephritis

Definition: It is a slowly progressive disease characterized by inflammation of the glomeruli which results in sclerosis, scarring and eventually renal failure.

Causes

- May be due to repeated attacks of acute glomerulonephritis
- Hypertensive nephrosclerosis
- Hyperlipidemia
- Glumerulo sclerosis

Pathophysiology

Repeated inflammation of the glomeruli results in sclerosis, and eventually scarring of the glomeruli. The kidneys are reduced to as little as one fifth of their normal size consisting largely

of fibrous tissue. The cortex shrinks to a layer 1-2 mm or less. Bands of scar tissue distort the remaining cortex making the surface of the kidney rough and irregular. Numerous glomeruli and their tubules become scarred and the branches of the renal artery are thickened. The result is severe glomerular damage that results in end stage renal disease.

Signs and Symptoms

In most patients, chronic glomerulonephritis develops insidiously. However some patients present with non-specific complaints such as:

- Loss of appetite
- Anaemia
- Vomiting or weakness

In some patients the disease is suspected upon discovering azotemia (elevated urea nitrogen and creatinine levels in the blood) , proteinuria and hypertension during the routine medical examination.

Investigations

As in acute glomerulonephritis, though it is often found coincidentally when an abnormality on urinalysis or elevated blood pressure is detected.

Nursing CARE

Diet and fluid intake – advice patient to reduce fluid intake and refrain from consuming alcoholic drinks or those with a high salt or potassium content.

The patient may be referred to a dietician who will give advice on potassium and salt intake, among other things.

Protein intake may be restricted if there is evidence of in nitrogenous wastes (elevated BUN value) but it should

Hyperlipidemia

Rest

It helps in maintaining adequate blood flow to the kidney

Psychological Care

Provide emotional support to the patient and the family.

Encourage the patient to verbalize his concerns about his inability to perform in his expected role. Reassure the patient that the activity restrictions are temporary

Hygiene: provide good skin care to help prevent complications of pruritus, sores and friability
Observations

Check the patient's vital signs and electrolytes values.

Assess the renal function daily through serum creatinine and BUN levels and urine creatinine clearance tests.

Monitor intake and output and daily weight to evaluate fluid retention.

Also observe peripheral edema and formation of ascites.

Information Education and Communication

Advise the patient get immediate treatment for a streptococcal infection that causes a sore throat or impetigo. If the patient is diabetic, advise them on the importance of adhering to the treatment plan.

Emphasize the need for regular blood pressure, urine protein and renal function assessment to detect reoccurrence.

Stress the importance of follow up examinations to detect complications like renal failure

Advise the patient to take prescribed anti-hypertensive and diuretics as scheduled, advise the patient to take diuretics during the day so that his night sleep is not disturbed. Stress the importance of compliance with prescribed diet

Teach the patient the signs of infection especially those of UTI and advise the patient to report immediately

Complications

End stage renal failure

Severe hypertension

Cardiac hypertrophy

Congestive cardiac failure due hypertension

Nephrotic Syndrome

Definition:

It is a nonspecific disorder in which the kidneys are damaged, causing them to leak large amounts of protein (proteinuria) at least 3.5 grams per day per $1.73m^2$ body surface area) from the blood into the urine.

OR

Nephrotic syndrome is a group of symptoms caused by renal injury characterized by low blood protein levels, high cholesterol, high lipids, swelling and large amounts of protein being lost in the urine due to increased glomerular permeability.

Causes

75% is due to primary and 15% is due to secondary causes.

Primary Causes

Lipid nephrosis: This is the main cause of nephritic syndrome in children under age of The glomeruli will contain increased lipid deposits and this increases glomerular protein permeability which leads to increased urinary excretion of protein especially albumin and subsequent hypoalbuminemia.

Focal glomerulosclerosis: This can develop spontaneously at any age, can occur after kidney transplant, or can result from heroin injection. Lesions initially affect some of the deeper glomeruli, causing hyaline necrosis. These lesions cause slowly progressive deterioration in renal function leading to increased glomerular protein permeability which leads to increased urinary excretion of protein especially albumin and subsequent hypoalbuminemia.

Membranous glomerulonephritis: This is characterized the appearance of immune complexes, seen as dense deposits, within the glomerular basement membrane and by the uniform thickening of the basement membrane leading to increased glomerular protein permeability causing increased urinary excretion of protein especially albumin and subsequent hypoalbuminemia.

Membranoproliferative glomerulonephritis: This causes slowly progressive lesions to develop in the subendothelial region of the basement membrane causing increased glomerular protein permeability causing increased urinary excretion of protein especially albumin and subsequent hypoalbuminemia.

This may follow infection particularly streptococcal infection and occurs primarily in children.

Secondary Causes

These include systemic diseases that affect other organs in addition to the kidneys, such as:
Diabetes, amyloidosis, and lupus erythematosus.

Circulatory diseases such as CCF, sickle cell anaemia, renal vein thrombosis, nephrotoxins, allergic reaction, neoplastic diseases.

All these secondary causes will damage the glomerular basement membrane increasing glomerular protein permeability which leads to increased urinary excretion of protein especially albumin and subsequent hypoalbuminemia.

Specific Clinical Features

Proteinuria: Proteinuria (particularly albumin which is greater than 3.5g/24 hours and urine may appear frothy) due to damage to the glomerular basement resulting in increased glomerular permeability.

Hypoalbuminemia: Hypoalbuminemia due to loss of albumin in urine

Hyperlipidemia: This is caused by two factors:

Hipoproteinemia stimulates protein synthesis in the liver, resulting in the overproduction of lipoproteins.

Lipid catabolism is decreased due to lower levels of lipoprotein lipase, the main enzyme involved in lipoprotein breakdown.

Edema: There will be excess fluid in the body due to the serum hypoalbuminemia. Because of low serum oncotic pressure, it will cause fluid to accumulate in the interstitial tissues.

Edema is aggravated by sodium and water retention and this may take several forms:

- Puffiness around the eyes, characteristically in the morning.
- Pitting edema over the legs.
- Fluid in the pleural cavity causing pleural effusion. More commonly associated with excess fluid is pulmonary edema.
- Fluid in the peritoneal cavity causing ascites.
- Generalized edema throughout the body known as anasarca.

Management

Diagnosis/Investigations

- **Physical Examination**

- Edema is the predominant feature of nephrotic syndrome and initially develops around the eyes and legs. With time, the edema becomes generalized and may be associated with an increase in weight, the development of ascites, or pleural effusions.
- Hematuria and hypertension manifest in a minority of patients.
- Additional features on exam will vary according to cause and as a result of whether or not renal function impairment exists.
- **Urinalysis:** 24 hour bedside urinary total protein estimation. Urine sample shows proteinuria (>3.5 g per 1.73 m^2 per 24 hours). It is also examined for urinary casts, which are more a feature of active nephritis.
- **Blood test for:** blood urea nitrogen (BUN) which is increased
- Cholesterol and triglyceride levels which are increased
- Electrolytes, urea and creatinine (EUCs): to evaluate renal function.
- Comprehensive metabolic panel (CMP) which shows hypoalbuminemia: albumin level ≤ 2.5 g/dL (normal=3.5-5 g/dL).
- Lipid profile. High levels of cholesterol (hypercholesterolemia), specifically elevated LDL, usually with concomitantly elevated VLDL is typical.
- Further investigations are indicated if the cause is not clear and these include the following:
 - Auto-immune markers (ANA, ASOT, C3, cryoglobulins, serum electrophoresis).
 - Ultrasound of the whole abdomen.
 - Kidney Biopsy -For histologic examination of renal tissue to confirm the diagnosis.

Treatment

The treatment includes drugs and supportive.

Drugs

- Corticosteroids (prednisone), cyclophosphamide, and cyclosporine are used to induce remission in nephrotic syndrome.
- Diuretics are used to reduce edema.
- Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II receptor blockers are administered to reduce proteinuria.

Supportive

Monitoring and maintaining the correct amount of fluid in the body:

Monitoring urine output, BP regularly.

Restrict fluid intake

Diuretics (IV furosemide).

Monitoring kidney function by doing do EUCs daily and calculating GFR.

Treat hyperlipidemia to prevent further atherosclerosis.

Prevent and treat any complications.

Prophylactic anticoagulation may be appropriate in some circumstances.

Diet

Reduce sodium intake to 1000–2000 mg daily. Foods high in sodium include salt used in cooking and at the table, seasoning blends (garlic salt, Adobo, season salt, etc.) canned soups, canned vegetables containing salt, luncheon meats including turkey, ham, bologna, and salami, prepared foods, fast foods, soy sauce, ketchup, and salad dressings. Sodium should be less than or equal to calories per serving.

Avoid offering patient saturated fats such as butter, cheese, fried foods, and fatty cuts of red meat, egg yolks, and poultry skin. Increase unsaturated fat intake, including olive oil, canola oil, peanut butter, avocados, fish and nuts.

Encourage patient to increase intake of fruits and vegetables.

Monitor fluid intake, which includes all fluids and foods that are liquid at room temperature.

Fluid management in nephrotic syndrome is tenuous, especially during an acute flare.

Nursing

CARE

Aims

To promote renal recovery

To prevent complications such as renal failure

To reduce oedema

Environment

This patient is prone to infection therefore he will be nursed in a clean and well ventilated room which is free from dust.

Position

Patient will be nursed in fowler's position to relieve dyspnea which is caused by edema.

Diet

A high carbohydrate diet will be offered to provide energy and reduce the catabolism of protein. The food should contain low sodium and foods high in sodium will be avoided.

For example the food that will be avoided include salt used in cooking and at the table, seasoning blends (garlic salt, Adobo, season salt, etc.) canned soups, canned vegetables containing salt, luncheon meats including turkey, ham, bologna, and salami, prepared foods, fast foods, soy sauce, ketchup, and salad dressings. Patient will be offered a moderate amount of high protein animal food such as fish, and poultry.

Observations

Vital signs such as pulse respirations, B/P and temperature will be checked to rule out any abnormal readings as these are affected in this condition.

Respirations will be checked to rule out dyspnea which can be as a result of edema. Observe temperature if it is high it is a sign of infection due to low immune response.

Fluid intake and output will be monitored to prevent fluid over load or under hydrating the patient.

Urine output will be monitored to rule renal failure which is denoted by reduced urine output. Patient will be weighed every day to see whether weight is increasing or reducing which can be due to oedema.

Observe skin turgor and presence of oedema

Observe for diuresis as this will be a sign of effective treatment. This also will result in decrease oedema and blood pressure.

Observe for signs/symptoms of complications such as reduced urine output which can denote renal failure.

Psychological Care

Explain the disease process to the patient and the parents in simple terms so that they can understand what is happening and they will be informed of the patient's progress. They will be encouraged to ask questions which should be adequately answered to alleviate any anxiety.

The reason for diet modification will be explained and why patient is on strict fluid intake and output. Every investigation done on the patient will be explained and why daily weighing is essential in this condition. This is to promote their cooperation and gain their confidence.

Hygiene

A bed bath will be given to the Patient to promote blood circulation and also for patient's comfort. Oral hygiene will be provided to minimize dryness of the oral mucosa.

Skin Care

The patient is likely to experience skin break due to oedema, therefore; it is important to keep the skin dry. Patient will be turned 2 hourly to relieve pressure on the prominent bones and prevent pressure sores. A pillow will be put in between his thighs to prevent friction of the skin.

Patient Education

Monitoring of the disease: Encourage patient and parents to monitor their child's urine and report to the nurse/doctor. Inform them that pediatric nephrotic syndrome is a chronic illness characterized by relapses and remissions, which can extend throughout childhood. There will be illness from the disease and from its treatment therefore there is need to monitor signs and symptoms.

Diet: Advise patient to reduce sodium intake daily. Remind him of foods high in sodium and this include salt used in cooking and at the table, seasoning blends (garlic salt, Adobo, season salt, etc.) canned soups, canned vegetables containing salt, luncheon meats including turkey, ham, bologna, and salami, prepared foods, fast foods, soy sauce, ketchup, and salad dressings. Avoid saturated fats such as butter, cheese, fried foods, and fatty cuts of red meat, egg yolks, and poultry skin. Advise him to increase unsaturated fat intake, including olive oil, canola oil, peanut butter, avocados, fish and nuts.

Seeking medical advice early: Advise patient/parents to seek medical advice early if they see signs and symptoms of urinary tract infection in the child. This is to prevent complications. For example patient/family should be observant on the signs and symptoms of thrombotic

complication, such as deep venous thrombosis of the calf veins or even a pulmonary embolus, may be the first clue indicating nephrotic syndrome.

Teach patient/family about the first signs of nephrotic syndrome so that they report to the health centre early, for example in children usually there is swelling of the face; this is followed by swelling of the entire body. Adults can present with dependent edema. Foamy urine may be a presenting feature.

Medication: Patient will be advised to comply with prescribed drugs, if he is taking immunosuppressants, he and his family will be taught to report even mild signs of infection. If he is undergoing long-term corticosteroid therapy he will be taught to report muscle weakness and mental changes.

Importance of rest: Advise patient to take enough rest to promote healing.

Importance of review date: This is to monitor disease whether there is any improvement or it is getting worse.

Central Nervous System

Convulsions

General over view

Convulsions are also known as ‘fits’, ‘epileptic attacks’ or ‘seizures’. Essentially, they’re states of altered consciousness, which can vary in severity. A seizure is a change in movement, attention or level of awareness that is sustained or repetitive and occurs as a result of abnormal neuronal discharges within the brain.

When seizures are recurrent or typical of a specific syndrome, then the term epilepsy is used and specific management applies.

Definition

These are involuntary contractions of the voluntary muscles.

Convulsive seizures are symptomatic of neurological disorders.

Causes of Convulsions in Children

The following are the causes of convulsions in children

Past perinatal conditions that include the following:

- Congenital infection
- Hypoxic-ischaemic damage
- Trauma
- Cerebral haemorrhage or thrombosis
- Cerebral malformation or degeneration

Poisoning such as:

- Accidental ingestion of medicines
- Medicine withdrawal in infancy
- Environmental toxins

Infections such as:

- Meningitis
- Encephalitis
- Brain abscess
- Febrile convulsions (commonest cause)

Metabolic conditions

- Hypoglycaemia
- Hypocalcaemia
- Hypomagnesaemia
- Hyponatraemia
- Hypernatraemia
- Inborn errors of metabolism

Systemic disorders such as:

- Vasculitis
- Hypertensive encephalopathy
- Uraemia (renal failure)
- Hyperammonaemia (Liver failure)

Primary Cerebral Causes

Trauma

Haemorrhage

Thrombosis

Genetic/familial (syndromic)

Tumour

Types OF CONVULSIONS

Clonic convulsion: these are convulsions marked by alternative contracting and relaxing of muscles.

Febrile convulsion: this is a convulsion occurring almost exclusively in children aged 6 months to 5 years of age and associated with fever of 38 degrees Celsius or higher

Tonic convulsion: these are prolonged contraction of the muscles as a result of epileptic discharge.

Febrile convulsions

Febrile convulsions occur because of fever, which is a temperature higher than 38°C. High fevers might come with an infection. In these cases, the rapid rise in temperature causes an abnormal electrical discharge in the brain.

Febrile convulsions are pretty common, occurring in about 4% of children between the ages of six months and five years. Two-thirds of these children will only ever have one fit. Most will occur while the child is younger than three years old.

Children who have their first febrile convulsion before the age of one year have a higher risk of having recurrent febrile convulsions. This type of convulsion tends to run in families.

Management

Diagnosis/Investigation

- History
- Blood: for glucose levels, blood slide, culture
- Urine examination
- Lumbar puncture if meningitis is suspected
- CT/MRI
- EEG: Indicated for recurrent or syndromic seizures

Treatment

Non-drug treatment

Ensure an open airway and administer oxygen

Position the child in lateral position to prevent aspirations

Check glucose during the seizure

Obtain intravenous access if seizure duration > 5 minutes

Keep child nil by mouth and intravenous fluid volume at maintenance rates.

Control fever with tepid sponging.

Drug Treatment

For fever: paracetamol, oral, 10-15 mg/kg dose 4-6 as required

Urgent drug treatment is only indicated if the seizure is generalized and lasts more than 5 minutes or is causing systemic compromise treat as for status epilepticus.

Symptoms

There are several different types of convulsions, but they're usually characterized by:

- The child's body suddenly stiffening
- The child becoming unconscious
- child jerking, and his eyes possibly rolling back in his head
- The child usually sleeping deeply for an hour or so afterwards.

Most convulsions **don't last longer than several minutes.**

Convulsions can be partial, affecting only one part of the body (and one part of the brain), or generalised, involving the whole body (and spreading throughout the brain).

Some convulsions (petit mal) don't involve jerking body movements, but simply appear as an 'absence' from activities. Your child might stare for a few seconds, then continue with what she was doing as if nothing has happened.

Tests

A child who's had a febrile seizure probably won't need tests. Sometimes blood or urine tests, or a chest X-ray, might be performed to work out the condition that caused the fever.

The child might be sent for an EEG if she's having repeated febrile convulsions, but this won't usually happen after a single episode.

If the child has a convulsion that isn't caused by fever, the doctor will suggest sending the child for an EEG, and occasionally a CT scan of the brain.

Treatment

The long-term treatment of general convulsions will depend on their cause and severity. A febrile convolution usually lasts only a few minutes, and almost always stops by itself before any treatment is given.

Management during the convolution

Place the child on a soft surface, lying on his side or back. Time the convolution and watch exactly what happens, so you can describe it later. If the seizure goes on for longer than five minutes, the child should be properly monitored, medication can be given (intravenously or rectally) to stop the seizure.

It's not usually necessary to hospitalize the child following a febrile seizure, unless there is a concern about the condition that caused the fever (such as pneumonia or meningitis). Generally, the child will be assessed, the underlying condition will be treated.

Prevention of Convulsions

There's no guaranteed method of preventing febrile convulsions. But it's possible to **lower the child's fever**, for her comfort, by using **paracetamol** and taking off extra clothing. Sometimes the seizure will be the first indication of a fever.

There's no point in giving the child anticonvulsant medication whenever she develops a fever, because it takes several days to build up sufficiently high levels of the drug in the bloodstream.

Prevention of non-febrile convulsions will depend on the diagnosed cause.

Meningitis

Introduction

Meningitis is a term used to describe an inflammation of the membranes that surround the brain or the spinal cord. Meningitis, especially bacterial meningitis, is a potentially life-threatening

condition that can rapidly progress to permanent brain damage, neurologic problems, and even death. Doctors need to diagnose and treat meningitis quickly to prevent or reduce any long-term effects.

Meningitis normally occurs as a complication from an infection in the bloodstream. A barrier (called the blood-brain barrier) normally protects the brain from contamination by the blood. Sometimes, infections directly decrease the protective ability of the blood-brain barrier. Other times, infections release substances that decrease this protective ability.

Once the blood-brain barrier becomes leaky, a chain of reactions can occur. Infectious organisms can invade the fluid surrounding the brain. The body tries to fight the infection by increasing the number of white blood cells (normally a helpful immune system response), but this can lead to increased inflammation. As the inflammation increases, brain tissue can start swelling and blood flow to vital areas of the brain can decrease.

DEFINITION:

Meningitis is an inflammation of the brain-meninges and underlying subarachnoid cerebrospinal fluid (CSF). or

Meningitis is the inflammation of the protective membranes covering the central nervous, known collectively as the meninges.

Causative Organisms

The inflammation causing meningitis is normally a direct result of either a bacterial infection or a viral infection.

Bacterial Meningitis

Bacterial meningitis can be caused by many different types of bacteria. Certain age groups are predisposed to infections of specific types of bacteria.

Under 2 months common organisms

E coli and other gram negative organisms

Group B strep

Listeria monocytogenes

Over 2 months common organisms

(Same as adult, but ranked differently)

- Neisseria meningitidis (20% in communities are carriers (in nose))
- Streptococcus pneumoniae
- Hemophilus influenzae: The widespread use of the Hib vaccine as a routine childhood immunization has dramatically decreased the frequency of meningitis caused by Hib.

Viral Meningitis

- Viral meningitis is much less serious than bacterial meningitis and frequently remains undiagnosed because its symptoms are similar to the common flu. The frequency of viral meningitis increases slightly in the summer months because of greater exposure to the most common viral agents, called enteroviruses.

Routes of Transmission of Meningitis

There are four main routes in which meningitis can spread to the meninges these are:

- **Haematogenous:** This is spread of the infection through the blood stream. Infection from other parts of the body can spread to the meninges through blood stream
- **Droplet:** This is due to inhalation of pathogens suspended in the air exhaled from someone already infected.
- **Direct extension of micro-organisms:** Micro-organism can directly extend from the affected tissues to the brain meninges. This can occur when there are scalp injuries where micro-organisms can enter through the injuries and extend to the meninges.
- **Iatrogenic spread:** This is infection which can be introduced during procedures such as lumbar puncture.

Predisposing Factors

The inflammation can also be caused by more rare conditions, such as:

- Cancer,
- A drug reaction,
- a disease of the immune system or from other infectious agents such as fungi (cryptococcal meningitis) or parasites
- Meningitis can also be caused by the direct spread of a nearby severe infection, such as an ear infection (otitis media) or a nasal sinus infection (sinusitis). An infection can also

occur any time following direct trauma to the head or after any type of head surgery. Usually, the infections that cause the most problems are due to bacterial infections.

Signs and Symptoms

Normally, meningitis causes fever, lethargy, and a decreased mental status (problems thinking), but these symptoms are often hard to detect in young children.

If the infection or resulting inflammation progresses past the membranes of the brain or the spinal cord, then the process is called encephalitis (inflammation of the brain).

In infants, the signs and symptoms of meningitis are not always obvious due to the infant's inability to communicate symptoms.

Therefore, caregivers (parents, relatives, guardians) must pay very close attention to the infant's overall condition.

The following is a list of possible symptoms seen in infants or children with bacterial meningitis (bacterial meningitis at any age is considered a medical emergency):

Classic or common symptoms of meningitis in infants younger than 3 months of age may include some of the following:

Decreased liquid intake

Vomiting

Rash

Stiff neck

Increased irritability

Increased lethargy

Fever

Bulging fontanelle (soft spot on the top of the head)

Seizure activity

Classic symptoms in children older than 1 year of age are as follows:

Nausea and vomiting

Headache

Increased sensitivity to light

Fever

Altered mental status (seems confused or odd)

Lethargy

Seizure activity

Neck stiffness or neck pain

Knees automatically brought up toward the body when the neck is bent forward or pain in the legs when bent (called Brudzinski sign)

Inability to straighten the lower legs after the hips have already been flexed 90 degrees (called Kernig sign)

Rash

Symptoms of viral meningitis most commonly resemble those of the flu (fever, muscle aches, cough, headache but some may have one or more of the symptoms listed above for bacterial meningitis), but the symptoms are usually considerably milder.

Management

Because meningitis is a potentially life-threatening infection, therapy may begin before all of the tests are performed and prior to having all of the results available.

Medical Management

Drugs

Antibiotics

IV 3rd generation cephalosporin (e.g. cefotaxim, ceftriaxone)

Give ampicillin if suspecting Listeria monocytogenes

Then wait for M/C/S and change antibiotics as necessary.

Dexamethasone/hydrocortisone

Steroids

Fluids: An IV is started to give fluids and to correct any dehydration. An IV also helps to maintain blood pressure and good circulation.

If any indication of respiratory distress is present, a breathing tube (intubation) may be needed to provide oxygen to help the child breath. A heart and breathing monitor is connected to accurately monitor the child's vital signs (respiratory rate, oxygen level, heart rate and rhythm).

Catheterization: A tube (paediatric catheter) may be placed in the bladder to obtain urine and to help accurately measure the child's hydration. A child who has bacterial meningitis or is suspected to have bacterial meningitis is admitted to the hospital

Investigations

Microbiology (M/C/S)

On skin scraping of the rash, or the content of the pustules

Throat swabs

Lumbar puncture(LP)

LP may be considered, unless there is raised Intracranial pressure(ICP)

Polymerase Chain Reaction (PCR)on the CSF

Nursing care

Aims

To promote adequate ventilation

To promote adequate nutrition

To promote adequate hydration

To promote quick recovery

To prevent complications such as pressure sore formation

Environment

Patient will be nursed in acute bay near the nurses table for easy observations. The environment should be clean and well ventilated to prevent secondary infections. The room should not be very bright as the patient has photophobia. In this environment the following resuscitative equipment and drugs will be within reach:

Suction machine in case of secretions to prevent blockage of airway.

Oxygen source in case the patient needs oxygen administration.

Endotracheal tube for intubation incase the patient has blocked airway to make breathing easy.

Sphygmomanometer, stethoscope,thermometer,

syringes and needles, a tray for neurological examination.

A tray for emergency drugs.

Maintenance of Adequate Ventilation

The patient can be nursed in a lateral position or recumbent position with the head tilted to the side to promote drainage of secretions.

Accumulation of secretions is a common problem in unconscious patients. These accumulated secretions can block the bronchiole tree leading to collapse of a part of the lung (atelectasis). In addition accumulated secretions are a good media for micro-organisms leading to infections such

as bronchitis and pneumonia. To prevent such problems and also maintain adequate ventilation, there is need to suction the airway.

If respirations are poor then oxygen may be administered.

Maintaining Safety

This patient may have seizures which can cause falls leading to injury, therefore there is need to protect the child from injury by nursing the child in a railed bed where the rails are raised all the time.

Care should also be taken to prevent injury from invasive lines and equipment.

Maintainance of adquate Circulation

In meningococcal meningitis there could be vomiting and diarrhoea, therefore; there is need to maintain adequate circulation by replacing the lost fluids such as ringers lactate.

Observations

Observe the vital signs $\frac{1}{4}$ hourly or $\frac{1}{2}$ hourly that is temperature, pulse, respirations and the blood pressure. Temp may be high because of infection therefore; there is need to monitor it to see whether it is subsiding or increasing. Pulse may be high due to increased metabolism (as a result of infection) causing a train on the heart. Respirations may be high ,for example when the airway is blocked by secretions and when the intracranial pressure is high.

Observe for seizures, if they occur monitor how often, duration of the seizures. Check the pressure points for signs of pressure sore formation.

Check the i.v site for any swelling and ensure that the i.v line is not kinked and is following well. Observe the patient for signs of dehydration for example loss of skin turgor which may be due to diarrhea, vomiting and high fever which increases the insensible fluid loss. Since this patient may be put on i.v fluids therefore; it is important to monitor the fluid intake and output to prevent fluid overload.

Observe the patient's level of consciousness $\frac{1}{4}$, $\frac{1}{2}$ or 1 hourly using the Glasgow coma scale based on three (3) aspects of the patient's behaviour as follows:

Eye opening response- spontaneous to voice, to pain or none.

Best verbal response- oriented, confused, inappropriate words, incomprehensible sounds or none.

Best motor response- obeys command, localizes pain, withdraws (pain), extension (to pain) or none.

Nutrition and Hydration

The patient should be fed via naso-gastric tube because of absence of swallowing reflexes.

Ensure that the diet is high in calories to replenish the glucose levels because of increased metabolism.

Provide high protein diet to help repair worn out tissues and boost the immunity. Provide high vitamins in the diet to help in healing and boosting the immunity. The feeds should be given 2 hourly and should be recorded.

Hygiene and Skin Care

The child should be bathed daily to promote blood circulation, remove dirt and this is an opportunity to observe the patient physically

Oral toilet should be done twice daily to prevent complications of a dirty mouth (oral infections). The skin of a patient who is unconscious is susceptible to break related to decreased circulation, immobility, poor nutrition and incontinence. In order to prevent skin break down, pressure area care and 2 hourly turnings can be done. Ensure that the linen where patient is laying on is kept dry by changing soiled linen whenever soiled to prevent pressure sores. In this condition the child may lose corneal reflexes leading to excessive drying and damage to the cornea therefore; it is important to clean the eyes with normal saline to prevent this from happening.

Elimination

Since this patient may be unconscious there are chances of the patient developing incontinence or urinary retention therefore; a catheter will be inserted for easy monitoring of intake and output. Urine output will be recorded on the fluid balance chart to prevent fluid overload and ascertain the renal function.

Immobility and lack of dietary fiber may cause constipation therefore; the number and consistency of bowel movements will be monitored.

Exercises

Ensure passive exercises are done to promote blood circulation, improve muscle tone and prevent skin breakages and at the same time this prevents contractures.

Medication

All prescribed drugs should be given at the right time, to the right patient, right dose and right route.

Specific Issues to Address in Care of this Patient

Pain Management: Alleviation of pain or a reduction in pain to a level of comfort that is acceptable to the patient

Analgesic Administration: Use of pharmacologic agents to reduce or eliminate pain

Environmental Management: Comfort: Manipulation of the patient's surroundings for promotion of optimal comfort and safety.

Anxiety Reduction: Minimizing apprehension, dread, foreboding, or uneasiness related to an unidentified source or anticipated danger

Calming Technique: Reducing anxiety in patient experiencing acute distress

Temperature Regulation: Attaining and/or maintaining body temperature within a normal range

Fever Treatment: Management of a patient with hyperpyrexia caused by non environmental factors

Malignant Hyperthermia Precautions: Prevention or reduction of hyper metabolic response to pharmacological agents.

Respiratory Monitoring: Collection and analysis of patient data to ensure airway patency and adequate gas exchange

Oxygen Therapy: Administration of oxygen and monitoring of its effectiveness

Airway Management: Facilitation of patency of air passages

Fluid Monitoring: Collection and analysis of patient data to regulate fluid balance

Hemodynamic Regulation: Optimization of heart rate, preload, afterload, and contractility

Skin Surveillance: Collection and analysis of patient data to maintain skin and mucous membrane integrity

Pressure Management: Minimizing pressure to body parts

Pressure Ulcer Prevention: Prevention of pressure ulcers for a patient at high risk for developing them for **Impaired Physical Mobility related to** neuromuscular damage do the following:

Assess the degree of immobilization of the patient.

Assistive range of motion exercises.

Give skin care, massage with moisturizer.

Check the area experiencing tenderness.

Provide training programs and the use of mobilization.

Prognosis of Meningitis

The prognosis for any type of meningitis depends on the exact cause and severity of infection. At the time of initial treatment and diagnosis, a doctor may not be able to tell a person the exact prognosis and possible recovery outlook. Bacterial meningitis can rapidly progress within hours and end in death despite the most advanced medical care.

For a child who survives a severe case of bacterial meningitis, the child may have long-term disabilities, including visual troubles, hearing difficulty, seizures, paralysis, and decreased mental function. In very mild cases of bacterial meningitis that are treated early, a child may completely recover over the course of a few weeks with rehabilitation.

Viral meningitis tends to be a much less severe infection and normally can be treated at home on an outpatient basis. Most children with viral meningitis get better within two weeks.

Complications

Cranial nerve damage - VI, VIII

Deafness

-> Audiology assessment in 2 weeks, and 2 months after discharge.

Continuous seizures

Cerebral infarct/oedema/abscess

Arthritis

Pericarditis

Waterhouse-Friderichsen syndrome

Gangrene of peripheral toes/fingers/other body parts

Hydrocephalus

Hydrocephalus is a condition caused by an imbalance in the production and absorption of CSF in the ventricular system. When production exceeds absorption, CSF accumulates, usually under pressure, producing dilation of the ventricles.

It is a term derived from the Greek words “hydro” meaning water, and “cephalus” meaning head, and this condition is sometimes known as “water on the brain”.

Children with hydrocephalus have abnormal accumulation of cerebrospinal fluid (CSF) in the ventricles, or cavities, of the brain.

This may cause increased intracranial pressure inside the skull and progressive enlargement of the head, convulsion, and mental disability.

Usually, hydrocephalus does not cause any intellectual disability if recognized and properly treated.

A massive degree of hydrocephalus rarely exists in typically functioning people, though such a frequency may occur if onset is gradual rather than sudden.

Hydrocephalus occurs with a number of anomalies.

Pathophysiology of Hydrocephalus

The primary site of CSF formation is believed to be the choroid plexus of the lateral ventricles. CSF flows from the lateral ventricles through the foramen of Monro to the third ventricle.

Increased Intracranial Pressure

Increased Intracranial pressure (ICP) is the pressure in the skull that results from the volume of three essential components: cerebrospinal fluid (CSF), intracranial blood volume and central nervous system tissue.

Etiology

Congenital hydrocephalus usually results from defects, such as malformations. It is also associated with spina bifida.

Acquired hydrocephalus usually results from space-occupying lesions, hemorrhage, intracranial infections or dormant development defects.

Classification Of Hydrocephalus

Hydrocephalus can be caused by:

Impaired cerebrospinal fluid (CSF) flow,

Reabsorption, or excessive CSF production.

The most common cause of hydrocephalus is CSF flow obstruction, hindering the free passage of cerebrospinal fluid through the ventricular system and subarachnoid space (e.g., stenosis of the cerebral aqueduct or obstruction of the interventricular foramina – foramina of Monro secondary to tumors, hemorrhages, infections or congenital malformations).

Hydrocephalus can also be caused by overproduction of cerebrospinal fluid (relative obstruction) (e.g., papilloma of choroid plexus).

Based on its underlying mechanisms, hydrocephalus can be classified into communicating, and non-communicating (obstructive). Both forms can be either congenital, or acquired.

Communicating

Communicating hydrocephalus, also known as non-obstructive hydrocephalus

It is caused by impaired cerebrospinal fluid resorption in the absence of any CSF-flow obstruction.

It has been theorized that this is due to functional impairment of the arachnoid granulations, which are located along the superior sagittal sinus and is the site of cerebrospinal fluid resorption back into the venous system.

Various neurologic conditions may result in communicating hydrocephalus, including subarachnoid/intraventricular hemorrhage, meningitis, Chiari malformation, and congenital absence of arachnoidal granulations (Pacchioni's granulations).

Normal pressure hydrocephalus (NPH) is a particular form of communicating hydrocephalus, characterized by enlarged cerebral ventricles, with only intermittently elevated cerebrospinal fluid pressure. The diagnosis of NPH can be established only with the help of continuous intraventricular pressure recordings (over 24 hours or even longer), since more often than not, instant measurements yield normal pressure values. Dynamic compliance studies may be also helpful. Altered compliance (elasticity) of the ventricular walls, as well as increased viscosity of the cerebrospinal fluid, may play a role in the pathogenesis of normal pressure hydrocephalus.

Hydrocephalus ex vacuo also refers to an enlargement of cerebral ventricles and subarachnoid spaces, and is usually due to brain atrophy (as it occurs in dementias), post-traumatic brain injuries and even in some psychiatric disorders, such as schizophrenia. As opposed to hydrocephalus, this is a compensatory enlargement of the CSF-spaces in response to brain parenchyma loss – it is not the result of increased CSF pressure.

Non-communicating

Non-communicating hydrocephalus, or obstructive hydrocephalus, is caused by a CSF-flow obstruction (either due to external compression or intraventricular mass lesions).

Foramen of Monro obstruction may lead to dilation of one or, if large enough (e.g., in colloid cyst), both lateral ventricles.

The aqueduct of Sylvius, normally narrow to begin with, may be obstructed by a number of genetically or acquired lesions (e.g., atresia, ependymitis, hemorrhage, tumor) and lead to dilatation of both lateral ventricles as well as the third ventricle.

Fourth ventricle obstruction will lead to dilatation of the aqueduct as well as the lateral and third ventricles.

The foramina of Luschka and foramen of Magendie may be obstructed due to congenital failure of opening (e.g., Dandy-Walker malformation).

The subarachnoid space surrounding the brainstem may also be obstructed due to inflammatory or hemorrhagic fibrosing meningitis, leading to widespread dilatation, including the fourth ventricle.

Congenital

The cranial bones fuse by the end of the third year of life. For head enlargement to occur, hydrocephalus must occur before then. The causes are usually genetic but can also be acquired and usually occur within the first few months of life, which include 1) intraventricular matrix hemorrhages in premature infants, 2) infections, 3) type II Arnold-Chiari malformation, 4) aqueduct atresia and stenosis, and 5) Dandy-Walker malformation.

In newborns and toddlers with hydrocephalus, the head circumference is enlarged rapidly and soon surpasses the 97th percentile. Since the skull bones have not yet firmly joined together, bulging, firm anterior and posterior fontanelles may be present even when the patient is in an upright position.

The infant exhibits fretfulness, poor feeding, and frequent vomiting. As the hydrocephalus progresses, torpor sets in, and the infant shows lack of interest in his surroundings. Later on, the upper eyelids become retracted and the eyes are turned downwards (due to hydrocephalic pressure on the mesencephalic tegmentum and paralysis of upward gaze).

Movements become weak and the arms may become tremulous. Papilledema is absent but there may be reduction of vision. The head becomes so enlarged that the child may eventually be bedridden.

About 80-90% of fetuses or newborn infants with spina bifida—often associated with meningocele or myelomeningocele—develop hydrocephalus.

Acquired

This condition is acquired as a consequence of CNS infections, meningitis, brain tumors, head trauma, intracranial hemorrhage (subarachnoid or intraparenchymal) and is usually extremely painful.

Pathophysiology of Hydrocephalus:

Clinical Manifestations:

Abnormal rate of head growth

Bulging fontanelle

Tense anterior fontanelle (often bulging and nonpulsatile)

Dilated scalp veins

Macewen's sign ("cracked pot")

Frontal bossing

Setting sun sign

Sluggish and unequal pupils

Irritability and lethargy with varying LOC

Abnormal infantile reflexes

Possible cranial nerve damage

Manifestations in children include possible signs of increased ICP, which include headache on awakening with improvement following emesis, papilledema, strabismus, ataxia, irritability, lethargy, apathy and confusion.

Laboratory and Diagnostic Study Findings

Level II ultrasonography of the fetus will allow a prenatal diagnosis. (Transuterine placement of ventriculoamniotic shunts during late pregnancy is still being developed as a treatment modality).

CT scan will diagnose most cases postnatally.

MRI can be used if a complex lesion is suspected.

Nursing Management:

1. Teach the family about the management required for the disorder
 - a. Treatment is surgical by direct removal of an obstruction and insertion of shunt to provide primary drainage of the CSF to an extracranial compartment, usually peritoneum (ventriculoperitoneal shunt)

1. The major complications of shunts are infections and malfunction
2. Other complications include subdural hematoma caused by a too rapid reduction of CSF, peritonitis, abdominal abscess, perforation of organs, fistulas, hernias and ileus.
- b. A third ventriculostomy is a new nonshunting procedure used to treat children with hydrocephalus.
2. Provide preoperative nursing care
 - a. Assess head circumference, fontanelles, cranial sutures, and LOC; check also for irritability, altered feeding habits and a high-pitched cry.
 - b. Firmly support the head and neck when holding the child.
 - c. Provide skin care for the head to prevent breakdown.
 - d. Give small, frequent feedings to decrease the risk of vomiting.
 - e. Encourage parental-newborn bonding.
3. Provide Postoperative nursing care (nursing interventions are the same as those for increased ICP)

- a. Assess for signs of increased ICP and check the following; head circumference (daily), anterior fontanelle for size and fullness and behavior.
- b. Administer prescribed medications which may include antibiotics to prevent infection and analgesics for pain.
- c. Provide shunt care
 - 1. Monitor for shunt infection and malfunction which may be characterized by rapid onset of vomiting, severe headache, irritability, lethargy, fever, redness along the shunt tract, and fluid around the shunt valve.
 - 2. Prevent infection (usually from *Staphylococcus epidermidis* or *Staphylococcus aureus*)
 - 3. Monitor for shunt overdrainage (headache, dizziness and nausea). Overdrainage may lead to slit ventricle syndrome whereby the ventricle become accustomed to a very small or slitlike configuration, limiting the buffering ability to increased ICP variations.
- 4. Teach home care
 - a. Encourage the child to participate in age-appropriate activities as tolerated. Encourage the parents to provide as normal lifestyle as possible. Remind both the child and parents that contact sports are prohibited.
 - b. Explain how to recognize signs and symptoms of increased ICP. Subtle signs include changes in school performance, intermittent headache, and mild behavior changes.
 - c. Arrange for the child to have frequent developmental screenings and routine medical checkups.

THE END

Nursing Care Plan – Hydrocephalus

Related Nursing Articles

Nursing Care Plan – Hydrocephalus

Hydrocephalus is characterized by an abnormal increase in cerebrospinal fluid (CSF) volume within the intracranial cavity and by enlargement of the head in infancy. Pressure from increased fluid volume can damage the brain tissue. Hydrocephalus...

Cerebral Palsy

Introduction

Cerebral palsy describes a group of permanent disorders of the development of movement and postures causing activity limitation, that are attributed to non progressive disturbance that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of

sensation, perception, cognition, communication and behavior by epilepsy and by secondary musculoskeletal problems.

DEFINITION

This is an umbrella term encompassing a group of non progressive, non contagious motor conditions that cause physical disability in human development, chiefly in the various areas of body movement

Encephalopathy = Brain Injury that is non-progressive disorder of posture and movement

Cerebral Palsy(CP) refers to a group of nonprogressive disorders that affect the motor centres of the brain, causing problems with movement and coordination

Causes

Can be caused by several factors which include the following:

- Congenital problems involving the central nervous system(eg.hydrocephalus,haemorrhage)
- Conditions of pregnancy or labour that interfere with oxygen reaching the fetal brain(e .g.pre mature separation of the placenta, prolonged labour)
- Exposure during pregnancy to infections (e. g. German Measles or Rubella,cytomegalovirus,toxoplasmosis) or toxins
- After first week of life : a number of diseases can damage the infant's brain,Such as : meningitis neglected or partly treated, encephalitis, cerebral malaria,uncontrolled febril convulsions where anoxia has damaged the brain, or cerebral thrombosis from Sickle cell disease, usually in older children

PREVALENCE

2-4/1000; 7-10,000 new babies each year. The incidence rate of CP is high in infants weighing less than 2500 g at birth and in multiple births.

150 years ago described by Dr. Little an orthopedic surgeon and known as Little's Disease

During past 3 decades considerable advances made in obstetric & neonatal care, but unfortunately there has been virtually no change in incident of CP

Clinical Presentation

- Apgar Score of less than 5
- Seizures ,usually within 48 hours

- Delay in reaching developmental milestones: sitting, crawling, creeping, standing and reaching for objects. (mental retardation although this may or not be present)
- Difficulty with the motor skills such as holding feeding utensils, writing, using scissors
- Feeding difficulties, poor sucking and swallowing, drooling, persistent tongue thrust
- Involuntary movements such as uncontrolled writhing motions of the hands
- Increased muscle tone: infant maybe rigid when pulled to a sitting **position**, infant reflexes do not disappear at the normal time
- Blindness and deafness can occur as well

Types of Cerebral Palsy

Cerebral Palsy are classified according to presentation

Spastic CP

Ataxic CP

Mixed CP

Monoplegic CP

SPASTIC CP

Muscular Rigidity, Spasm: children in abnormal positions. It is further classified into:

- Hemiplegia; one half of the body is affected
- Diplegia; legs are more affected than hands
- Quadriplegia; the whole body is affected
- Atherosclerosis; Uncontrolled purposeless movements

ATAXIC CP

Unsteady or shaky movements that are less pronounced than in Athetosis

MIXED CP

Children show more features of more than one type of CP

MONOPLEGIC

Only one limb is affected

- Cerebral Palsy: Physiologic

CEREBRAL PALSY: COMPLICATIONS

Spasticity

Weakness

Increase reflexes
Clonus
Seizures
Articulation & Swallowing difficulty
Visual compromise
Deformation
Hip dislocation
Kyphoscoliosis
Constipation
Urinary tract infection
Cerebral Palsy: Management
Neurologic and Physiatric
OT and PT
Speech
Adaptive equipment
Surgical
Rhizotomy, Baclofen pumps, Botoxin
Cerebral Palsy
What is substantially disabling Cerebral Palsy?
Mobility
Communication
Learning
Self Care
Self Direction
Independent Living
Economic Sufficiency
Management
Depending on what type of CP the following are advised:
Regular exercises under the guidance of the Physiotherapy
Sometimes orthopaedic operation may be done to correct some deformities such as tendon stretching

If brain is damaged parents can be referred to the community worker for continuous monitoring

Activity

Well class, now do this activity

1. Define cerebral palsy
2. List the causes of cerebral palsy
3. List the four classifications of cerebral palsy
4. List the signs and symptoms of cerebral palsy
5. Mention the complications of cerebral palsy

Good, you can now compare your answers with the information that is in your note books

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Infectious diseases

Introduction

Measles definition

Measles is an acute highly contagious viral disease caused by measles virus and it is characterized by fever, URT catarrhal inflammation, koplik's spots and maculopapules.

Types of Measles

There are two types of measles which are;

Rubeola measles

Rubella measles

Each type of measles is caused by a different virus. Although both produce a rash and fever, they are really different diseases. When most people use the term measles, they are referring to the first condition below.

The rubeola virus causes "red measles," also known as "hard measles" or just "measles." Although most people recover without problems, rubeola can lead to [pneumonia](#) or inflammation of the brain ([encephalitis](#)).

The rubella virus causes "German measles," also known as "three-day measles." This is usually a milder disease than red measles.

However, this virus can cause significant birth defects if an infected [pregnant](#) woman passes the virus to her unborn child.

Rubella ("German measles")

German measles causes milder symptoms than red measles. The incubation period between getting the virus and getting sick is 10 days to two weeks.

Cause of Measles

It is caused by measles virus and it has been classed as a paramyxovirus. It is spherical in appearance, measuring about 100~150nm in diameter. It has an outer envelope composed of M-protein, H-protein, F-protein, and internal core is RNA.

Both the rubeola and rubella viruses are spread through the respiratory route. This means they infect susceptible individuals exposed to an infected person who is coughing and sneezing. In fact, the rubeola virus is one of the most contagious viruses known to man. As a result, it can spread rapidly in a susceptible population. Infected people carry the virus in their respiratory tract before they get sick, so they can spread the disease without being aware of it. If people are immune to the virus (either through vaccination or by having had measles in the past), they cannot get the disease caused by that virus.

For example, someone who had rubeola as a child would not be able to get the disease again. Remember that rubella and rubeola are different viruses. An infection with or vaccination against one of these viruses does not protect against infection with the other.

Pathogenesis of Measles

Measles can be detected from blood and nasal, pharyngeal secretions. Three kinds of antibodies are produced after infection, that is:

complement combining antibody;

hemagglutinin inhibiting antibody

neutralizing antibody

Only one antigenic type of measles virus is known.

Clinical Manifestations

Stages of infection — Classic measles infection can be subdivided into the following clinical stages:

Incubation,

Prodrome,

Exanthem, and

Recovery.

Incubation period — the incubation period begins after measles virus entry, via the respiratory mucosa or conjunctivae. The virus replicates locally, spreads to regional lymphatic tissues, and is then thought to disseminate to other reticuloendothelial sites via the bloodstream. The incubation period of measles is usually 10 days with a range generally of 8 to 10 days. Infected individuals are characteristically asymptomatic during the incubation period, although some have been reported to experience transient respiratory symptoms, fever, or morbilliform rash. The dissemination of measles virus due to viremia, with associated infection of endothelial, epithelial, monocyte, and macrophage cells, may explain the variety of clinical manifestations and complications that can occur with measles infection. A second viremia occurs several days after the first, coinciding with the appearance of symptoms signaling the beginning of the prodromal phase.

Prodrome phase — The prodrome phase is defined by the appearance of symptoms which typically include fever, malaise, and anorexia, followed by conjunctivitis, coryza, and cough. The severity of conjunctivitis is variable and may also be accompanied by lacrimation or photophobia. The respiratory symptoms are due to mucosal inflammation from viral infection of epithelial cells. Fever is typically present; the pattern may be variable. Various fever patterns have been described; fever as high as 40°C can occur. The prodrome usually lasts for two to three days but may persist for as long as eight days. The child may develop an exanthema known as Koplik's spots; these are 1 to 3 mm whitish, grayish, or bluish elevations with an erythematous base, typically seen on the buccal mucosa opposite the molar teeth, though they can spread to cover the buccal and labial mucosa as well as the hard and soft palate. They have been described as "grains of salt on a red background". Koplik's spots subsequently may coalesce and generally last 12 to 72 hours.

It is important to search carefully for Koplik's spots in patients with suspected measles, since they are considered pathognomonic for measles infection and occur approximately 48 hours before the characteristic exanthem. However, this exanthem does not appear in all patients with measles. Uncommonly, patients with severe measles develop generalized lymphadenopathy and splenomegaly.

Exanthem Phase — the exanthem of measles is a maculopapular, blanching rash beginning on the face and spreading cephalocaudally and centrifugally to involve the neck, upper trunk, lower trunk, and extremities ([picture 2A-B](#)). The lesions may become confluent, especially in areas such as the face, where the rash develops first. The rash may also have some petechiae; in severe cases it may appear hemorrhagic. In general, the extent and degree of confluence of the rash correlates with the severity of the illness in children. The palms and soles are rarely involved. The cranial to caudal progression of the rash is characteristic of measles but is not pathognomonic. Other characteristic findings during the exanthematous phase include lymphadenopathy, high fever (peaking two to three days after appearance of rash), pronounced respiratory signs including pharyngitis, and nonpurulent conjunctivitis. Koplik's spots often begin to slough when the exanthem appears.

Clinical improvement typically ensues within 48 hours of the appearance of the rash. After three to four days the rash darkens to a brownish color and begins to fade, followed by fine desquamation. The rash usually lasts six to seven days.

Recovery and immunity phase — Cough may persist for one to two weeks after measles infection. The occurrence of fever beyond the third to fourth day of rash suggests a measles-associated complication.

Immunity after measles infection is thought to be life long, although there are rare reports of measles reinfection.

Symptoms and Signs

Rubeola ("red measles" or "hard measles"): Symptoms appear about 10-14 days after a person is infected with the rubeola virus. This is called the incubation period. During this period, the virus is multiplying. Symptoms occur in two phases.

The early phase begins with these symptoms:

Fever

A run-down or lethargic feeling

[Cough](#)

Red eyes ([conjunctivitis](#))

Runny nose

Loss of appetite

The red measles rash develops from two to four days later.

The rash usually starts on the face, spreading to the trunk and then to the arms and legs.

The rash is initially small red bumps that may blend into each other as more appear. From a distance, the rash often looks uniformly red.

Patient with measles may develop small grayish spots on the inside of the cheek, called "[Koplik spots](#)."

The rash is usually not itchy, but as it clears up, the skin may shed (this looks like skin that is peeling after [sunburn](#)).

Although red measles is often a mild disease, a few serious complications may occur. Red measles makes a patient more vulnerable to pneumonia and bacterial ear infections. Red measles is particularly severe in people with weakened immune systems, including people who are malnourished or have [HIV](#).

Management

Investigations/Diagnosis

Blood routine

Serum Anti-body measurement

Complement combining antibody;

Hemagglutinin inhibiting antibody;

Neutralizing antibody;

Specific antibody IgM.

Other Ag and multinucleated giant cells

The separation of virus

Measles virus can be isolated in tissues culture;

Antibody titer;

WBC is relative low

Eye swab for m/c/s

Medical treatment

There is no specific treatment for measles. Medical management is therefore symptomatic.

For fever administer analgesia e. g calpol 100mg to 200mg tds for 3 days.

For conjunctivitis appropriate antibiotics will be given such as Tetracycline eye ointment TDS.

For itchy rash antihistamine e.g piriton syrup or calamine lotion

For cough safe cough remedies will be given such as lemon tea, honey tea or breast milk if breast fed.

Antibiotic prophylaxis e.g Amoxycilline 125-250mg TDS will be given

Vitamin A supplementation for preservation of sight and also immune booster will be given to the child. This will be given 100000IU to 200000IU on day 1,2 and day 8

Sodium bicarbonate for mouth wash.

Multivitamin will be administered to the child.

Nursing Care (Specific Care)

Aims:

To relieve symptoms

To promote rest and comfort

To prevent complications

Environment

Measles is highly infectious therefore the child will be nursed in isolation and infection prevention protocols should be applied, for example wearing of protective clothing such as gloves, gowns. Visitors will be restricted to prevent spread of infection. The environment should be dim lit as the patient may have photophobia due to conjunctivitis. The room should be cool and humid to prevent intense itchy from rash.

Observations

Vital signs especially temperature which is usually high and swinging about 380C – 400C should be observed to see if it is increasing or reducing. If temperature continues to be high interventions for fever management will be employed such as tepid sponging, cool environment, and remove excess line and if this does not work out the prescribed antipyretic will be administered to the child such as calpol. Temperature will be observed vigilantly in order to identify and prevent complications because if it is swinging it may denote setting in of complications. The child will be observed for hydration because he/she is losing a lot of fluids through diarrhea, sweating, coughing and sneezing, therefore there is need to ensure good hydration to avoid dehydration. The skin will be observed for rash to see the extent of rash and the parts that are affected. The mouth of the child will be observed for koplik spots which might hinder with sucking/feeding to see if it is increasing or reducing. If koplik spot is present therefore, frequent mouth wash or care will be done with sodium bicarbonate to soothe the mouth hence enhancing good sucking. The eyes will be observed for any discharge that can be profuse and hinder good vision. The eye discharge will be observed for amount, colour of discharge. The eyes will also be observed if there

is oedema and to take note of the extent of the oedema. Observe for pain and take note the intense of pain.

Psychological Care

The disease process will be explained to the mother so that she understands what is happening with her child. This helps to allay anxiety and assists the parents to co-operate with the medical team giving care to the child. The parents will understand why the child has been isolated hence the infection will be prevented from spreading as the mother will follow all the guidelines that have been put in place for isolation technique to be effective. All myths and misconceptions about measles will be ironed out so that the parents are clear. For example the myths associated with bathing of the child with measles will be explained. Since the child's condition tends to change abruptly, the general condition of the child will be assessed every 4 hourly and the mother will be informed about the general well being of the child. The mother will be allowed to ask questions about her child's condition and all are questions will be addressed accordingly.

Hygiene

This child may have diarrhea, eye discharge, and macula-pustulo rash therefore there is need to change soiled line and nappies frequently to prevent skin excoriation and also for patient's comfort as odour will be eliminated. The child's nails will be cut short to prevent collection and accumulation of dirt which can be a source of other infections. Short nails will also prevent the child's skin from being injured as a result of itchy rash. The eyes will be cleaned with normal saline PRN as the child's eyes may be discharging due to conjunctivitis. The child will be bathed daily using a non irritating carbolic soap to remove dirty and dead cells from the body. The environment in which the child is being nursed should be clean to avoid the child from getting other infections.

Nutrition

The child will have difficulties in eating due to koplik spots in the mouth and this will lead to the child refusing to eat food hence impairing nutrition status. The child may lose appetite due to presence fever and diarrhea therefore it is important to stimulating appetite for the child by doing mouth care PRN to improve blood circulation in the child's mouth there by stimulating the taste buds. If the child is breast feeding the mother will be encouraged to continue breast feeding. If the child cannot breast feed due to sores in the mouth the mother will be encouraged to express milk and it will be given to the child using cup and spoon. The feeds will be given in small and frequent amount which the child can tolerate. Fruit juices will be provided to promote quick healing of koplik spots and boosts up immunity. If the child cannot tolerate oral feeds then parenteral feeds will be instituted and a strict intake and output will be maintained.

Information Education and Communication

The mother and the child will be encouraged on the following:

Importance of hygiene

Importance of nutrition in relation to disease process

Importance of isolation

Importance of drug compliance and avoidance of herbal concoctions as herbal drugs can cause complications.

Complications

Measles infection can cause:

Transient immunosuppression due to suppression of T-cell responses.

Anergy (specific immunological tolerance in which T cells and B cells fail to respond normally) may be present before the appearance of the exanthem and for several weeks after measles infection.

Pneumonia: Pneumonia as a complication of measles is especially serious in infants and is responsible for most deaths in this age group.

Inflammation of the brain (encephalitis)

Bronchopneumonia;

Myocarditis;

Laryngitis;

Neurologic complications

Preventive Strategies of Measles

Contact tracing

Immunization campaign

I.E.C on mode of transmission, immunization, isolation

Notification

Chicken Pox

DEFINITION

Chicken-pox is an infectious disease caused by varicella-zoster virus characterized by the appearance of rash on the skin and mucus membranes of successive crops of typical vesicles

OR

Chickenpox is a highly contagious, acute exanthematous disease that is characterized by successive crops of lesions that progress rapidly from macules and papules to vesicles, pustules and crusts.

Transmission

Chicken pox is transmitted from person to person through:

- i. Droplet inhalation: This can happen through sneezing and coughing
- ii. Direct contact: This means it can be spread either through person-to-person contact.

Pathophysiology Of Chicken Pox

Chickenpox is usually acquired by the inhalation of airborne respiratory droplets from an infected host and transmission may also occur through direct contact with these vesicles. After initial inhalation of contaminated respiratory droplets, the virus infects the conjunctivae or the mucosae of the upper respiratory tract. Viral proliferation occurs in regional lymph nodes of the upper respiratory tract 2-4 days after initial infection; this is followed by primary viremia on post infection days 4-6. A second round of viral replication occurs in the body's internal organs, most notably the liver and the spleen, followed by a secondary viremia 14-16 days post infection. This secondary viremia is characterized by diffuse viral invasion of capillary endothelial cells and the epidermis. VZV infection of cells of the malpighian layer produces both intercellular edema and intracellular edema, resulting in the characteristic vesicle.

The initial site of virus replication is unknown but subsequently there is a viremia with subsequent skin lesions. The early papular lesions are minute vacuoles surrounded by ballooning degeneration of epithelial cells within the prickle cell layer of the epidermis. In a few hours edema fluid accumulates, elevating the stratum corneum to form a clear vesicle, while multinucleated giant cells, containing eosinophilic intranuclear inclusions, form among the cells at the edges and base of the lesion. As the vesicles begin to dry, they become filled with a cloudy, fibrinous fluid containing leukocytes and desquamated epidermal cells. The final stages of lesion formation are characterized by crusting along with regeneration of the epithelial cells.

Nursing care

Aims

- To prevent spread of infection
- To prevent complications
- To relieve sign and symptoms
- To Allay anxiety

Environment

Patient will be nursed in isolation because this is an infectious disease which can spread to other patients. The child will be nursed in a room which is cool, clean and humidified to relieve signs and symptoms such as running nose. The room should be warm to prevent hypothermia and it has to be quiet to promote rest.

Observation

Vital signs will be done. Observe if fever is subsiding which is an indication of reduction in infection and if it is persistently increasing it means infection is worsening. Observe the intensity of rash. This pt may experience some body pains/headache therefore, observe for pain. Observe for cough and note the type of cough, consistence and intensity. This child may present with sore throat therefore; observe the throat of the child if it is still inflamed or inflammation is subsiding.

Psychological Care

The disease process will be explained to the parents to make them understand the child's condition therefore allaying parent's anxiety. Parents will be told that the child has been isolated to prevent spread of infection to other patients and this will make them understand therefore; they will cooperate with the medical team. The child and the parents will be kept together to prevent the child from crying which can provoke cough. All procedures that are to be done on the child will be explained to the parents to keep them well informed and allay anxiety. All

myths and misconceptions about Chicken pox will be ironed out so that the parents are clear. For example the myths associated with bathing of the child with Chicken pox will be explained.

Hygiene

The child should be bathed daily with warm water to promote blood circulation, soothe the skin, to remove dirt and this is an opportunity to observe the patient physically. The child will be bathed daily using a non-irritating carbolic soap to remove dirty and dead cells from the body. Fingernails will be cut and kept short to stop deep scratching causing injury to the skin. Oral toilet should be done twice daily to prevent complications of a dirty mouth (oral infections). Cleansing throat gargle may be ordered to clean and soothe the throat. Bed linens will be changed as necessary to keep the patient dry hence prevent pressure sore formation.

Medication

All prescribed drugs will be given at the right time, to the right patient, right dose and right route. The child will be given an analgesic or antipyretic such as paracetamol to relieve headache and to lower fever. Calamine lotion will be applied to all the body

Antihistamine tablets or liquid medicine will be given at bedtime to help with sleep if itch is a problem.

Information Education and Communication

The mother and the child will be encouraged on the following:

Importance of hygiene: The mother will be advised to bathe the child every day to remove dirt from the skin to maintain skin

Importance of nutrition: The mother will be advised to give a well-balanced diet rich in proteins to repair worn out tissues, high in vitamins to maintain skin integrity and boost immunity.

Seeking medical advice early: this will facilitate early treatment and prevent complications that may arise. It will also prevent spread of infection therefore; the disease will be controlled in the community.

Importance of drug compliance: She will be advised to continue giving the child the drugs that are prescribed on discharge as this will aid in healing and recovery. She should avoid giving the child herbal concoctions as herbal drugs can cause complications.

Review date: Encourage the mother to take the child to the hospital for review for the doctor to see whether the child is responding to the treatment.

Under five clinic

She should be taking the child for under five clinic for growth monitoring, deworming and to receive vitamin A.

Whooping Cough

Diphtheria

Diphtheria is an acute infectious disease of childhood that affects the upper respiratory tract (nose tonsils, pharynx, and larynx) and occasionally of other mucous membranes or skin caused by corynebacterium diphtheriae characterized by local inflammation of the epithelial surface, formation of a membrane, and severe toxemia.

Etiology

The Causative agent is Bacteria known as **Corynebacterium diphtheriae**.

Incubation

The incubation period is 2-6 days or longer.

Method of Spread

The method of spread is by droplet from respiratory tract of infected person or carrier.

Source of infection: -secretions and discharge from an infected person or carrier

Human are chief reservoirs

Mode of transmission : -

Contact or through droplets of secretion

Portal of entry :

Respiratory tract

May enter through the conjunctiva or skin wound

Characteristics

These are gram-positive, catalase-, aerobic or facultatively anaerobic, generally nonmotile rods.

Pathogenesis

When bacteria enters the respiratory tract the bacilli multiply locally in the throat and elaborate a powerful exotoxin which produces local and systemic symptoms.

Local lesions : Exotoxin causes necrosis of the epithelial cells and liberates serous and fibrinous material which forms a grayish white pseudomembrane. The membrane bleeds on being dislodged. Surrounding tissue is inflamed and edematous. The characteristic membrane of diphtheria is thick, leathery, grayish-blue or white and composed of bacteria, necrotic epithelium, macrophages, and fibrin. The membrane firmly adheres to the underlying mucosa; forceful removal of this membrane causes bleeding. The membrane can spread down the bronchial tree, causing respiratory tract obstruction and dyspnea.

Systemic lesions : Exotoxin affects the heart , kidney and CNS

Heart :

Myocardial fibers are degenerated and the heart is dilated

Conduction disturbance

CNS : polyneuritis

Kidney : renal tubular necrosis

Types of Diphtheria

This depends on the site of lesion:

Nasal diphtheria :

Unilateral or bilateral serosanguineous (blood and serous fluid) discharge from the nose

Excoriation of upper lip

Faucial (Tonsular) diphtheria :

Redness and swelling over fauces

Exudates on the tonsils coalesces to form grayish white pseudo membrane

Regional lymph nodes are inflamed

Sore throat and dysphagia

Laryngotracheal diphtheria :

Membrane over the larynx results in brassy (hardness) cough and hoarse voice

Respiration ----- noisy

Suprasternal and subcostal recession

Restlessness

Increasing respiratory effort

Use of accessory muscles

Unusual sites :

Conjunctiva and skin

In the skin :

There are ulcers (tender)

Predisposing Factors

- Poor nutrition.
- Outbreak in the community.
- Crowded or unsanitary living conditions.
- Low vaccine coverage among infants and children.
- Lack of mass immunization programmes amongst children and adults at high risk.
- Insufficient information for the general public on dangers of the disease and the benefits of immunization.
- Lack of vaccines in many areas.

Epidemiology

Humans are the only known reservoir for the disease. The primary modes of dissemination are by airborne respiratory droplets, direct contact with droplets, or infected skin lesions. Asymptomatic respiratory carrier states are believed to be important in perpetuating both endemic and epidemic disease. Immunization reduces the likelihood of carrier status.

Clinical Manifestations

1-Nasal diphtheria: This resembles common cold therefore the child will present with nasal discharge and may be frank epistaxis.

2-Tonsillar (pharyngeal diphtheria): The child will have malaise, anorexia, sore throat, low grade fever, adherent white or gray membrane.

Severe cases will develop toxemia, septic shock, death within 6-10 days.

3-Laryngeal diphtheria: fever, hoarsness of voice, cough, airway obstruction, cyanosis.

Diagnosis

Clinical history examination and identification of diphtheria bacilli from the site of lesion.

The diagnosis is confirmed by isolation and identification of *C. diphtheria* from infected sites.

Differential diagnosis

Nasal diphtheria :

Foreign body in nose ,

Rhinorrhea

Laryngeal diphtheria :

Croup

Acute epiglottitis

Laryngotracheobronchitis

Peritonsillar abscess

Retropharyngeal abscess

Faucial diphtheria :

Acute streptococcal membranous tonsillitis (high grade fever , child less toxic)

Viral membranous tonsillitis :

high grade fever ,

WBC : normal or low ,

Antibiotic : no effects

Herpetic tonsillitis (Gingivitis and stomatitis)

Infectious mononeucleosis :

Generalized rash and lymphadenopathy besides oral mucosal lesions

Treatment

Principles :

Neutralization of free circulating toxin by administration of antitoxin

Antibiotic to eradicate bacteria

Supportive and symptomatic therapy

Management of complications

Analgesia will be administered to relieve pain and also to lower fever. For example paracetamol 100-250 mg tds oral for 3 days will be prescribed

Adrenaline (epinephrine) should be administered to cope with anaphylactic reactions to the antitoxins.

Antibiotics will be administered and this will stop toxin production and prevent further spread of organisms. The best antibiotic will be prescribed after culture and sensitivity results. These will include drugs such as; erythromycin, penicillin G, cephalosporin.

Penicillin:

Procaine penicilline (3 – 6 lac units IM at 12 hourly intervals till the patient is able to swallow)

Oral penicillin (125 – 250 mg qid)

Erythromycin (25 – 30 mg / kg / day) for 14 days

Three negative cultures at 24 hours intervals should be obtained before the patient is declared free of the organism

Corticosteroids may be prescribed especially if it is laryngeal diphtheria because this will reduce swelling.

Diphtheria antitoxin (DAT) Dose given depends on site of infection and length of time patient is symptomatic:

For Laryngeal or pharyngeal disease of <48 h duration: give 20,000-40,000 U IV over 60 minutes.

For Nasopharyngeal infection:give 40,000-60,000 U IV

Extensive disease of >3 day duration or any patient with neck swelling: give 80,000-100,000 U IV.

Nursing Care

The aims of treatment are To inactivate toxin, To kill the organism, and to

To prevent respiratory obstruction.

To promote rest,

To prevent spread of infection

Environment

Patient will be nursed in isolation because this is an infectious disease which can spread to other patients. The child will be nursed in a room which is cool, clean and humidified to relieve signs and symptoms such as running nose. The room should be warm to prevent hypothermia and it has to be quiet to promote rest.

The environment should have the following resuscitative equipment and drugs within reach:

Suction machine to remove secretions so as to prevent blockage of airway.

There should be oxygen source because this patient usually has blocked airway which reduces air flow to the respiratory system therefore; the child will need oxygen administration. There should be endotracheal tube for intubation to make breathing easy incase the patient has severe blocked airway.

Observations

Vital signs will be checked and this will include temperature, pulse, respiration and blood pressure. These should be monitored closely to check if there changes which can denote improvement or deterioration of the patient's condition. Temperature will be monitored to see if it is increasing or reducing and an increase in temperature indicates that infection is still increasing and a reduction in temperature may indicate that infection is reducing which is a positive response to the antibiotics being administered.

Cough will be monitored and take note the type, breathe sounds, hoarseness, cyanosis, respiratory rate and character especially prolonged and labored respirations. If tracheostomy was performed the tube will be monitored for any blockage and also to ensure that it is in situ.

The child needs to be monitored for restlessness which can be due to reduced oxygen supply to the muscles. Temperature will be monitored to see if it is subsiding or increasing. The heart rate will be monitored well for any complications such as cardiac arrhythmias if it has been affected by the bacteria.

Monitor oxygen saturation and when needed, blood gases are obtained frequently to evaluate respiratory status.

Monitor hydration and nutrition status by monitoring the IV infussion, monitoring nasogastric or gastrostomy feeding, suctioning oropharyngeal secretions when indicated.

The general condition of the baby will be observed to note if there is any improvement or deterioration of the condition. , vital signs 1/2hourly to monitor the progress, frequency and duration. The child will be observed for cyanosis which shows reduced oxygen tissue perfusion. Degree of restlessness will also be observed as this may indicate hypoxia.

Position

The child will be positioned in such a way that the head is elevated to facilitate breathing. Sitting up position in bed is recommended because this will facilitate full lung expansion hence improve breathing.

Psychological Care

The illness will be explained to the parents to make them understand the child's illness therefore allaying parent's anxiety. The child and the parents will be kept together to prevent the child from crying which can provoke cough and worsen hoarseness of the voice. All procedures that are to be done on the child will be explained to the parents to keep them well informed.

Fluid Therapy

The child will be kept well hydrated by putting up a drip to prevent dehydration. The fluid balance chart will be maintained to prevent fluid overload and this will assist to monitor if kidneys are function well by checking the output.

Maintenance of Adequate Ventilation

The patient will be positioned in an infant seat or prop her up with a pillow this is to facilitate proper breathing.

Hygiene

Patient should be bathed daily in order to promote blood circulation as well as removing dirt from the patient's body. Oral toilet should be done twice daily to prevent complications of a dirty mouth (oral infections). Cleansing throat gargle may be ordered to clean and soothe the throat. Bed linens should be changed as necessary to keep the patient dry hence prevent pressure sore formation.

Nutrition

A well balanced diet will be given to the child. If the child is still breastfeeding then the mother will be encouraged to continue breastfeeding because breast milk has all necessary nutrients. She may be asked to express breast milk which will be given through cup and spoon.

In this condition feeding may be difficult hence an NG tube will be inserted to facilitate feeding and maintain nutrition status of the child. Liquid or soft diet, or parenteral fluid will be given to the child to maintain nutrition status.

Rest

The child may be restless due to reduced oxygen supply to the muscles therefore; oxygen will be administered to provide oxygen supply to the muscles hence reducing restlessness and this promotes patient's rest. The child will be kept calm to facilitate the little oxygen being used by the vital organs such as the brain and this facilitates psychological and physiological rest. Efforts should be made to control or eliminate disturbance of the child from sound, this can be achieved by minimizing noise on the ward and ensuring that all trolleys are well oiled to prevent loud noise. Unnecessary handling of the child should be avoided to prevent crying which can precipitate cough hence disturbing the patient rest. Procedures to be done on a patient should be planned well in such a way that periods of rest will be created to promote rest. Visitors should be restricted to promote patient's rest.

Medication

All prescribed drugs should be given at the right time, to the right patient, right dose and right route. The child will be given an analgesic or antipyretic such as paracetamol to relieve chest pains and to lower fever. Treatment with diphtheria antitoxin should be started on clinical suspicion without waiting for definitive laboratory confirmation. The dose of antitoxin depends on the site of primary infection, Pseudomembrane and the delay between the onset and antitoxin administration. The following doses will be given:

20,000-40,000 units for faacial diphtheria of less than 48 hours duration or cuteneous infection;
40,000-80,000 units for faacial diphtheria of more than 48 hours duration or laryngeal infection;
80,000-100,000 units for malignant diphtheria (bull neck, toxic state).

Complications

- Myocarditis (2nd week).
- Neuritis.

- Secondary complications include
- Aspiration from bulbar paralysis
- Bronchopneumonia from respiratory muscle dysfunction

Prevention

Childhood immunization is the prevention method of choice. Diphtheria/tetanus/pertussis (DTP) vaccine, given at ages 2, 4, and 6 months; at age 15-18 months; and at least 5 years later (age 4-6 y) is the immunization regimen recommended.

Poliomyelitis

Definition

Poliomyelitis is an acute infectious viral disease caused by enterovirus characterized by varying degree of **neuronal injury** with special localization in the **anterior horns** and the **motor nuclei** of the brain stem.

Poliomyelitis is an enteroviral infection that can manifest in 4 different forms: inapparent infection, abortive disease, nonparalytic poliomyelitis, and paralytic disease.

Cause

Poliomyelitis is caused by infection with a member of the genus Enterovirus known as poliovirus (PV). This group of RNA viruses colonize the gastrointestinal tract — specifically the oropharynx and the intestine.

Incubation Period

The incubation time (to the first signs and symptoms) ranges from three to 35 days, with a more common span of six to 20 days. PV infects and causes disease in humans alone.

Characteristics of Polio Virus

Its structure is very simple, composed of a single (+) sense RNA genome enclosed in a protein shell called a capsid. In addition to protecting the virus's genetic material, the capsid proteins enable poliovirus to infect certain types of cells.

Types of Polio Virus

There are three serotypes of poliovirus that have been identified:

- Type 1 (PV1),
- Type 2 (PV2), and
- Type 3 (PV3)

Each of the type has a slightly different capsid protein.

All three are extremely virulent and produce the same disease symptoms. PV1 is the most commonly encountered form, and the one most closely associated with paralysis.

Individuals who are exposed to the virus, either through infection or by immunization with polio vaccine, develop immunity.

In immune individuals, IgA antibodies against poliovirus are present in the tonsils and gastrointestinal tract, and are able to block virus replication; IgG and IgM antibodies against PV can prevent the spread of the virus to motor neurons of the central nervous system.

Infection or vaccination with one serotype of poliovirus does not provide immunity against the other serotypes, and full immunity requires exposure to each serotype.

Predisposing Factors

Factors that increase the risk of polio infection or affect the severity of the disease include: immune deficiency, malnutrition, tonsillectomy, physical activity immediately following the onset of paralysis, skeletal muscle injury due to injection of vaccines or therapeutic agents.

Pathophysiology

Poliovirus enters the body through the mouth, infecting the first cells it comes in contact with—the pharynx (throat) and intestinal mucosa. It gains entry by binding to an immunoglobulin-like receptor, known as the poliovirus receptor on the cell membrane. The virus then hijacks the host cell's own machinery, and begins to replicate. Poliovirus divides within gastrointestinal cells for about a week, from where it spreads to the tonsils (specifically the follicular dendritic cells residing within the tonsilar germinal centers), the intestinal lymphoid tissue including the M cells of Peyer's patches, and the deep cervical and mesenteric lymph nodes, where it multiplies abundantly. The virus is subsequently absorbed into the bloodstream. Known as viremia, the presence of virus in the bloodstream enables it to be widely distributed throughout the body.

Poliovirus can survive and multiply within the blood and lymphatics for long periods of time, sometimes as long as 17 weeks. Rarely, this may progress and the virus may invade the central nervous system, provoking a local inflammatory response.

In most cases this causes a self-limiting inflammation of the meninges, the layers of tissue surrounding the brain, which is known as non-paralytic aseptic meningitis. Penetration of the CNS provides no known benefit to the virus, and is quite possibly an incidental deviation of a normal gastrointestinal infection.

Transmission

Poliomyelitis is highly contagious via the oral-oral (oropharyngeal source) and fecal-oral (intestinal source) routes. Virus particles are excreted in the feces for several weeks following initial infection. The disease is transmitted primarily via the fecal-oral route, by ingesting contaminated food or water. Polio is most infectious between seven and 10 days before and after the appearance of symptoms, but transmission is possible as long as the virus remains in the saliva or feces.

Classification Of Poliomyelitis

Abortive Poliomyelitis

Abortive poliomyelitis is a mild form of the disease that lasts only from a few hours to a few days. If symptoms occur, they may include fever, headache, sore throat, fatigue, nausea, or vomiting—many of the symptoms typical of the flu. For the vast majority of people infected with the poliovirus, the illness gets no worse.

Nonparalytic Poliomyelitis

Poliovirus infection of nerve cells sometimes results in nonparalytic poliomyelitis—that is, polio without paralysis. Patients with nonparalytic polio experience the fever and other symptoms of abortive poliomyelitis. In addition, they typically feel pain and stiffness in the neck and back. They also may develop aseptic meningitis—inflammation of the membranes that surround the brain and spinal cord. Symptoms from nonparalytic polio usually subside within a week without causing lasting damage.

Paralytic Poliomyelitis

In about 1 or 2 percent of poliovirus infections, paralytic poliomyelitis, a disabling form of the disease, occurs. The virus infects motor neurons (nerve cells that send signals to muscles) in the spinal cord and damages or destroys them. The muscles that the neurons activate become painful and weak. Paralysis begins when the muscle is no longer able to move. Roughly 2 to 5 percent of infants who develop paralytic polio die.

Spinal Poliomyelitis:

In this type muscles are affected and the extent of the paralysis depends on the part of the spinal cord the poliovirus invades and the number of nerves affected.

The legs or arms are most often affected, and one side or both sides of the body may be involved. The older the person is when polio strikes, the more likely extensive paralysis becomes. In some cases paralysis of muscles that control breathing occurs, requiring mechanical breathing assistance (Artificial Respiration).

Bulbar Poliomyelitis.

In the most serious cases of paralytic polio, the virus attacks the brainstem, causing bulbar poliomyelitis. This type of polio can affect nerves that send signals to the ears, eyes, and the muscles controlling chewing and swallowing.

Sometimes the virus affects the part of the brain that controls the rate of breathing and the heartbeat, resulting in death. A combination is called **Bulbospinal**.

Clinical FEATURES

Early symptoms of paralytic polio include:

- High fever,
- Headache,
- Stiffness in the back and neck,
- Asymmetrical weakness of various muscles, sensitivity to touch,
- Difficulty swallowing,

- Muscle pain,
- Loss of superficial and deep reflexes, paresthesia (Pins and needles), i
- Irritability, constipation, or difficulty urinating.

Management Of Poliomyelitis

Investigations/Diagnosis

History

It is important to determine the source of the virus because for each reported case of paralytic polio caused by wild poliovirus. History of loss of motor function, and sensation, respiratory distress, headache, fever.

Physical examinations

Assesses tendon reflex to exclude paralysis and prick examination to exclude loss of sensation

Laboratory investigations

The diagnosis of polio is by :

Isolating the virus in throat cultures, stool samples,

Samples of cerebrospinal fluid (CSF) taken from an infected person through a Lumbar Puncture reveals an increased number of white blood cells (primarily lymphocytes) and a mildly elevated protein level.

Detection of virus in the CSF is diagnostic of paralytic polio, using the PCR amplification, to determine whether it is "wild type" (that is, the virus encountered in nature) or "vaccine type" (derived from a strain of poliovirus used to produce polio vaccine);

Blood tests that identify antibodies to the poliovirus also confirm a diagnosis.

Treatment

There is no cure for polio. The focus of modern treatment has been on providing relief of symptoms, speeding recovery and preventing complications.. Supportive measures include antibiotics to prevent infections in weakened muscles, analgesics for pain, moderate exercise and a nutritious diet.

Treatment of polio often requires long-term rehabilitation, including physical therapy, braces, corrective shoes and, in some cases, orthopedic surgery.

Portable ventilators may be required to support breathing. Ventilator, can be used to artificially maintain respiration during an acute polio infection until a person could breathe independently.

Nursing care

Aims

To relieve pain

To prevent complications

To maintain nutritional status

Environment

The patient should be isolated (Reverse Isolation) because the patient is highly infectious and susceptible to infections. Visitors should be restricted to prevent patient from getting infection as well as to enable patient to rest. The environment should consist of resuscitative equipment such as ventilators. The room should be clean to prevent further infections, warm to prevent hypothermia and well ventilated to allow free flow of fresh air.

Position – the patient should be propped up because of dyspnea. This position will enable patient breath properly as it facilitates full lung expansion.

Observations

Observation of vital signs should be done 4 hourly ie temperature, pulse, respirations.

Observe for bleeding gums.

Side- effects of the drugs.

Observe if patient is constipated or not.

Strict input and output of fluids.

Observe for muscle wasting, paralysis of the limbs.

Nutritional status.

Observe if patient is eating/ breastfeeding if not put up a nasogastric tube for feeds.

Observe for pain and administer analgesics to relieve pain.

Nutrition and Diet.

The patient should be given a high protein diet to help in body repair, growth and prevent malnutrition to set in.

Also give a lot of vitamins and roughage to prevent constipation.

Give foods rich in iron and folic acid such as Milk, eggs, meat etc. Give a lot of fluids for adequate hydration and prevention of constipation.

Prevention of infection.

Patient should be isolated (reverse isolation.)

There should be strict observation of personal hygiene. E.g. hand washing before procedures, use of aseptic technique, use clean utensils and food should be prepared and served hygienically.

Hygiene.

Daily bed bath should be done.

Mouth care should be observed twice daily.

Pressure area care should be done to prevent pressure sore formation.

Soiled bed linen should be promptly changed.

Elimination.

Constipation should be prevented by giving a lot of fluids and roughage.

This is because constipation brings about straining at stool which is not desired as we are trying to conserve patient's energy.

Information Education and Communication

Explain about the nature of the disease in a simple way for the mother patient to easily understand.

Give advice to the mother that treatment of polio often requires long-term rehabilitation, including physical therapy and that orthopedic surgery may be required.

Measures to avoid infection e.g. avoid overcrowded places, practicing personal hygiene and keeping home environment clean to prevent other infections which can lead to complications.

Exercises

Massage and passive motion exercises will be encouraged to strengthen the muscles. This should be done gently because the patient is always in pain.

Diet

Encourage parents/guardians to offer patient food rich in proteins, a lot of fruits and vegetables for vitamins and to take a lot of water. Regular review as this is a chronic condition.

Complications

- Myocarditis
- Hypertension
- Pulmonary oedema
- Shock
- Nosocomial pneumonias
- Urinary tract infections

Emotional problems

Severe paralytic disease

Prevention Of Poliomyelitis

Prevention is through immunization

A child receives oral polio vaccine

Two vaccines are used throughout the world to combat polio. Both vaccines induce immunity to polio, efficiently blocking person-to-person transmission of wild poliovirus, thereby protecting both individual vaccine recipients and the wider community. A single dose of oral polio vaccine produces immunity to all three poliovirus serotypes in approximately 50% of recipients. Three doses of live-attenuated OPV produce protective antibody to all three poliovirus types in more than 95% of recipients.

Mumps

Definition

Mumps is an acute, self-limited, systemic viral illness characterized by the swelling of one or more of the salivary glands, typically the parotid glands.

Cause

The illness is caused by a specific RNA virus, known as Rubulavirus.

Family of the Virus

Rubulavirus is in the genus Paramyxovirus and is a member of the family Paramyxoviridae.

Characteristics of the Virus

The virus contains a single-stranded, negative-sense RNA surrounded by a glycoprotein envelope. One of the 2 glycoproteins on the surface of the viral envelope mediates neuraminidase and hemagglutination activity, whereas the other is responsible for lipid membrane fusion to the host cell.

Rubulavirus may be isolated in viral culture from saliva, urine, and cerebrospinal fluid (CSF). Serologic assays can determine the presence of an antibody response and assess differences between acute and convalescent titers. Affected salivary glands show edema and lymphocytic infiltration.

The mumps virus shares various epidemiologic characteristics with other well-known viral pediatric diseases, such as measles (RNA virus, of the genus Morbillivirus, in the Paramyxoviridae family) and rubella (RNA virus, of the genus Rubivirus, in the Togaviridae family).

Epidemiology

Mumps occurs worldwide. Humans are the only known natural hosts. They do not usually affect children younger than 1 year.

This Paramyxovirus is highly infectious to nonimmune individuals and is the only cause of epidemic parotitis.

Transmission

Humans are the sole reservoir for the mumps virus. The transmission mode is person to person via respiratory droplets and saliva, direct contact.

Reason for not affecting children younger than 1 year

The reason is that presence of maternal antibodies typically protects infants younger than 1 year from the disease.

Incubation period

Mumps has an incubation period of 16-18 days; however, cases can occur from 12-25 days after exposure.

Signs and symptoms

Prodromal symptoms (including low-grade fever, malaise, myalgias, headache, and anorexia) occur; these symptoms can last 3-5 days. After this prodromal period (about 48 h), the clinical path of the virus depends on which organ is affected.

After the prodromal period, one or both parotid glands begin to enlarge. Initially, local parotid tenderness and same-sided earache can occur. Ordinarily, the parotid glands are not palpable; but in patients with mumps, parotid swelling increases rapidly over several days. Seventy to 80% of symptomatic cases are bilateral with unilateral swelling occurring first, followed by bilateral parotid involvement.

Parotitis is caused by the direct viral infection of the ductal epithelium and presents with localized inflammation. Other affected sites of infection are the testes, pancreas, eyes, ovaries, central nervous system (CNS), joints, and kidneys.

Period Of Infectiousness

A patient is considered infectious from about 3 days before the onset of and up to 4 days after the start of active parotitis (although it has been suggested that the communicable period is actually longer, lasting from 6thday before to 9thday after facial swelling is apparent).

Occasionally, simultaneous involvement of both glands occurs. Edema over the parotid gland presents with nondiscrete borders, pain with pressure, and the angle of the mandible obscured. The orifice of the Stensen duct also appears erythematous and enlarged. Parotid swelling can last for 10 days. Serologically, this inflammatory process can be confirmed with an elevated salivary amylase level.

Approximately one third of post pubertal male patients develop unilateral orchitis. Orchitis is considered the most common complication of mumps infection in the adult male. This inflammation usually follows parotitis but may precede or occur in the absence of parotid gland swelling.

Orchitis usually appears during the first week of parotitis, but it can occur in the second or third week. Bilateral orchitis occurs much less frequently (about 10% of cases). Gonadal atrophy may follow orchitis, posing a greater risk with bilateral involvement; however, sterility is rare. Prepubertal boys may develop orchitis, but it is uncommon in boys younger than 10 years.

Orchitis presents with high fevers (39-41°C), severe testicular pain accompanied by swelling, and erythema of the scrotum. Nausea, vomiting, and abdominal pain are not uncommon. Fever and gonadal swelling usually resolve in 1 week, but tenderness may persist.

Another clinical manifestations of mumps is acute pancreatitis. Pancreatitis presents with abdominal distention and pain, fever (typically low grade), nausea, and vomiting. An elevated serum lipase value supports this diagnosis. In post pubertal females, oophoritis occurs in about 7% of patients. Thyroiditis and mastitis have also been reported.

CNS involvement is the most common extrasalivary complication of this viral illness. Its presentation is most often as aseptic meningitis rather than as a true encephalitis. This complication usually presents within the first week after parotid swelling.

Neuritis of the auditory nerve may result in sensorineural deafness. A sudden onset of tinnitus, ataxia, and vomiting is followed by permanent deafness. Other neurologic complications include facial nerve neuritis and myelitis.

Mumps in infancy

Maternal transplacental antibodies are protective of infants up to age 12 months. Infants born to mothers who have mumps a week prior to delivery may have clinically apparent mumps at birth or develop illness in the neonatal period.

Pathophysiology

After the initial entry into the respiratory system, the virus replicates locally. Viremic dissemination then occurs to target tissues, such as the salivary glands (parotid glands) and extrasalivary locations (CNS). A secondary phase of viremia, occurring before the immune response, is the result of replication of the virus at the target organs.

Viruria is also common, via blood transmission of the virus into the kidneys, where active replication occurs. Therefore, impairment of renal function (glomerulonephritis) may occur.

Cell necrosis and inflammation with mononuclear cell infiltration is the tissue response.

Salivary glands show edema and desquamation of necrotic epithelial cells lining the ducts. Focal hemorrhage and destruction of germinal epithelium may occur, leading to duct plugging.

Risk FACTORS

Lack of immunization

International travel, and immune deficiencies can make a child more prone to infection by the Paramyxovirus mumps virus.

Management

Diagnostic Considerations

Approximately 10% of all infected patients develop a mild form of aseptic meningitis, which clinically can be confused with bacterial meningitis. Encephalitis, transient myelitis, and polyneuritis are rare.

Conditions to be considered in the differential diagnosis of mumps include the following:

Viral pathologies (ie, uveoparotid fever, coxsackievirus, influenza A virus, parainfluenza virus, cytomegalovirus, adenovirus, Epstein-Barr virus, varicella-zoster virus)

Suppurative (bacterial, especially *Staphylococcus aureus*) or recurrent parotitis

Parotid calculus

Parotitis (different etiologies)

Mixed tumors, hemangiomas, lymphangiomas of the parotid gland

Calculus of the Stensen duct

Adenitis (cervical lymphadenitis)

Mastoiditis

Orchitis

Epididymitis

Ovarian Torsion

Mikulicz syndrome

Drug reactions (thiazide diuretics)

Allergic reaction (rare)

Laboratory Studies

Serum amylase is elevated in mumps parotitis (amylase-S) and pancreatitis (amylase-P). Serum lipase is elevated in pancreatitis.

A complete blood cell (CBC) count reveals a normal, decreased, or elevated white blood cell (WBC) count, with the differential reflecting a relative lymphocytosis.

Viruria is present, even in uncomplicated mumps, with the virus detected during the first 2 weeks of illness.

Mumps virus can be isolated from nasopharyngeal swabs, blood, and fluid from buccal cavity typically from 7 days before up until 9 days after the onset of parotitis. Mumps virus can be isolated in a cell culture inoculated with throat washings, urine, or spinal fluid. Spinal fluid as part of CNS infections usually exhibits a lymphocytic pleocytosis. Polymerase chain reaction (PCR) assay of the CSF can be used to detect viral mumps RNA and fosters a rapid confirmation for the diagnosis.

Mumps infection can be confirmed by demonstrating a significant rise in mumps-specific immunoglobulin G (IgG) antibody titers between acute and convalescent sera specimens or a positive mumps immunoglobulin M (IgM) titer. IgG titer can be detected by complement fixation, hemagglutination inhibition, or enzyme immunoassay. Interpretation of titer rise may have limitations because of mumps cross-reaction with parainfluenza viruses.

In mumps orchitis, an elevated serum C-reactive protein (an inflammatory marker) may be found.

Imaging Studies

No specific imaging studies are diagnostic.

Imaging studies may be needed as a further workup with certain complications of mumps. If there is concern for meningitis or encephalitis, prior to lumbar puncture, head computed

tomography (CT) scanning without contrast should be considered. Testicular ultrasonography must be performed when acute orchitis is found clinically, with specific indication to rule out torsion.

Approach Considerations

Mumps without associated major complications can be managed on an outpatient basis with supportive care and good follow up.

If a patient has been diagnosed with mumps he should be isolated for 5 days from the onset of symptoms.

Medical CARE

Conservative, supportive medical therapy is indicated in patients with mumps. No antiviral agent is indicated for viral illness, as it is a self-limited disease.

Generous offering of fluids is essential, because maintenance of adequate hydration and alimentation of patients are important.

Foods and liquids which are acidic should be avoided as they may cause swallowing difficulty, as well as gastric irritation.

Prescribe analgesics (acetaminophen, ibuprofen) for severe headaches or discomfort due to parotitis. Topical application of warm or cold packs to the swollen parotid may soothe the area. Stronger analgesics may be required for patients with orchitis. Bed rest, scrotal support, and ice packs are recommended.

Diet and Activity

A light diet with generous fluid intake is recommended.

Avoiding acid-containing foods (eg, tomato, vinegar-containing food additives) and liquids (eg, orange juice) is beneficial for pain reduction.

Bed rest is recommended to foster a faster recovery and is indicated for patients with complicated cases.

Nursing care

- 1-Isolation until swelling subside.
 - 2-Bed rest until swelling subside.
 - 3-Liquid or soft food, restrict food containing acid.
 - 4-Local application of heat to salivary gland to reduce discomfort.
- Optimal oral hygiene

Prevention

- The principal strategy to prevent mumps is to achieve and maintain high immunization levels, primarily in infants and young children. Universal immunization as part of good health care should be routinely carried out in public health clinics.
- Programs aimed at vaccinating children with MMR should be established and maintained in all communities. In addition, all other persons thought to be susceptible should be vaccinated, unless otherwise contraindicated. This is especially important for adolescents and young adults in light of the observed increased risk of disease in these populations.
- If a case of mumps occurs in a childcare facility, notify the local health department and parents. Make sure all children and adults follow good handwashing practices. In large facilities, follow appropriate group separation practices.
- Review the immunization records of all children in the facility to assure that they have received their first mumps vaccination. Those not adequately vaccinated should be referred to their physicians. Closely observe all children for symptoms and refer anyone developing symptoms to his or her physician.

Vaccination

Susceptible children, adolescents, and adults should be vaccinated against mumps, unless vaccination is contraindicated. Mumps vaccine is of particular value for children approaching puberty and for adolescents and adults who have not had mumps.

The MMR vaccine is the vaccine of choice for routine administration and should be used in all situations in which recipients are also likely to be susceptible to measles, rubella, or both. The favorable benefit-to-cost ratio for routine mumps immunization is more marked when vaccine is administered as MMR.

Persons should be considered susceptible to mumps unless they have documentation of (1) physician-diagnosed mumps, (2) adequate immunization with live mumps virus vaccine on or after their first birthday, or (3) laboratory evidence of immunity.

Patient EDUCATION

Advise parents and educators to exclude the infected child from large-population facilities until 9 days after parotid swelling begins or until this swelling subsides.

Advise all children and adults to follow good hand washing practices.

Complications

Potential complications of mumps include the following:

- Meningitis/encephalitis
- Sensorineural hearing loss/deafness
- Transverse myelitis
- Polyneuritis
- Guillain-Barré syndrome
- Cerebellar ataxia (with encephalitis)
- Keratouveitis
- Thyroiditis
- Myocarditis
- Mastitis
- Pneumonia
- Pancreatitis
- Nephritis
- Orchitis
- Oophoritis
- Arthritis
- Thrombocytopenia purpura

UNIT 6: DEVIATION FROM NORMAL GROWTH AND DEVELOPMENT

6.1 Introduction

Congenital anomalies are structural anomalies present at birth. They may be obvious on examination of the newborn or they may be detected by histological structures. One reason why more deaths occur in the first months than during the remaining months of the first year of life is that many Pediatric Nursing and child health care

61 congenital abnormalities are compatible with intrauterine life, but not with extra-uterine life approximately 15 % of death in the neonatal period care caused by such gross malformations.

6.2 Unit Objectives

At the end of this unit you should able to:

1. Define deviation from normal growth and development
2. Assess the child with disability
3. Identify disabilities in a child

6.3 Discuss the management of the child with congenital abnormalities
Definition of deviation from normal growth and development

DEVIATION FROM NORMAL GROWTH AND DEVELOPMENT

Growth

This is the increase in body size of an organism

Development

It is the progressive change in an individual adaptation to the environment which includes physical, intellectual, social and emotional aspects of one's behavior.

Therefore, deviation from normal growth and development is when there is no progressive increase in size of a child or parts of a child. Deviation from normal development is when there is no progressive acquisition of various skills (abilities) such as head support, speaking, learning, expressing one's feelings and cannot tolerate with other people.

6.4 Assessment of a child with disability

An assessment is a continuous process of collecting and organizing relevant information in order to plan and implement effective treatment (Hockenberry, 2004).

The physician and the nurse are important members of the professional team that work with disabled children. This team must have the skill and knowledge to contribute to the assessment of children because the assessment of children is the professional responsibility that serves the purpose of keeping the therapist's work correct. It is important for therapists to base their treatment recommendations on appropriate tools of assessment. Children may present with a wide variety of behavioral difficulties and the physician and the nurse must determine how best they should help them to perform to the fullest potential. Knowledge of the normal, orderly sequence of developmental achievement and patterns of integration is the basis upon which significant deviation in maturation is gauged. Therefore, it is important that a nurse is knowledgeable the normal developmental stages in a child as presented in chapter 2. Understanding this developmental scope lays the basis for therapeutic interventions. Developmental milestone presents the major clinical parameters of progressive growth and integration in the central nervous system. It is important to focus on those aspects of motor behaviour that are of great concern.

Assessment

Refer to unit 2 under subheading 2.5 which looks at full physical assessment of a child.

6.5 Identification of disabilities in a child

A disability is a physical or mental condition that limits a person's movements, senses or activities. Or it can also be defined by WHO as any restriction or lack of ability to perform an activity in the manna or within the range considered normal for a human being (Hockenberry, 2004). A good understanding of normal child development helps to identify children who are not developing as expected, to plan training and to check on progress. Good assessment guidelines are a key to identification of disabilities in children. For example, the following needs to be done:

- Parents must give a written informed consent for legal protection to the
- Take proper history according to date and age of a child and type of delivery
- Watch what a child can do and what cannot do in relation to the age
- Carry out a full physical examination as stipulated in unit 2. It is through a thoroughly physical examination that most of the disabilities will be identified.
- In the early stages of life the child should be able to do certain things with respect to age. Any deviation may mean that something is wrong.

- It is also important to use the developmental charts that show the age at which some activities develop. Failure of the child to do those activities at that particular age would mean that something is wrong. Also assess the child for the following:
 - Health
 - vision and hearing
 - social and emotional status
 - general intelligence
 - academic performance
 - communicative status
 - motor abilities

- Try to work out the reason for a particular difficulty.

Self evaluation 1

Now learners, having discussed this topic, iam asking if you can define these terms:

- Growth
- Development
- Disability
- Assessment

Good, we can now compare our answers with what we have discussed below

Answers to the above questions

- Growth is the increase in body size of an organism
- Development is the progressive change in an individual adaptation to the environment which includes physical, intellectual, social and emotional aspects of one's behavior.
- Disability is any restriction or lack of ability to perform an activity in the manna or within the range considered normal for a human being.

- It can also be defined as a physical or mental condition that limits a person's movements, senses or activities.
- **An assessment is a continuous process of collecting and organizing relevant information in order to plan and implement effective treatment.**

6.6 Management of a child with congenital abnormalities

Types of congenital abnormalities

- Cleft lip and palate
- Malformation of oesophagus
- Oesophageal atresia
- Hypertrophic and pyloric stenosis
- Malformation of the gut
- Imperforated anus
- Malformation of the brain and spinal cord

Phimosis

- Undescended testes
- Epispadius
- Hypospadius

Malformation of the mouth**Cleft lip and palate**

Cleft lip and palate are congenital deformities due to the failure of various parts of the upper lip and palate to fuse in the normal manner. They are usually caused by abnormal facial

development during pregnancy. Both may be present together. Cleft lip is operated on about the age of three months, cleft palate about the age of one year before speech detects have developed.

Risk factors to cleft lip and palate

- Genetic and hereditary factors are attributed to formation of clefts
- Environmental influences may also cause, or interact with genetics to produce orofacial clefting due to gene mutation. E.g. exposure to chemicals such as lead.
- Smoking as it can lead to hypoxia
- Reduced intake of vitamins by the mother especially Vt A.
- Intake of certain drugs in pregnancy, such as heroin, cocaine or certain anticonvulsants such as as topiramate or valproic acid .
- Maternal conditions such as oligohydramnios.
- Metabolic diseases such as Diabetes Mellitus

Diagnosis

- Traditionally, the diagnosis is made at the time of birth through physical examination.
- Recent advances in prenatal diagnosis have allowed obstetricians to diagnose facial clefts in utero using ultra sound scan.

Cleft lip (CHEILOSCHISIS)

- A cleft is a fissure, opening or gap. It may be unilateral or bilateral and may be extended up into nostril. The condition is due to the failure of fusion of the maxillary and medial nasal processes (Stanfied & Bwino, 2010). If the fissure does not affect the palate structure of the mouth it is referred to as Cleft lip. Cleft lip is formed in the top of the lip as either a small slit or a depression in the lip (partial or incomplete cleft) or it continues into the nose (complete cleft).



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Surgical management

Pre-operative care

The child should be admitted several days before operation and observed for signs of a cold, as operation should be delayed if this is present. Prior to surgery, a complete physical examination is done and investigations are carried out.

Throat swabs should be taken. Blood is taken for estimation of the haemoglobin levels. The hemoglobin must be 70% before operation is undertaken. The child is trained in spoon feeding, putting the feeds well to the back of the tongue. The child is trained to have elbows restrained to gain co-operation post-operatively.

Operation done-Cheiloplasty

The surgeon pares the edges and stitches them together

Specific post-operative care The major effort in the post-operative period is directed towards protecting the operative site. After cleft lip repair, a metal appliance or adhesive strips are applied to the cheeks to relax the surgical site and to prevent tension on the suture line caused by crying or other facial movements. Restrain the elbow to prevent the infant from rubbing or disturbing the suture line. Remove elbow restraints periodically to exercise the arms, to provide relief from restrictions, to observe the skin for signs of irritation and to provide an opportunity for mother-child bonding. Allow the child to sit in a chair to promote circulation. Give adequate analgesia to prevent post-operative pain. Offer clear liquids when fully awake. Allow the child to resume feeding when fully awake and as tolerated. Cleanse the suture line with normal saline. A topical antibiotic may be prescribed to prevent infection. The stitches are removed on the 3-5th day post-operatively. No visitors with colds should visit the child.

Cleft palate (PALATOSCHISIS)

Definition

A condition in which the two plates of the skull that form the hard palate are not fused completely (Stanfied & Bwino, 2010)

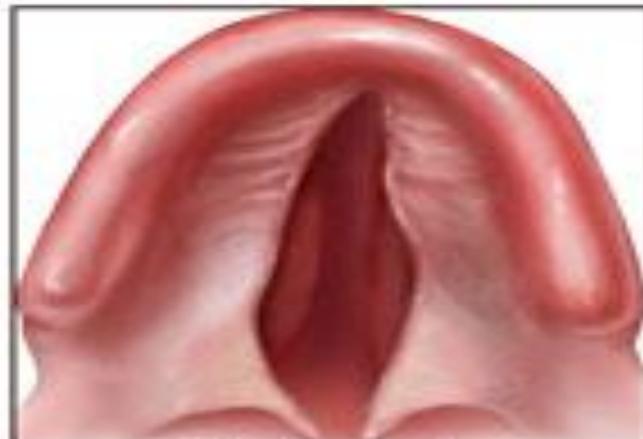
The soft palate in this case is divided as well. It can occur as Complete (soft and hard palate, possibly including a gap in the jaw) or Incomplete (a fissure in the roof of the mouth, usually as a cleft soft palate). Cleft Palate occurs due to failure of fusion of the lateral palatine processes, nasal septum, and/or the median palatine processes (formation of the secondary palate).



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Baby with cleft palate



Cleft palate

It is treated similarly by paring the edges and suturing after cutting on either side.

Pre-operative care

The child should be admitted well before operation to be accustomed with the environment. He should be trained on spoon feeding. His general condition must be improved and he must not be exposed to infection. Prior to surgery, a complete physical examination is done and investigations are carried out. Signs of oral, respiratory or systemic infections are looked out for because the cleft may act as a portal of entry for microorganisms. A throat swab in this case may be taken for microscopy, culture and sensitivity. Blood is collected for estimation of the haemoglobin levels.

Nutrition

The nutritional status of the child should be assessed

An infant with a cleft palate will have greater success feeding in a more upright position; gravity will help prevent milk from coming through the nose.

Gravity feeding can be accomplished by using specialized equipment, such as the Haberman feeder.

A medicine dropper can be used if the Haberman feeder is unavailable.



Care during surgery

Often a cleft palate is temporarily covered by a Palatal obturator (a prosthetic device made to fit the roof of the mouth covering the gap). The procedure is called palatoplast. Cleft palate would then be corrected by single or a series of surgery, usually performed between 6 and 12 months. If the cleft extends into the maxillary alveolar ridge, the gap is usually corrected by filling the gap with bone tissue. The bone tissue can be acquired from the baby's own chin, rib or hip. If the cleft is bilateral and extensive, two surgeries may be required to close the cleft, one side first, and the second side a few weeks later.

Specific post-operative care The child with cleft palate repair is allowed to lie on the abdomen immediately after surgery. The child may resume feeding by bottle, breast or cup shortly after surgery. Oral packing may be secured to the palate after palatoplast. This packing is usually removed after 2-3 days. Sometimes the child may have difficulties in breathing following surgery. This is normal as the child is trying to adjust to breathing through the nose.

Arms must be splinted or restrained to keep the hands away from the mouth.. Instruct the parents to maintain elbow restraints at home until the palate is healed usually 4-6 weeks. Instruct the

parents to remove the restraints at regular intervals to allow the child to exercise the arms. Assess the infant for the levels of post-operative pain for possible administration of analgesics. Order children are discharged on a soft diet until healing has taken place. Soft feeds are given by spoon placed well back on the tongue and followed by sterile water.

Complications of unrepaired cleft lip and palate

- Difficulty feeding
- Malnutrition
- Ear infections and hearing loss
- Dental problems
- Speech difficulties
- Challenges of coping with a medical condition

Self evaluation test 2-Completion: Fill in the blank spaces with the appropriate words

- a)is a condition in which the two plates of the skull that form the hard palate are not fused completely
- b) A surgical procedure used to repair cleft lip is called
- c) An infant with a cleft palate will have greater success feeding in a more position;
- d) A fissure, opening or gap is called

Good work, you can now go through your work by checking the correct answers

Answers to the above questions

- i. Cleft palate
- ii. Cheiloplasty
- iii. Upright
- iv. Cleft

Malformation of oesophagus

Esophageal atresia

Definition is a congenital medical condition (birth defect) which affects the alimentary tract.

Or **Oesophageal atresia** is a congenital medical condition (birth defect) which affects the alimentary tract and it is characterised by failure of the oesophagus to develop as a continuous passage ending as a blind pouch rather than connecting normally to the stomach.

It comprises a variety of congenital anatomic defects that are caused by an abnormal embryological development of the esophagus. This causes obstruction of the oesophagus with interruption of the continuity of the oesophageal wall

This birth defect arises in the fourth fetal week, when the trachea and esophagus should begin to separate from each other. It can be associated with disorders of the tracheoesophageal septum. Other birth defects may co-exist, particularly in the heart, but sometimes also in the anus, spinal column, or kidneys. This is known as VACTERL association because of the involvement of Vertebral column, Anorectal, Cardiac, Tracheal, Esophageal, Renal, and Limbs. It is associated with polyhydramnios in the third trimester.

Diagnosis

Ultrasound: This condition is visible, after about 26 weeks, on an ultrasound. On antenatal USG, the finding of an absent or small stomach in the setting of polyhydramnios used to be considered suspicious of esophageal atresia. However, these findings have a low positive predictive value.

Plain X-ray of the chest and abdomen showing a feeding tube unable to move beyond an upper esophageal pouch.

Physical examination: The upper neck pouch sign is another sign that helps in the antenatal diagnosis of esophageal atresia and it may be detected soon after birth as the affected infant will be unable to swallow its own saliva. Also, the newborn can present with gastric distention, cough, apnea, tachypnea, and cyanosis. In many types of esophageal atresia, a feeding tube will not pass through the esophagus.

Treatment

Treatments for the condition vary depending on its severity. The most immediate and effective treatment in the majority of cases is a surgical repair to close the fistula/s and reconnect the two ends of the esophagus to each other. Although this is usually done through an incision between the ribs on right side of the baby, a technique using three small incisions (thoracoscopy) is being used at some centers. In a minority of cases, the gap between upper and lower esophageal segments may be too long to bridge. In some of these so-called long gap cases, though, an advanced surgical treatment developed by John Foker, MD, may be utilized to elongate and then join together the short esophageal segments. Using the Foker technique, surgeons place traction sutures in the tiny esophageal ends and increase the tension on these sutures daily until the ends are close enough to be sewn together. The result is a normally functioning esophagus, virtually indistinguishable from one congenitally well formed.

Complications before surgery

- Aspiration: Any attempt at feeding could cause aspiration pneumonia as the milk collects in the blind pouch and overflows into the trachea and lungs.
- Furthermore, a fistula between the lower esophagus and trachea may allow stomach acid to flow into the lungs and cause damage. Because of these dangers, the condition must be treated as soon as possible after birth.

Post-operative complications:

- A leak at the site of closure of the esophagus.
- Sometimes a stricture, or tight spot, will develop in the esophagus, making it difficult to swallow. This can usually be dilated using medical instruments.
- In later life, most children with this disorder will have some trouble with either swallowing or heartburn or both.

MALFORMATION OF THE GUT

a) Imperforate anus

Definition

A birth defect in which the rectum is a blind alley and there is no anus (Stanfied & Bwino, 2010)

The rectum may end in a blind pouch that does not connect with the colon.

The rectum may have openings to the urethra, bladder, base of the penis or scrotum in boys, or vagina in girls. Or there may be narrowing (Sternosis) of the anus or no anus.

Causes/risk factors

- The problem is caused by abnormal development of the fetus.
- Many forms occur with other birth defects.

Incidence

- Occurs in about 1 out of 5,000 infants.

Clinical features

- Missing anal opening
- No passage of meconium within 24 to 48 hrs. after birth.
- Distended abdomen
- Stool comes out through the vagina, base of penis, scrotum, or urethra.
- Restlessness and crying most of the times.

Diagnosis

- Through history gotten from the mother that the baby has not yet passed meconium.
- On physical examination of the newborn.
- Imaging tests using contrast media to assess association of the rectum with surrounding organs like the vagina, urethra or urinary bladder.

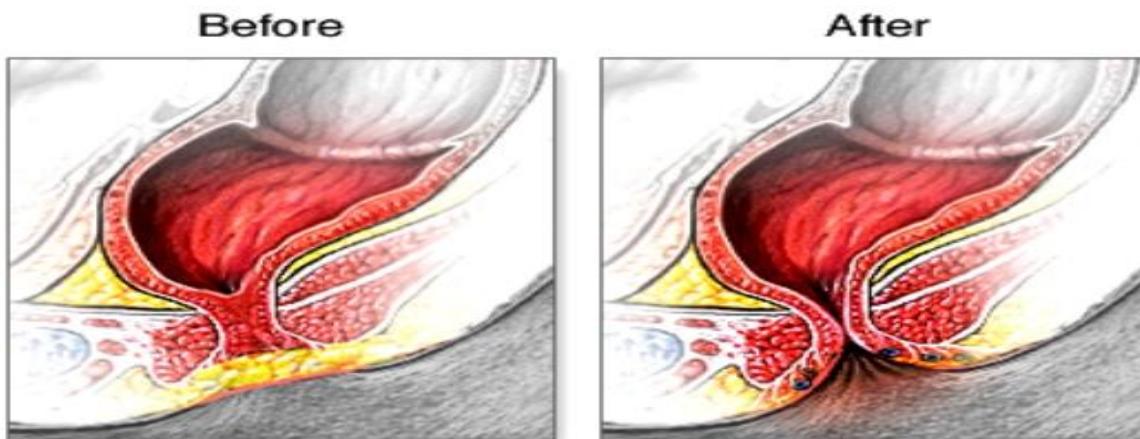
Management

- Investigate for other conditions, especially those affecting the genitals, urinary tract, and spine.
- Surgery to correct the defect is needed.

- If the rectum connects with other organs, these organs will also need to be repaired.
- A temporary Colostomy may be necessary to allow for healing.

Nursing care

- Role of the nurse throughout management is to offer psychological support to the parents of the baby and significant others in order to allay anxiety and promote cooperation.
- All procedures and investigations should be explained to the mother and appropriate consent obtained before surgical intervention.
- Role of the nurse throughout management is to offer psychological support to the parents of the baby and significant others in order to allay anxiety and promote cooperation.
- All procedures and investigations should be explained to the mother and appropriate consent obtained before surgical intervention.



 ADAM

b) Congenital Hypertrophic pyloric stenosis

This is a common surgical condition of the intestinal tract in infancy. It occurs most frequently in some family strain, in firstborn infants, and in males. Pathologically, there is an increase in size of the circular musculature of the pylorus. The musculature is greatly thickened, and the resulting

tumor like mass constricts the lumen of the pyloric canal. This impedes emptying of the stomach content through the constricted pylorus.

Clinical manifestations and x-ray, finding

The symptoms appear in infants 2-4 weeks old. The initial symptom is vomiting during and after feeding. The vomiting is at first mild, becomes progressively more forceful until it is projectile. Since little of the feeding is retained the infant is always hungry. There is either failure to gain weight or loss of weight. The signs of pyloric stenosis, dehydration with poor skin turgor, distention of the epigastrium and an olive-shaped mass, located by palpation, in the right upper quadrant of the abdomen. If barium is added to the feeding, an x-ray film will show the enlargement of the stomach, and the narrowing and enlargement of the pylorus, increased peristaltic waves, and an abnormal retention of the barium in the stomach.

Treatment

Pyloromyotomy involving longitudinal splitting

Self evaluation test 3

Well class thank you for your good participation. Now do the following assignment by Putting true or false in the following blank spaces:

1.In esophageal atresia the oesophagus ends as a blind pouch rather than connecting abnormally to the stomach.
2. Pyloromyotomy is the treatment for Congenital Hypertrophic pyloric stenosis
3.a colostomy serves as a permanent measure after surgery due to imperforate anus
4. Aspiration is not one of the complications of esophageal atresia before surgery
5.Imperforate anus is a birth defect in which a rectum ends as a blind pouch.

6.In imperforate anus sometimes stool comes out through the vagina, base of penis, scrotum, or urethra.

Answers to the above questions

1. F

2. T

3. F

4. F

5. T

6. T

Malformation of the brain and spinal cord

Spinal bifida

Definition

Spinal bifida (Latin: "split spine") is a developmental birth defect caused by the incomplete closure of the embryonic neural tube (<http://www.spinabifidaassociation.org/site>)

Some vertebrae overlying the spinal cord are not fully formed and remain unfused and open. If the opening is large enough, this allows a portion of the spinal cord to stick out through the opening in the bones. There may or may not be a fluid filled sac surrounding the spinal cord. The most common location of the malformations is the lumbar and sacral areas.

Cause

The real cause is not known

Predisposing factors

Spinal bifida is associated with vitamin B and folic acid deficiency.

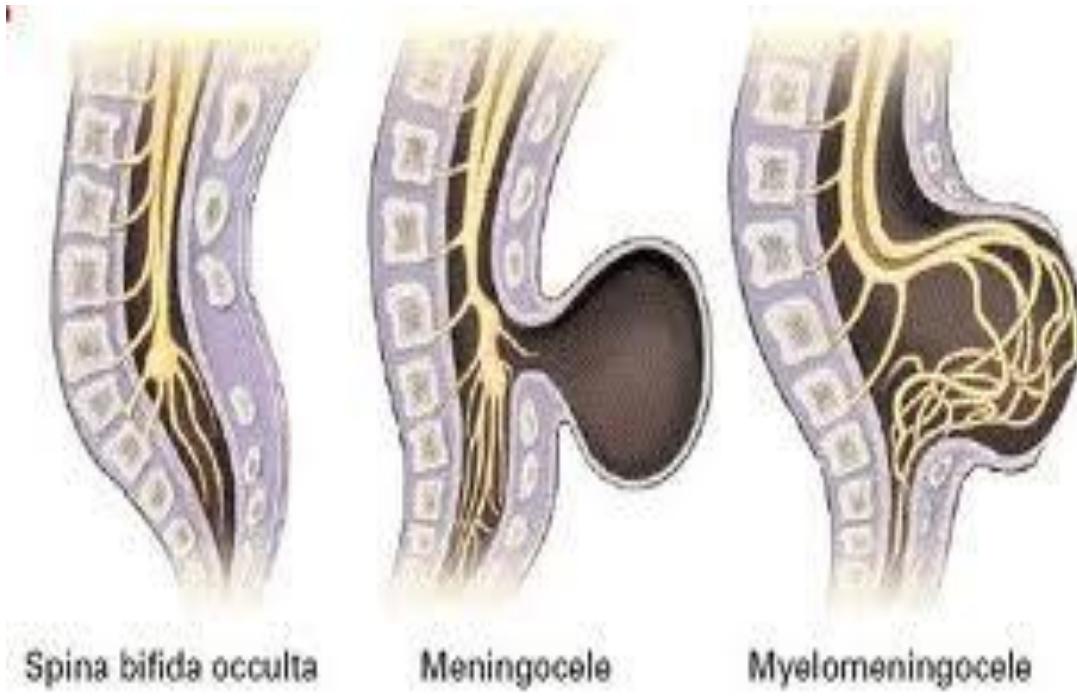
Incidence

- Spinal bifida is one of the most common birth defects, with an average worldwide incidence of 1–2 cases per 1000 births, but certain populations have a significantly greater risk

Types of spinal bifida

There are different types of spinal bifida and these include:

- Spinal bifida occulta
- Spinal bifida cystica
- Meningocele
- Meningomyelocele



Spina bifida occulta

Meningocele

Myelomeningocele

c) Spinal bifida occulta

Occulta is Latin for "hidden". This is one of the mildest forms of spinal bifida. In occulta, the outer parts of some of the vertebrae are not completely closed. The split in the vertebrae is so small that the spinal cord does not protrude. The skin at the site of the lesion may be normal, or it may have some hair growing from it; there may be a dimple in the skin, a lipoma, a dermal sinus or a birthmark. Many people with the mildest form

of this type of spinal bifida do not even know they have it, as the disease is asymptomatic in most cases. There is weakness or atrophy of one or both lower limbs.

The diagnosis is made by ultrasound results and it also rules out any associated spinal cord involvement.

d) Spinal bifida cystica

A cyst protrudes through the defect in the vertebral arch. These conditions can be diagnosed in utero on the basis of elevated levels of alpha-fetoprotein after amniocentesis and by ultrasound imaging. Spinal Bifida Cystica may result in hydrocephalus and neurological deficits.

e) Meningocele

The least common form of spinal bifida is a posterior Meningocele or meningeal cyst. In a posterior Meningocele, the vertebrae develop normally, however the meninges are forced into the gaps between the vertebrae. As the nervous system remains undamaged, babies with Meningocele are unlikely to suffer long-term health problems.

Causes of Meningocele include teratoma and other tumours of the sacrococcyx and of the presacral space.

f) Meningomyelocele

This is the most serious and common form in which the unfused portion of the spinal column allows the spinal cord to protrude through an opening. The meningeal membranes that cover the spinal cord form a sac enclosing the spinal elements. The exposure of these nerves and tissues make the baby more prone to life-threatening infections. The protruded portion of the spinal cord and the nerves which originate at that level of the cord are damaged or not properly developed. As a result, there is usually some degree of paralysis and loss of sensation below the level of the spinal cord defect. In some babies this causes significant traction on the spinal cord and can lead to a worsening of the paralysis, scoliosis, back pain, or worsening bowel and/or bladder function

Management of spinal bifida

Immediate management

In spinal bifida immediate management involves covering open lesions with a non-adherent dressing or careful handling of the baby to preserve the integrity of the sac as this limits the risk of meningitis.

Surgical management

There is no known cure for nerve damage due to spinal bifida. To prevent further damage of the nervous tissue and to prevent infection, paediatric neurosurgeons operate to close the opening on the back. During the operation for spinal bifida Cystica, the spinal cord and its nerve roots are put back inside the spine and covered with meninges. In addition, a shunt may be surgically installed to provide a continuous drain for the cerebrospinal fluid produced in the brain, as happens with hydrocephalus. Shunts most commonly drain into the abdomen. However, if spinal bifida is detected during pregnancy, then open foetal surgery can be performed.

Prevention of spinal bifida

- There is no single cause of spinal bifida or any known way to prevent it entirely.
- However, dietary supplementation with folic acid has been shown to be helpful in preventing spinal bifida. Sources of folic acid include whole grains, fortified breakfast cereals, dried beans, leaf vegetables and fruits.
- Genetic counselling and further genetic testing, such as amniocentesis, may be offered during the pregnancy as some neural tube defects are associated with genetic disorders such as trisomy 18.
- Ultrasound screening for spinal bifida is partly responsible for the decline in new cases, because many pregnancies are terminated out of fear that a new born might have a poor future quality of life.
- With modern medical care, the quality of life of patients has greatly improved.

Activity 1

Well learners, now let us move on to activity 1

List four types of spinal bifida. Good, now compare your answers with what is in your note books

Defects of the genital urinary tract

g) PHIMOSIS

Definition

It refers to a scarring and stenosis of the apex of the foreskin (Wong's, 2004).

Types

- Acquired (pathological)
- Congenital (physiological)

A Phimosis can be acquired or congenital. Acquired is considered pathological and congenital is considered physiological.

Causes of acquired Phimosis

- Poor hygiene leading to inflammation of the glands penis or prepuce.
- Scaring from forceful retraction of the foreskin.
- Balanitis (inflammation of the glands penis)
- Masturbations

Causes of congenital Phimosis

- The tip of the fore skin may be too narrow to pass over the glands penis.
- The frenulum may be too short to allow retraction of the fore skin.
- The inner surface of the fore skin is fused with the glands penis.

Management of phimosis

- In infants it is nearly always physiology hence it is treated only when it is causing problems like obstruction or urinary discomfort.

Treatment

- Application of steroid cream e.g. betamethasone bd for 6/52, it is applied to the narrow part of the foreskin.
- Surgical treatment is circumcision where the foreskin is removed (excised) followed by wound care.

h) Undescended testes (Cryptorchidism)

Cryptorchidism is a Greek word in which kryptos means hidden and orchis means testicle. Therefore Cryptorchidism is a defect in which there is failure one or both testes to descend normally through the inguinal canal (Hockenberry, 2004).

When a male fetus is developing in utero the testicles normally descend from their original position in the abdomen into the scrotum during the eighth month of pregnancy. It occurs when one or both of the testicles do not reach the scrotum and remain inside the abdomen or groin. Overall three percent of full-term male newborns have Cryptorchidism, with a prevalence of 30% in premature male neonates. In approximately 50% of cases a testicle that is undescended at birth will naturally correct itself by the age of three months. If a testicle is still undescended after three months of age, a doctor should be consulted.

Cause

- Unknown

Predisposing factors

- Prematurity
- Low birth weight
- Small for gestational age
- Multiple pregnancy
- Maternal exposure to estrogen during the first trimester.

Clinical Presentation

- Approximately 80% of undescended testes are palpable and 20% are non palpable.
- Non palpable testes may be intra-abdominal or absent.

- Palpable testes may be undescended, ectopic, or retractile.

Diagnosis

- Physical examination to locate the undescended testicle by palpation.
- If the testicle is not able to be felt, further diagnostic tests may be recommended:
 - Ultrasound scanning,
 - MRI
 - Laparoscopy (inserting a telescope-like instrument into the abdomen to survey the anatomy).
 - Blood tests to check hormone levels

Treatment/Nursing care

Surgery is the treatment of choice, usually performed within the first year after birth. The testicle is returned to its normal position during an operation called an Orchidopexy.
Operation performed under general anaesthesia and usually involves an overnight stay in hospital. During the procedure a small incision is made in the groin and another is made in the scrotum. The testicle is located, moved to the required position in the scrotum and attached so that it does not retract. The testicle is located, moved to the required position in the scrotum and attached so that it does not retract. The incisions are closed with small dissolvable stitches. Encourage parents to express their feelings, share their concerns, and identify fears and sources of stress. Normalize these hopes and fears and help parents realize that these extreme emotions are a normal process of coping and adaptation.
Consider introducing the parents to experienced parents whose child once had Cryptorchidism, was treated and now is well. Scheduled counselling may be indicated in some situations.

Activity 2

Well learners, having covered undescended testes, list risk factors to undescended testes. Good, now compare your answers with what is in your notes

i) Epispadias

Definition

Epispadias is a congenital defect in which the meatal opening is located on the distal surface of the penis (Wong's, 2004).

Causes

The causes of epispadias are not known.

It may occur when there is failure of abdominal and pelvic fusion in the first months of embryogenesis.

Epispadias can occur with a rare birth defect called bladder exstrophy. In this birth defect, the bladder is inside out and sticks through the abdomen wall. Epispadias can also occur with other birth defects. The condition occurs more often in boys than girls. It is most often diagnosed at birth or soon afterward.

Symptoms

- Males will have a short, wide penis with an abnormal curve.
- The urethra most often opens on the top or side of the penis instead of the tip.
- However, the urethra may be open along the whole length of the penis.
- Females have an abnormal clitoris and labia.
- The urethral opening is often between the clitoris and the labia, but it may be in the belly area. They may have trouble controlling urination (urinary incontinence).

Investigations/diagnosis

1. Clinical presentation of the patient such as:
 - Abnormal opening from the bladder neck to the area above the normal urethra opening
 - Backward flow of urine into the kidney (reflux nephropathy)
 - Urinary incontinence
 - Urinary tract infections
 - Widened pubic bone
2. Blood test
3. Intravenous pyelogram (IVP), a special x-ray of the kidneys, bladder, and ureters
4. MRI and CT scans, depending on the condition

5. Pelvic x-ray
6. Ultrasound of the urinary system and genitals

Management

Surgical management usually including penile and urethral lengthening and bladder neck reconstruction

Complications

- Some people with this condition may continue to have urinary incontinence, even after surgery.
- Ureter and kidney damage
- Infertility

j) Hypospadias

Incidence

It occurs in every 1:300 live births

Causes

Unknown Predisposing factors

- Genetic factors such as failure of the body to respond to testosterone may increase the risk of Hypospadias
- Infant males born to mothers who used in vitro fertilization to conceive due to exposure to progesterone administered during in vitro process.
- Environmental factors

Diagnosis

- It is usually done by physical examination which will review incomplete and misplaced urethral opening

- MRI which will locate the congenital abnormality

Treatment

- **Surgical repair to correct the urethral position**
- **NB: Do not circumcise, reserve the foreskin for repair.**

Self assessment 4

Dear learners, now do assignment

Choose the most appropriate answer

1. A developmental birth defect caused by the incomplete closure of the embryonic neural tube is called:-

- a) Spinal bifida cystica
- b) Spinal bifida
- c) Spinal bifida occulta
- d) Myelomeningocele

2. One of the following is true about spinal bifida:-

- a) It is associated with folic acid deficiency
- b) It is associated with vitamin B12 deficiency
- c) It is associated with Vitamin C deficiency
- d) It is associated with vitamin A deficiency

3. All of the following are types of spinal bifida except:-

- a) Spinal bifida occulta
- b) Spinal bifida cystica
- c) Myelomeningocele
- d) Spinal bifida Meningocele

4) A congenital defect in which the urethra meatus is on the distal surface od the penis is called:-

- a) Hypospadius

- b) Cryptorchidism
- c) Epispadias
- d) Phimosis

5) The best treatment for Hypospadias is:-

- Circumcision
- Correction of urethral opening
- Betamethasone cream
- Retraction of the fore skin

1. is failure of one or both testes to descend normally through the inguinal canal

- i. Cryptorchidism
- ii. Phimosis
- iii. Epispadias
- iv. Impotence

2. An operation done to return the testicle to its normal position called:-

- o Orchidopexy
- o Palatoplast
- o Herniorrhaphy
- o Circumcision

3. is a condition where the distal prepuce (foreskin) cannot be retracted over the glans penis.

- a) Paraphimosis
- b) Epispadias
- c) Hypospadias
- d) Phimosis

Answers to the above questions

- 1. b
- 2. a
- 3. d
- 4. c
- 5. b
- 6. a
- 7. a
- 8. d

6.7 Counselling of Parents and Children

The birth of an infant with a major congenital malformation is experienced by the family as a calamity. Parents have an urgent need for compassionate and skilled attention, and a long-term need for counseling to help them adapt to the crisis especially where there is a family history, one need be aware of the often perceived guilt of the parents. At times, it may be necessary to help the parents retain sufficient ‘self-control’, delaying the grieving process to enable them to contribute to the decision making. The difficult ethical and legal implications of such cases further complicate the doctor's ability to care for the patient and family. Potential conflicts of interest have recently led to the use of voluntary consultation by hospital committees, or obligatory involvement by the courts. Parents have an urgent need for compassionate and skilled attention, and a long-term need for counselling to help them adapt to the crisis.

It is important to ensure that parents are counselled. First you need to review your understanding of parental reactions to such a situation, and to outline some of the legal and ethical issues related to counselling in this setting.

Parental responses and needs

The birth of a defective new-born is experienced by the parents as two calamities: “the sudden loss of the baby that was expected, and sudden birth of a feared, threatening, anger-evoking child.”

The reactions to the loss are similar to the stages of grief in other settings of death and dying. There is almost always an initial phase of severe shock, lasting days to months. During this time, the parents are typically incapable of assimilating information. Because of the urgent demands of the abnormal infant, they lack the time and energy for the grief-work which normally follows death of a loved one. The situation is further aggravated by the sudden and unexpected nature of the loss and new burden, and by its appearance at a time when the mother is exhausted.

This may be followed by a period of denial, during which the parent may withdraw, or guilt, resulting in excessive attention to the child, often at the expense of other family members. Its

intensity may vary with the visibility of the defect. This phase is usually followed by a prolonged period of sadness, or anxiety, or anger sometimes lasting for years. Eventually most, but not all, parents achieve some degree of adaptation, sometimes by rejecting the child, and some ultimately develop attachment and parent the child successfully. In the long term, there may be a variety of psychosocial problems in families who raise such children. The incidence and severity of problems vary widely, depending in large part on the interest, skill and availability of prevention-oriented health professionals. These concepts, combined with information from empiric studies, suggest the following approaches may facilitate successful adaptation:

- (1) Informing parents of the reality of the situation must be done repeatedly, over long periods of time. Counselling during the initial phase of shock is unlikely to be effective.
- (2) Consoling, in contrast, and listening are particularly needed in the early days and weeks. Most parents report an unmet need to talk to sympathetic and informed professional.
- (3) The parent should be informed and should be allowed to see the child as soon as possible. Nearly all resent delays in hearing bad news or in being allowed to see their defective child. Fantasies are usually worse than the reality, and parents are more likely than the professionals to notice and appreciate the many normal features of the child. Even if the infant dies soon after birth, the parent's ability to grieve successfully may be thwarted if the child has never been viewed.
- (4) Non-urgent and reversible decisions, such as long-term custody arrangements, should be separated from urgent decisions, such as those concerning surgery or intensive medical care. Parents need not be burdened by the false belief that they must make a lifetime contract at the moment of birth. Other options, such as foster care, institutionalization, or termination of custody, should be explained. Parents should know that a decision to provide emergency medical care for the child does not necessarily bind them to maintain long-term custody, a decision which may be altered at any point in the child's life.
- (5) Whether the child lives or dies, follow-up after discharge from the hospital is essential for successful resolution of grief, assistance of other family members, and genetic counselling.
- (6) The physician should be alert to the possibility of child abuse, particularly if other risk factors are present. These would include prolonged separation and consequent failure of bonding in the immediate neonatal period, a history of child abuse in the childhood of either parent, or extreme social isolation from family and friends

a. Genetic Counselling

Genetic counselling is initiated as soon as a person begins to be evaluated and continues for as long as the physician is in contact with the family. This responsibility to communicate also may extend into the indefinite future if a new treatment is found or if new methods for screening or prenatal diagnosis become available. Birth defects, whether genetic or not, and genetic conditions have the potential for significant emotional impact on the family, often because of potential for parental feelings of guilt.

Definition

Genetic counselling is the process by which patients or relatives at risk of an inherited disorder are advised on the consequences and nature of the disorder, the probability of developing or transmitting it and the options open to them in management and family planning (Staniford & Bwino, 2010).

Goals of genetic counselling

- To give vital, unbiased information and non directive assistance in the patient's decision making process
- To increase understanding of genetic diseases
- To discuss disease management options
- To explain the risks and benefits of testing

Aspects of genetic counselling

- Diagnosis and support aspects.
- Interpretation of family and medical histories to assess the chance of disease occurrence or recurrence.
- Education about inheritance, testing, management, prevention and resources.
- Counselling to promote informed choices and adaptation to the risk or condition.

When to consider genetic counselling

- Before conception when one or two of the parents are carriers of a certain trait.
- Throughout adulthood for adult onset of genetic conditions such as hereditary cancer.
- Any time a person seeks out genetic counselling for a condition they may have inherited from their biological parents.
- During routine antenatal screening or diagnosis. Some women are referred for genetic counselling if a risk is discovered during routine antenatal screening.
- After birth of a child with a genetic condition

Detectable conditions

Many disorders cannot occur unless both the mother and father pass on their genes. Some diseases can be inherited from one parent. Other genetic disorders are due to an error or mutation occurring during cell division process. Examples of conditions that may require genetic counselling are:

- Down syndrome
- Sickle cell anaemia
- Spina bifida
- Muscular dystrophy
- Mental retardation

Activity 3

Thank you class for your good participation. Now let us wind up the topic by doing this activity

- 1.List the goals of genetic counseling
- 2.List four aspects of genetic counselling

Compare your answers with what is in your note books

b. Support Services in the Community

Definition

Community Support Services is a private, and not a profit service agency that initiates, provides and promotes services for people with developmental disabilities and their families, within their own communities, in order to strengthen their independence, self-esteem and ability to participate in and contribute to community life.

(<http://www.christianvolunteering.org/org/community-support-services>).

Community Support Services include assistance with identifying and Coordinating services and supports identified in an individual's service plan, that is, Supporting an individual and family in crisis situations; and providing individual Interventions to develop or enhance an individual's ability to make informed and Independent choices. They consist of a variety of interventions, primarily face-to-face and in community locations that address barriers that impede the development of skills Necessary for independent functioning in the community. The purpose of Community Support Services is to surround individuals/families with the services and resources Necessary to promote recovery, rehabilitation and resiliency. Community support Activities address goals specifically in the following areas: independent living; Learning; working; socializing and recreation.

Source of funding

- Non-governmental organizations
- Churches
- Community based clubs

Target population

- Children at risk of/or experiencing Serious Emotional/Neurobiological/Behavioral Disorders;
- Adults with Severe Mental Illness (SMI);
- Individuals with chronic substance abuse; or
- Individuals with a co-occurring disorder (mental

illness/substance abuse) and/or dually diagnosed with a primary diagnosis of mental illness.

Orphans

Activity 4

We have come to the end of the topic. We can wind up by working on activity number 4

1. Define community support services
2. Write the purpose of community support services
3. List the target population for community support services

Good, now compare your answers with what is in your note books

Summary

Well learners, we have come to the end of unit 6. In this unit, we looked at deviation from normal growth and development. We define deviation from normal growth and development as the situation when there is no progressive increase in size of a child or parts of a child. We also looked at a child with disabilities, how he can be assessed and how the disabilities can be identified in children. We discussed that during assessment, a full physical examination should be done. We further discussed that when identifying disabilities in a child Parents must give a written informed consent for legal protection to the health team. We also said that proper history according to date and age of a child and type of delivery should be taken, the child should be watched for what he can do and what he cannot do in relation to his age. A full physical examination should be done because it is through this that most of the disabilities will be identified. It was discussed that In the early stages of life the child should be able to do certain things with respect to age. Any deviation may mean that something is wrong. In this unit we also looked at different types of congenital abnormalities and their management. These are cleft lip and palate, imperforate anus, oesophageal atresia, Phimosis, epispadias, Hypospadias and malformations of the brain and spinal cord such as spinal bifida. We also looked at genetic counselling in which we defined it as Genetic counselling can also be defined as the process by which patients or relatives at risk of an inherited disorder are advised on the consequences and nature of the disorder, the probability of developing or transmitting it and the options open to them in management and family planning .We further looked at the goals and aspects of genetic

counselling. Finally, we looked at support services in the community in which we defined them as a private, and not a profit service agency that initiates, provides and promotes services for people with developmental disabilities and their families, within their own communities, in order to strengthen their independence, self-esteem and ability to participate in and contribute to community life. We discussed that the purpose of Community Support Services is to surround individuals/families with the services and resources necessary to promote recovery, rehabilitation and resiliency.

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UNIT 7: INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESS

7.1 Unit Introduction

Welcome to unit 7, Integrated Management of Childhood Illnesses (IMCI). In the previous unit, you discussed the Deviation from normal growth and development where you looked at management of a child with different types of congenital abnormalities. This unit will take you through Concept of IMCI, assess and classify the sick child age 2 months to 5 years. We will then identify treatment and treat the child as well as council the care taker on caring for the child's health growth and development.

The unit will further discuss the management of the sick young infant aged 2 months. It will also look at preparation for delivery area for the mother and the new born, essential needs for all the new borns. We will also learn how to check for very severe disease and local bacterial infections, jaundice, diarrhea, HIV etc. The unit will further look at feeding and immunizations, essential care for every young infant and how to assess and classify young infants and finally identify treatment for young infants, treat and council the care taker and then follow up the young infant.

Come with me as we review the unit objectives.

7.2 Unit objectives

At the end of the unit, you will be able to:

1. Describe the concept of Integrated management of Childhood Illness(IMCI)
2. Assess and classify the sick child aged two months up to five years
3. Identify treatment for the child
4. Council the care taker on caring for the child's health growth and development.
5. Discuss the management of the sick young infants up to two months
6. Prepare a delivery area for the mother and new born
7. Outline the essential needs for all new borns
8. Check for very severe disease and local bacterial infection, jaundice, diarrhea and HIV
9. Identify feeding problems and immunizations
10. Describe the essential care for every young infant
11. Assess and classify young infants

12. Identify treatment for young infants, treat , counsel the care taker
13. Follow up the young infant

7.3 Introduction of modules on integrated management of childhood illness

Integrated Management of Childhood Illness (IMCI) is a systematic approach to children's health which focuses on the whole child. This means not only focusing on curative care but also on prevention of disease. The approach was developed by United Nations Children's Fund and the World Health Organization in 1992.

An approach integrating technical guidelines for management of specific diseases of sick children under the age of 5 years. It is a step by step process .Step by step management helps to look at the entire sick child so that major signs and symptoms of illness are not overlooked.

Integrated Management of Childhood Illness has 6 modules. Module 1 focuses on assessing and classifying a sick child aged 2months up to 5 years. Module 2 will take you through identify treatment, Module 3 will cover Treat the child, Module will look at council the care taker, Module 5 will look at management of the sick infant and module 6 will take you through follow up.

7.4 Introduction Module.

IMCI has been chosen as one best way of reducing high childhood mortality rates due to Pnuemonia, Diarrhoea, Malaria, Measles and Malnutrition by 50%. The training in IMCI was initially introduced in Zambia in May, 1996. It was designed in collaboration with USAID, WHO, and UNICEF. The generic WHO materials were adapted to the Zambian situation. The IMCI strategy includes three main components which are

- Improving case management skills of health workers.
- Improving the health system to deliver IMCI essential drug supply and management
- Improving family and community practice

7.5 Assess and classify the sick child age 2 months up to 5 years

Ask the mother what the child's problems are then determine if this is an initial or follow up visit for this problem. If follow-up visit, use the follow-up instructions on **TREAT THE CHILD chart**. - if initial visit, assess the child as follows:

Check for general danger signs

ASK:

- If the child is able to drink or breastfeed?
- If the child is vomiting everything?
- If the child has had convulsions?

Look:

- See if the child is lethargic or unconscious

Check and classify for danger signs, assess classify for the presence of all main symptoms cough, diarrhea, fever and ear problem

Cough Or Difficulty In Breathing

A child with cough or difficulty breathing may have pneumonia or another severe respiratory infection. Most coughs are caused by viral infection, which may lead to bronchitis. These children aren't seriously ill; therefore they don't need treatment with antibiotics. Nurses need to identify the few, very sick children with a cough or difficulty breathing who need treatment with antibiotics.

Assessment

Ask about cough and difficulty breathing in all children.

ASK: Does the child have a cough or difficult breathing?

If the child does not have a cough or difficult breathing, ask about next main symptom, diarrhea. Do not assess the child further for signs related to cough or difficulty breathing.

If caretaker answers YES, ask the next question.

ASK: For how long? A child who has had cough or difficulty breathing for more than 3 weeks has a chronic cough. This may be a sign of tuberculosis, asthma, whooping cough or another problem. Then look for fast breathing, chest indrawing and strider or wheezing in a calm child.

The cut – off points for fast breathing are as follows: If a child is 2 months up to 12 months, fast breathing is 50 breaths per minute while for a child up to 5 years, fast breathing is 40 breaths per minute or more.

CLASSIFICATION

After you assess for the main symptoms and related signs, classify the child's illness as follows:

1. SEVERE PNEUMONIA OR VERY SEVERE DISEASE

Any general danger sign or chest indrawing or stridor in a calm child classifies this as severe pneumonia or very severe disease.

NURSING INTERVENTIONS FOR SEVERE PNEUMONIA

Manage the airway

Clear a blocked nose. Use a plastic syringe (without a needle) to gently suck any secretions from the nose.

Keep the infant warm

Infants lose heat rapidly when wet, so keep them dry and warm. If child is wheezing and you have a bronchodilator, give it.

Treat fever

If the child has an auxiliary temperature of 38.5*c or above, give Paracetamol every 6 hours.

Antibiotics are very important for children with pneumonia, fever increases consumption of oxygen.

Manage fluids carefully

Children with pneumonia or very severe disease can become overloaded with fluids. So give fluids cautiously. Children with pneumonia or very severe disease often lose water, especially if

there is fever. If they can drink, give fluids by mouth. Encourage the caretaker to continue with breastfeeding if the child is not in respiratory distress. If the child is too ill to breastfeed but can swallow, have the caretaker express milk into the cup and slowly feed the child the breast milk with a spoon. Encourage the child to drink. If the child is not able to drink, either use a dropper to give the child fluid very slowly or drip fluid from a cup or a syringe without a needle. Avoid using an NGT if the child is in a respiratory distress.

How to calculate amount of fluid to be given

- For less than 12 months old give 5ml/ kg/hour milk or formula.
- For children 12 months up to 5 years give 3-4 ml/kg/hour milk or formula.
- The total amount in 24 hours should be 72 to 96 ml/kg.

Give antibiotic treatment

Children with severe pneumonia or very severe disease should receive antibiotic treatment.

If the child has mild chest indrawing and does not appear to be in respiratory distress, give oral cotrimoxazole. Observe the child each day. If the child does not get better, give IM Chloramphenicol instead of oral cotrimoxazole.

If child has general danger sign or severe chest indrawing but doesn't have the classification "very severe febrile disease", give IM Chloramphenicol. If IM Chloramphenicol is not available, give IM Benzyl penicillin. If the child vomits oral drug, repeat the dose. Cephalosporins are useful alternatives to penicillin or Chloramphenicol in serious infections

Activity 1

List the interventions you would put in place when managing a child with severe pneumonia

Good, now compare your answers with what is in your note books

2. PNEUMONIA

The sick child is classified to have pneumonia if he/she has fast breathing. Give the child who has pneumonia co-trimoxazole or amoxicillin for 5 days and then review him/her 2 days later to see if there is any improvement.

3. NO PNEUMONIA: COUGH OR COLD

The sick child is classified under cough or cold when there is no sign of severe disease or pneumonia.

NURSING INTERVENTIONS FOR COUGH OR COLD

If the child has a cough for more than 3 weeks re-assess the child or refer for assessment.

Advise the caretaker on safe remedy for cough and sore throat. You can then review the child after 5 days.

Table 6: Classification for cough or difficulty in breathing

SIGNS	CLASSIFY AS	TREATMENT (Urgent pre-referral treatments are in bold print)
<ul style="list-style-type: none">▪ Any general danger sign OR▪ Chest Indrawing OR▪ Stridor in calm child	SEVERE PNEUMONIA OR VERY SEVERE DISEASE	<ul style="list-style-type: none">➢ Give first dose of an appropriate antibiotic IM➢ If wheezing give a trial of rapid acting bronchodilator for up to three times before classifying severe pneumonia*➢ Refer URGENTLY to hospital
<ul style="list-style-type: none">▪ Fast breathing	PNEUMONIA	<ul style="list-style-type: none">➢ Give oral antibiotic for 5 days➢ If wheezing give a trial of rapid acting bronchodilator for up to three times before classifying pneumonia. If wheezing give an inhaled bronchodilator for five days*➢ If recurrent wheezing refer for an assessment➢ Soothe the throat and relieve the cough with a safe remedy➢ Check for HIV Infection➢ If coughing for more than 30 days refer for possible TB or asthma➢ Advise the mother when to return immediately➢ Follow-up in 2 days
<ul style="list-style-type: none">▪ No signs of pneumonia or very severe disease	COUGH OR COLD	<ul style="list-style-type: none">➢ If wheezing give an inhaled bronchodilator for 5 days*➢ If recurrent wheezing refer for an assessment➢ Soothe the throat and relieve cough➢ If coughing for more than 30 days refer for possible TB or asthma➢ Advise mother when to return immediately➢ Follow up in 5 days if not improving

* In settings where inhaler is not available, oral salbutamol may be the second choice

Activity number 2

Thank you for your participation, we can now

Mention the three classifications of pneumonia

Good we can compare our answers with what is in our notes

- Classification tables on the *ASSESS & CLASSIFY* chart have 3 rows.
- Each row is coloured **PINK, YELLOW, OR GREEN**.
- The colours help to identify rapidly whether the child has a serious disease requiring urgent attention.
- **Pink Row** means the child has a severe classification and needs urgent attention and referral or admission for inpatient care **Yellow Row** means the child needs a specific medical treatment
- **Green Row** is not given a specific medical treatment

DIARRHOEA

Definitions

1. It is the passage of more than 300g per day of loose Stool (Parveen Kumar, 1992).
2. Passage of loose stool more than 3 times a day (Joan Llewellyn, 1986)
3. Three or more loose or watery stools in a 24hrs period (ITG, 200).

ASSESSMENT

Ask all the children about diarrhea. If the caretaker's answer is NO, you do not need to assess the child further about diarrhea. If YES, continue assessing for dehydration, persistent diarrhea and dysentery. Ask for how long? Diarrhea that last for 14 days or more is persistent diarrhea. Diarrhea that has blood in it is dysentery.

CAUSES OF DIARRHOEA

Infection of the Gut; viruses, bacteria, amoeba and girdia can all cause infections which can damage the wall of the gut and prevent proper digestion and absorption of food.

Malnutrition: it weakens the gut wall, so the food cannot be digested, but passes out as stool.

Osmotic Diarrhea: the child could have ingested a non-absorbable substance like Lactulose.

Dirty environment it can be transmitted by the 5 F (Flies, Formite, food, feces and fingers).

NOTE

Diarrhea in an infant less than 1 week of age is seldom an isolated problem. It should always be considered as a sign of *neonatal sepsis*.

CLINICAL FEATURES

Clinical manifestations are categorized according to the severity of the *dehydration*. And treatment is also according the severity of the dehydration. The classifications are as follows:

- Diarrhea with no or with mild dehydration
- Diarrhea with some dehydration
- Diarrhea with severe dehydration.
- There are not enough signs to classify the dehydration as Severe or Some dehydration.

DIARRHEA WITH NO OR WITH MILD DEHYDRATION

Management

This classification of diarrhea is usually treated at home. Give fluid and food to treat diarrhea at home. Advise the caretaker on when to return to the clinic or hospital. Treat according to Plan A diarrhea with no or with mild dehydration.

Three rules of treatment of Diarrhea at home

1. Give the Child More Fluids Than usual to Prevent Dehydration.

Use recommended home fluids, including salt and sugar solution, ORS, food based fluids such as soup, rice, yoghurt. But if the child is less than 6 months old and is not yet taking solid foods, give ORS rather than a food-based solution. Give the fluids until the diarrhea stops.

2. Give the Child Plenty of Foods To Prevent Malnutrition.

Continue to breast feed frequently. If the child is not breastfed give the usual formular or milk. If the child is 6 months or older or already taking solid foods; In addition, give cereal or another starchy food mixed if possible with pulses, vegetables, meat or fish. Add 1 or 2 teaspoonful of vegetable oil to each serving. Give fresh fruit juices or mashed Banana to provide potassium. Give freshly prepared food. Cook and mash or grind food well. Offer food at least 5 to 6 times every day.

3. Take the child to the Health Workers if the child does not get better in five days, or develops any of the following; many watery stools, eating or drinking poorly, repeated vomiting, fever and marked thirsty and blood in stool.

SOME DEHYDRATION

This is classified if any two of the following are present; restless, irritable, sunken eyes, drinks eagerly, thirsty and skin pinch goes back slowly.

MANAGEMENT

If the child has no severe classification, give fluids according to treatment plan B

If the child has severe classifications refer to the hospital immediately.

APPROXIMATE ORS TO GIVE IN THE FIRST 4 HOURS

AGE	<4 month	4-11month	12-23month	2-4 years	5-14 years	15 years
Weight	< 5kg	5-7.9kg	8-10 kg	11-15 kg	16-29 kg	30 kg
Mils	200-400	400-600	600-800	800-1,200	1,200-2,200	2,200-4000

If the child wants more ORS than shown, give more. Encourage the mother to continue breastfeeding. For infants under 6 month who are not breastfed, also give 100 to 200mls of clean water during this period of time. After 4 hours, re-assess the child to find out if there is any improvement in the condition.

SEVERE DEHYDRATION

In severe dehydration two of the following signs have to be present; Lethargic or unconscious, sunken eyes, not able to drink or drinks poorly and if skin pitch goes back slowly.

Skin pinch

Locate the area on the Childs abdomen half way between the umbilicus and the side of the abdomen. To do the skin pitch, use your thumb and first finger. Do not your fingertips because this will cause pain. Place your hand so that when you pitch the skin, the folds of skin will be line up and down the child body, and not across the Childs body. Firmly pick up all the layers of skin and the tissue under them. Pinch the skin for a second and then release **MANAGEMENT**

If the child has no other severe classification, give fluids according to plan C.

If the child has another severe classification refers urgently to the hospital, give the caretaker ORS to give to the child on the way to the hospital. If you can give intravenous (i.v) fluids

immediately, start I.V Fluids immediately. If the child can drink, give ORS by mouth while the drip is being set up; give 100ml/Kg Ringers Lactate solution as shown below.

Age	First give 30mls/Kg in	Then give 70ml/kg in
Infant < 1 year	1 hour	5 hours
1 – 5 years	30 minutes	2hrs 30minutes
Older		

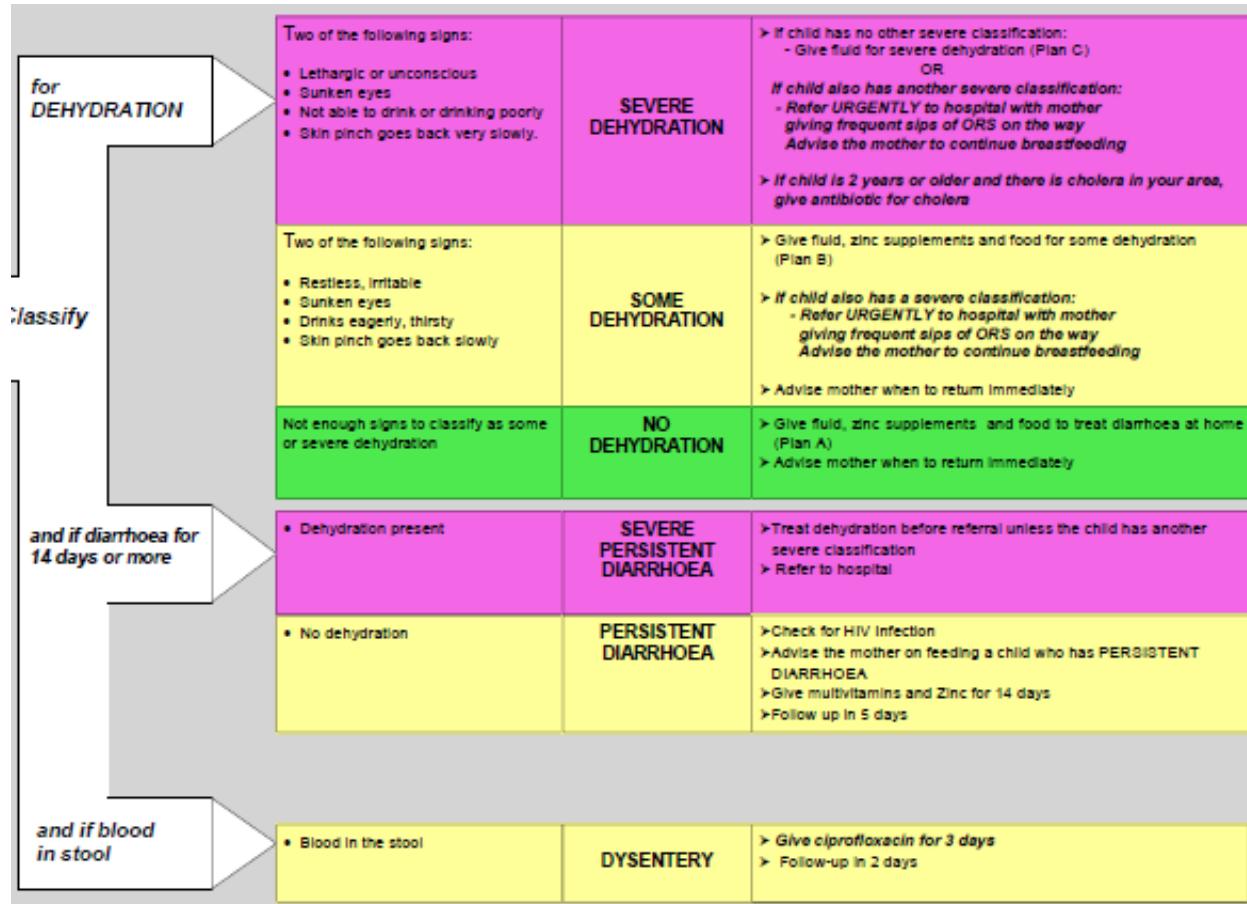
Repeat once if radial pulse is still very weak or not detectable. Re-assess the child every 1-2 hour if hydration is not improving; give the I.V drip more rapidly. Also, give ORS about 5ml/Kg/hr as soon as the child can drink; usually after 3 to 4 hrs (infant) or 1 to 2 hrs for older. Reassess the infant after 6hours and for older children after 3hours.

If the I.V line is not available, send patients for i.v treatment immediately. Start rehydration by tube with ORS 20ml/Kg/hr for 6hrs. Re-assess the child every 1 to 2 hours.

If there is repeated vomiting or increased abdominal distention, give fluids more slowly.

If dehydration has not improved for more than 3 hours, send the child for i.v therapy. After 6 hours, re-assess the patient. If diarrhea persists for 14days it is classified as persistent diarrhea. Refer to the hospital for treatment and investigation if; there is blood in stool which is considered as dysentery. Treat with appropriate antibiotics.

Table 7: classification of diarrhea



Self evaluation test 1

Well learners, thank you for good participation. Now you can answer the following questions:

1. What do the letters IMCI stand for?
2. What is diarrhoea?
3. What are the three classifications of dehydration?
4. What are the 3 rules of treating diarrhoea at home?

Answers

- 1.** IMCI stands for integrated management of child hood illnesses
- 2.** Diarrhoea is defined by the World Health Organisation as having 3 or more loose or liquid stools per day, or as having more stools than is normal for that person.
- 3.** The three classifications of dehydration are no dehydration, some dehydration and severe dehydration
- 4.** The 3 rules of treating diarrhoea at home are:
 - a)** Give the child fluids than usual to prevent dehydration
 - b)** Give the child plenty of foods to prevent malnutrition
 - c)** Take the child to the health workers if he does not get better or develops any of the following:
 - Many watery stools
 - Eating or drinking poorly
 - Repeated vomiting, fever, marked thirsty and blood in stool

FEVER

According to IMCI, a child with fever may have Malaria, Meningitis, Measles or another severe disease.

Causes of Malaria

- Plasmodium vivax
- Plasmodium Malariae
- Plasmodium Falciparum (more severe)
- Plasmodium Ovale.

Transmission of Malaria

Malaria is transmitted by the bite of infected female Anopheles mosquito, which is found in dumpy, swampy, watery areas.

CLINICAL PICTURE

- Fever

- Headache
- Abdominal pains
- Nausea and Vomiting
- General body pains and body weakness.

NURSING MANAGEMENT

Nurse will ask the parent or caretaker for a history of fever or if the child's body feels hot. The child has a history of fever if child has had any fever with this illness. Measure the body temperature of all sick children or child in this case.

Find out if the child:

- Has history of fever.
- Feels hot, nurse should feel the child's stomach or under arm and determine if child feels hot.
- Has a temperature of 37.5 or above.

If child does not have fever by history or does not feel hot or temperature is not 37.5 or above, do not assess the child for signs of related fever. If caretaker reports that the child has had fever with this illness, and then assesses the child for signs of related fever, even if the child does not have a temperature of 37.5 or does not feel hot. Ask for how long has the fever been? Is it more than 7 days? Has the fever been present every day? Thereafter, look or feel for stiff neck.

Draw the child's head to his umbilicus or toes. For example, you can tickle his toes to encourage the child to look down. Look to see if the child can bend his neck when he looks down at his umbilicus or toes. If you still have not seen the child bend his neck himself, asks the caretaker to help you lay the child, gently support his back and shoulders with one hand. With the other hand, then carefully bend the head forward towards his chest. If the neck bends easily, the child does not have a stiff neck. If the neck feels stiff and there is resistance to bending the child the child does have a stiff neck.

CLASSIFICATION OF FEVER

There are two possible classifications of fever;

- Very severe febrile disease
- Malaria

Table 8: Classification of fever

<ul style="list-style-type: none"> • Any general danger sign or • Stiff neck. 	VERY SEVERE FEBRILE DISEASE	<ul style="list-style-type: none"> > Give quinine for severe malaria (first dose) > Give first dose of an appropriate antibiotic > Treat the child to prevent low blood sugar > Give one dose of paracetamol in clinic for high fever (38.5°C or above) > Refer URGENTLY to hospital
<ul style="list-style-type: none"> • Fever (by history or feels hot or temperature 37.5°C*** or above) 	MALARIA	<ul style="list-style-type: none"> > Give oral co-artemether or other recommended antimalarial > Give one dose of paracetamol in clinic for high fever (38.5°C or above) > Advise mother when to return immediately > Follow-up in 2 days if fever persists > If fever is present every day for more than 7 days, refer for assessment
<ul style="list-style-type: none"> • Any general danger sign or • Clouding of cornea or • Deep or extensive mouth ulcers 	SEVERE COMPLICATED MEASLES***	<ul style="list-style-type: none"> > Give Vitamin A for treatment > Give first dose of an appropriate antibiotic > If clouding of the cornea or pus draining from the eye, apply tetracycline eye ointment > Refer URGENTLY to hospital
<ul style="list-style-type: none"> • Pus draining from the eye or • Mouth ulcers 	MEASLES WITH EYE OR MOUTH COMPLICATIONS***	<ul style="list-style-type: none"> > Give Vitamin A for treatment > If pus draining from the eye, treat eye infection with tetracycline eye ointment > If mouth ulcers, treat with gentian violet > Follow-up in 2 days.
<ul style="list-style-type: none"> • Measles now or within the last 3 months 	MEASLES	<ul style="list-style-type: none"> > Give Vitamin A for treatment

1. Very Severe Febrile Disease

Signs are any general danger sign for example, stiff neck, and convulsions.

Treatment

1. Give a first dose of injection Quinine e.g. 1 year of 8 kg give 0.8mls-loading dose, then 0.4mls for maintenance dose. For a 5 years child weighing 15kg, give 2.4mls loading dose then 1.2 maintenance dose. Treat the child to prevent low blood sugar (preventing low blood sugar is an urgent pre-referral treatment for children very severe febrile disease) by giving some breast milk, breast milk substitutes or sugar water all provide glucose to treat and prevent low blood sugar. Give 50% Dextrose or Ringers lactate. Give a first dose of an appropriate antibiotic e.g. co-trimoxazole. Do tepid sponging and give one dose of Paracetamol for fever of 38.5 or above. Then refer urgently to the hospital.

2. Malaria

Signs are: Any history of fever or temperature of 37.5 or above.

Treatment

First line treatment using the new government policy is Coartem or Atermether-lumefantrine.

Fansidar will be used in the transition period as first line drug for malaria treatment, given in a single dose. Under 1 year give $\frac{1}{4}$ tablets, 1-3 years give $\frac{1}{2}$ tablet, 4-6 years give 1 tablet.

Then Quinine will be used as the second line treatment. If the child has already been treated with Fansidar during this episode of fever, treat with oral Quinine. Do tepid sponging.

Give one dose of Paracetamol for fever of 38.5 or above. Advise the caretaker when to return immediately or for review. Ask the caretaker to return in 2 days time if fever persists. If fever is present everyday for 7 days, re-assess and refer to the hospital.

Activity 2

Well learners, having covered malaria, let us now do activity number 2

1. List the four species of plasmodium
2. List the clinical features of malaria
3. Mention the two classifications of fever

Good, now compare your answers with what is in your note books

MENINGITIS

It is one of the causes of fevers in children. Acute bacterial meningitis is a bacterial infection of the meninges and the cerebral spinal fluids, which results in meningeal inflammation, obstruction of the circulation of cerebral spinal fluid caused by purulent exudate, cerebral edema and local necrosis of nerve fibres and cerebral vessels.

Diagnosis

- Look for history of:
- Vomiting
- Inability to drink and breastfeed
- A headache or pain in back of neck
- A recent head injury
- Convulsions and irritability.

On examination, look for:

- A stiff neck
- Repeated convulsions
- Lethargy
- Irritability
- Bulging fontanelle

Also look for signs of increased intracranial pressure:

- Unequal pupils
- Rigid posture
- Focal paralysis in any of the limb or trunk
- Irregular breathing

Lab investigations

Lumbar puncture

- CSF microscopy will reveal the presence of meningitis
- White cell count is above 100/mm³
- CSF glucose lower than 1.5 mmol/litre
- CSF protein higher than 0.4g/litre

Treatment

If the CSF is obviously cloudy, treat immediately with antibiotics before results of lab CSF are available. If the child has signs of meningitis and lumbar puncture is not possible treat immediately.

Antibiotic treatment

Choose one of the two regimes

1. Chloramphenicol 25mg/kg IM (IV) qid Plus Ampicillin 50mg/kg IM (or IV) qid
2. Chloramphenicol 25mg/kg IM (or IV) qid Plus Benzylpenicillin 60mg/kg IM or IV qid

In case of resistant the third generation drugs are used:

Ceftriaxone 50mg/kg IV, over 30- 60 minutes every 12 hours or Cefotaxime 50mg/kg IM or IV, every 6 hrs.

Self assessment 2

Indicate true or false in the blank spaces below

- 1.....Bacterial meningitis is associated with meningeal irritation and blockage of the circulations of cerebral spinal fluid
2.Bacterial meningitis I not associated with convulsions
- 3.....In increased intracranial pressure, there is focal paralysis of the limbs and trunk

Good, now you can compare your answers with the answers below

1. T
2. F
3. T

EAR PROBLEM

Ask if the child has an ear problem

IF YES, ASK:

- If there is ear pain?
- If there is ear discharge?

If yes, for how long?

LOOK AND FEEL:

- Look for pus draining from the ear.
- Feel for tender swelling behind the ear **CLASSIFY EAR PROBLEM** If there is a tender swelling behind the ear



Treatment

- Give first dose of an appropriate antibiotic.
- Give first dose of paracetamol for pain.
- Refer URGENTLY to hospital.
- If there is pus draining from the ear and discharge is reported for less than 14 days, or Ear pain.
- Then it is acute ear infection.

Treatment

- ***Give an antibiotic for 5 days***
- Give paracetamol for pain.
- Dry the ear by wicking.
- Follow-up in 5 days.
- If Pus is seen draining from the ear and discharge is reported for 14 days or more.
- Then it is chronic ear infection

Treatment

- Dry the ear by wicking.
- Follow-up in 5 days

If there is No ear pain and no pus

Then there is no ear problem and no additional treatment

Refer to the table below for the summary of ear problem

Table 9: Classification of ear problem

▪ Tender swelling behind the ear.	MASTOIDITIS	> Give first dose of an appropriate antibiotic. ➢ Give first dose of paracetamol for pain. ➢ Refer URGENTLY to hospital.
▪ Pus is seen draining from the ear and discharge is reported for less than 14 days, or ▪ Ear pain.	ACUTE EAR INFECTION	> Give an antibiotic for 5 days. ➢ Give paracetamol for pain. ➢ Dry the ear by wicking. ➢ If ear discharge, check for HIV Infection ➢ Follow-up in 5 days.
▪ Pus is seen draining from the ear and discharge is reported for 14 days or more.	CHRONIC EAR INFECTION	> Dry the ear by wicking. ➢ Treat with topical quinolone eardrops for 2 weeks ➢ Check for HIV Infection ➢ Follow-up in 5 days.
▪ No ear pain and No pus seen draining from the ear.	NO EAR INFECTION	> No treatment.

Check for acute malnutrition, anaemia, HIV, TB and child's Immunization.

MAL NUTRITION

Look and feel for:

- Visible severe wasting
- Palmar pallor if present, is it severe or some palmar pallor?
- Oedema of both feet and
- Determine the weight.

CLASSIFY THE NUTRITIONAL STATUS

If the child presents with:

- Visible severe wasting a child with severe muscle wasting has *Marasmus*.
- A child with Severe palmar pallor has *Anaemia*
- A child with Oedema of both feet has *Kwarshokor*.

Assess for growth faltering

- Growth faltering is inadequate weight gain, static or loss of weight over a period of a month
- Compare the weight of the child now to any weight of the child that was recorded a month ago
- All children very low weight for age or less than 2 years, **ASSESS THE FEEDING**

Table10: classification of malnutrition

<ul style="list-style-type: none"> Visible severe wasting or Oedema of both feet 	SEVERE MALNUTRITION	<p>> Treat the child to prevent low sugar</p> <p>> Refer URGENTLY to a hospital</p>
<ul style="list-style-type: none"> Very low weight for age 	VERY LOW WEIGHT	<p>> Assess the child's feeding and counsel the mother on feeding according to the feeding recommendations</p> <p>> Advise mother when to return immediately</p> <p>> Follow-up in 30 days</p>
<ul style="list-style-type: none"> Not very low weight for age and no other signs of malnutrition 	NOT VERY LOW WEIGHT	<p>> If child is less than 2 years old, assess the child's feeding and counsel the mother on feeding according to the feeding recommendations</p> <p>- If feeding problem, follow-up in 5 days</p> <p>> Advise mother when to return immediately</p>

Identify Treatment

For treatment, consider the following:

- Give vitamin A
- Refer urgently to the Hospital.

If the child presents with:

- Some palmer pallor or
- Very low weight for age

For Anaemia or very low weight.

Identify Treatment

- Assess the child's feeding and counsel the mother on feeding according to the FOOD box on the *COUNSEL THE MOTHER* chart.
- If feeding problem, follow-up in 5 days.

If pallor:

- Give iron.
- Give oral antimalarial if there is a high risk Malaria
- Give mebendazole if child is 2 years or older and has not had a dose in the previous 6 months.
- Advise mother when to return immediately.
- If pallor, follow-up in 14 days.
- If very low weight for age, follow-up in 30 days.

If child does not present with very low weight for age and no other signs of malnutrition.

Classify as NO Anaemia and NOT Very Low Weight

Treatment

- If child is less than 2 years old, assess the child's feeding and counsel the mother on feeding according to the **FOOD box on the COUNSEL THE MOTHER chart**.
- If feeding problem, follow-up in 5 days.
- Advise mother when to return immediately

Table 5 : Classification of anaemia

• Severe palmar pallor	SEVERE ANAEMIA	> Refer URGENTLY to hospital
• Some palmar pallor	ANAEMIA	> Give iron > Give oral antimalarial if high malaria risk > Check for HIV infection > Give mebendazole if child is 1 year or older and has not had a dose in the previous six months > Advise mother when to return immediately > Follow up in 14 days
• No palmar pallor	NO ANAEMIA	If child is less than 2 years old, assess the child's feeding and counsel the mother on feeding according to the feeding recommendations (page 24) - If feeding problem, follow-up in 5 days

Activity 4

Well students, thank you very much for your good participation. Let us do activity 3

1. Mention the four classifications of ear infections

2. Mention the classifications of malnutrition

Good, we can compare our answers with what is in your note books

CHECK FOR HIV INFECTION

- Decide if the child should be assessed
- Check ALL Children for HIV infection
- If the child has no **SEVERE CLASSIFICATION** proceed as follows:

ASK:

- Has the mother or child had an **HIV** test?
- Check the under 5 card
- **Does the child have one or more of the following conditions?**
 - Pneumonia now?
 - Persistent diarrhea now?
 - Chronic ear infection now?
 - Very low weight for age OR growth faltering OR history of weight loss
 - If yes to one of the two questions above assess the child for HIV infection.
 - A Child who is already on ART should not be assessed for HIV infection

LOOK and FEEL:

- For enlarged lymph nodes – **neck, armpit and groin**
- For Oral thrush
- For Parotid enlargement

CLASSIFY HIV INFECTION

Refer to the diagram below for the summary of classify HIV infection

SIGNS	CLASSIFY	IDENTIFY TREATMENTS
<ul style="list-style-type: none"> • Positive HIV antibody test for child 18 months and above OR • Positive HIV virological test 	CONFIRMED HIV INFECTION	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infections ➢ Give co-trimoxazole prophylaxis ➢ Give Vitamin A supplement from 6 months of age every 6 months ➢ Assess the child's feeding and provide appropriate counselling to the mother ➢ Refer for further assessment including HIV care/ART ➢ Follow-up in 14 days, then monthly for 3 months and then every 3 months or as per immunization schedule
<p>One or both of the following:</p> <ul style="list-style-type: none"> • Mother HIV positive and no test result for child OR • Child less than 18 months with positive antibody test 	HIV EXPOSED/ POSSIBLE HIV	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infections ➢ Give co-trimoxazole prophylaxis ➢ Give Vitamin A supplements from 6 months of age every 6 months ➢ Assess the child's feeding and provide appropriate counselling to the mother ➢ Confirm HIV infection status of child as soon as possible with best available test ➢ Follow-up in 14 days, then monthly for 3 months and then every 3 months or as per immunization schedule**
<ul style="list-style-type: none"> • 2 or more conditions AND • No test results for child or mother 	SUSPECTED SYMPTOMATIC HIV INFECTION	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infection ➢ Give co-trimoxazole prophylaxis ➢ Give Vitamin A supplements from 6 months of age every 6 months ➢ Assess the child's feeding and provide appropriate counselling to the mother ➢ Test to confirm HIV infection ➢ Refer for further assessment including HIV care/ART ➢ Follow-up in 14 days, then monthly for 3 months and then every 3 months or as per immunization schedule
<ul style="list-style-type: none"> • Less than 2 conditions AND • No test result for child or mother 	SYMPTOMATIC HIV INFECTION UNLIKELY	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infections ➢ Advise the mother about feeding and about her own health ➢ Encourage HIV testing
<ul style="list-style-type: none"> • Negative HIV test in mother or child AND not enough signs to classify as suspected symptomatic HIV infection 	HIV INFECTION UNLIKELY	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infections ➢ Advise the mother about feeding and about her own health

Self assessment 3

Well class, let us now do activity 3. Put true or false against each option

1.If a child has an HIV antibody or virological test positive at 18 months the child is classified as having HIV infection.

2.....Mother HIV positive and no test result for the child, the child is classified as HIV exposed or possible HIV infection.

3.....Negative HIV test in mother or child and no enough signs to classify as suspected symptomatic HIV infection, the child is classified as HIV infection unlikely

4.....When a child has 2 or more conditions and no test result for the child or mother, the child is classified as symptomatic HIV infection.

Good, now we can compare our answers with the answers below

1. F

2. T

3. T

4. F

The next step is treatment of HIV

7.5 Identify Treatment

Having assessed, classified and identified treatment, you can then treat the child.

WHO PAEDIATRIC CLINICAL STAGING FOR HIV

Has the child been confirmed HIV Infected?

(If yes, perform clinical staging: any one condition in the highest staging determines stage. If no, you cannot stage the patient)¹

	WHO Paediatric Clinical Stage 1- Asymptomatic	WHO Paediatric Clinical Stage 2 - Mild Disease	WHO Paediatric Clinical Stage 3 - Moderate Disease	WHO Paediatric Clinical Stage 4 - Severe Disease (AIDS)
Growth	-	-	Moderate unexplained malnutrition not responding to standard therapy	Severe unexplained wasting/stunting/Severe malnutrition not responding to standard therapy
Symptoms/ signs	No symptoms or only: <ul style="list-style-type: none"> • Persistent Generalized Lymphadenopathy (PGL) 	<ul style="list-style-type: none"> ➢ Unexplained persistent enlarged liver and/or spleen ➢ Unexplained persistent enlarged parotid ➢ Skin conditions (prurigo, seborhoeic dermatitis, extensive molluscum contagiosum or warts, fungal nail infections, herpes zoster) ➢ Mouth conditions (recurrent mouth ulcerations, angular cheilitis, linear gingival Erythema) ➢ Recurrent or chronic upper RTI (sinusitis, ear infections, otorrhoea) 	<ul style="list-style-type: none"> ➢ Oral thrush (outside neonatal period) ➢ Oral hairy leukoplakia ➢ Unexplained and unresponsive to standard therapy: <ul style="list-style-type: none"> ▪ Diarrhoea >14 days ▪ Fever >1 month ▪ Thrombocytopenia* (<50,000/mm³ for > 1 month) ▪ Neutropenia* (<300/mm³ for 1 month) ▪ Anaemia for >1 month (haemoglobin < 8 g/dl)* ➢ Recurrent severe bacterial pneumonia ➢ Pulmonary TB ➢ Lymph node TB ➢ Symptomatic LIP* ➢ Acute necrotizing ulcerative gingivitis/ periodontitis ➢ Chronic HIV associated lung disease including bronchiectasis* <p>ART is indicated: Irrespective of the CD4 count, and should be started as soon as possible</p>	<ul style="list-style-type: none"> ➢ Oesophageal thrush ➢ More than one month of herpes simplex ulcerations ➢ Severe multiple or recurrent bacterial infections ≥ 2 episodes in a year (not including pneumonia) ➢ Pneumocystis pneumonia (PCP)* ➢ Kaposi's sarcoma ➢ Extrapulmonary tuberculosis ➢ Toxoplasma brain abscess* ➢ Cryptococcal meningitis* ➢ Acquired HIV-associated rectal fistula ➢ HIV encephalopathy* <p>If HIV infection is NOT confirmed in infants <18 months, presumptive diagnosis of severe HIV disease can be made on the basis of: **</p> <ul style="list-style-type: none"> ➢ HIV antibody positive AND ➢ One of the following: <ul style="list-style-type: none"> ○ AIDS defining condition OR ○ Symptomatic with two or more of: <ul style="list-style-type: none"> • Oral thrush • Severe pneumonia • Severe sepsis
ARV Therapy	Indicated only if CD4 is available: <ul style="list-style-type: none"> • ≤ 11 mo and CD4 < 25% (or ≤ 1500 cells) • 12-35 mo and CD4 ≤ 20% (or ≤ 750 cells) • 36-59 mo and CD4 ≤ 15% (or ≤ 350 cells) • ≥ 6 yrs and CD4 ≤ 15% (<200 cells/mm³) 	Indicated only if CD4 or TLC is available: <ul style="list-style-type: none"> • Same as stage I OR • ≤ 11 mo and TLC < 4000 cells/mm³ • 12-35 mo and TLC ≤ 3000 cells • 36-59 mo and TLC ≤ 2500 cells • ≥ 5-8 years and TLC ≤ 2000 cells* <p>* There is not adequate data for children older than 8 years.</p>	<p>ART is indicated:</p> <ul style="list-style-type: none"> • Child less than 12 months, regardless of CD4 • Child is over 12 months—usually regardless of CD4 but if LIP/TB/oral hairy leukoplakia—ART initiation may be delayed if CD4 above age related threshold for advanced or severe immunodeficiency 	

Check the child's Immunization status.

- USE the recommended immunization schedule
- OBSERVE contraindications to immunization
- **Do not give BCG in Symptomatic HIV infection**
- **Do not give DPT-Hep-Hib 2 or DPT-Hep-Hib 3 to a child who had convulsions or shock within 3 DYAS of the MOST RECENT DOSE**
- **Do not give DPT-Hep-Hib to a child with convulsions or another active neurological disease of the CNS. There is NO CONTRAINDICATION to immunize a sick child who is well enough to go home**
- If a child is to be referred **DO NOT GIVE immunization to AVOID DELAY**
- Children with diarrhoea who are due for **OPV**, should receive **OPV, but should not be COUNTED AND RECORDED.**

- The dose should be repeated in the next visit after 4 weeks and counted and recorded.

All children should receive all the recommended immunizations **BEFORE THEIR FIRSTIRTHDAY**

- **LOOK** at the age of the child on the clinical record
- **ASK** the care taker if the child has an immunization card
- Check all immunizations received
- Circle immunizations needed today

CHECK THE CHILD'S IMMUNIZATION STATUS

IMMUNIZATION SCHEME	AGE	VACCINES
	Birth	BCG, OPV -0
	6 weeks	DPT-1 , PCV-1OPV-1
	10 weeks	DPT-2, OPV-2, PCV-2
	14 weeks	DPT-3, PVC-3, OPV-3
	9months	Measles.

Check Vitamin A, Deworming, Other problems and Caretaker's health needs

- **LOOK** at the age of the child on the clinical record
- **LOOK** at the child's immunization record
- **Check** if there is a record of earlier vitamin A doses
- If the child is 6 months up to 24 months and had no vitamin A received write **YES**
- Check whether a child should receive Mebendazole or Albendazole
- All children 1 year or older should be given Mebendazole or Albendazole every 6 months

Check other problems and Caretaker's health needs.

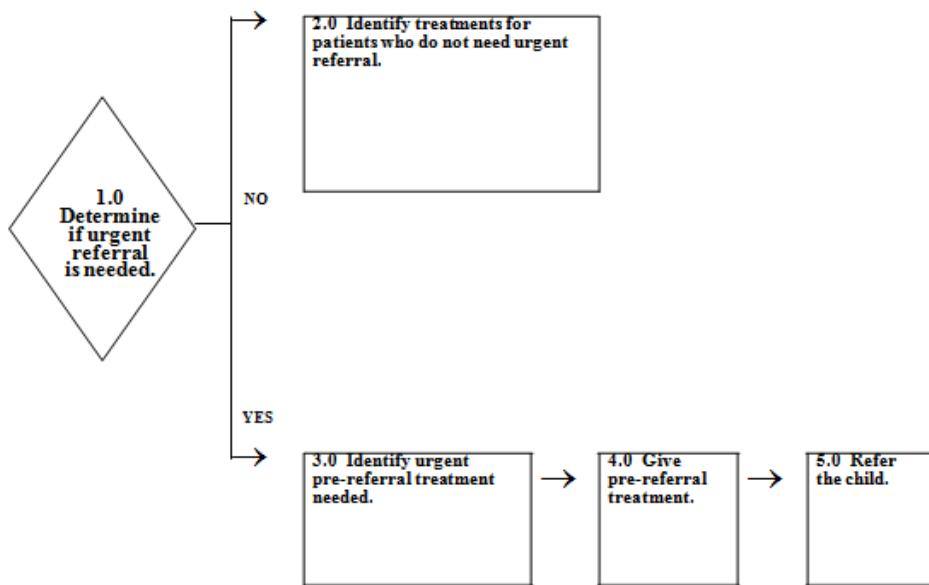
- For **ALL sick Children**

- ASSESS other problems
- TREAT any other problems according to your level of training, experience and policy
- Refer the child with any other problem that you cannot manage
- Then CHECK the caretaker's other health needs
- TREAT caretakers problems
- REFER the caretaker if you cannot treat

7.4. Identify treatment

This lecture describes the final step on the **ASSESS & CLASSIFY** chart: "**Identify Treatment.**"

- A classification in the **PINK** row needs urgent referral
- A classification in the **YELLOW** low needs an appropriate oral drug or other treatment
- A classification in a **GREEN** row does not need specific medical treatment such as antibiotics
- Some treatments may be the same – for **PNEUMONIA** and **EAR INFECTION**



All SEVERE CLASSIFICATIONS on ASSESS and CLASSIFY are coloured PINK

- Severe pneumonia or Very severe disease

- Severe Dehydration
- Severe Persistent Diarrhoea
- Very Severe Febrile Disease
- Severe Complicated Measles
- Mastoiditis
- Severe Malnutrition
- Severe Anaemia

Determining if the child needs urgent referral

- Severe classifications have an instruction of Refer **URGENTLY** to hospital after giving pre-referral treatments
- For Severe Persistent Diarrhoea the instruction is Refer to hospital – meaning it is necessary but not urgent
- For Severe Dehydration you may keep and treat a child whose ONLY severe classification is **SEVERE DEHYDRATION** if your clinic has the ability to treat the child.
- This child may have a general danger sign related to dehydration such as lethargic, unconscious, or not able to drink because he is severely dehydrated.
- Most children who have a General Danger Sign also have a severe classification
- They will be referred or treated at the centre if have **SEVERE DEHYDRATION ONLY**
- ASK yourself, DOES the child have any other severe problem that can not be treated at the centre
- **If YES then REFER THE CHILD**

Urgent pre-referral treatment needed

- Give diazepam for a child who is convulsing now
- Give an appropriate antibiotic
- Give quinine for severe malaria
- Give a rapid acting bronchodilator or subcutaneous epinephrine
- Give vitamin A
- Treat the child to prevent low blood sugar
- Give paracetamol for high fever

- Apply tetracycline eye ointment (if clouding of the cornea or pus draining from eye)
- Provide ORS solution so that the mother can give frequent sips on the way to the hospital

- Many severe cases need the first dose of an antibiotic before referral.
- Intramuscular injection of Benzyl penicillin and Gentamycin instead of an oral antibiotic.
- ORS or oral drugs such as paracetamol will need to be given at the hospital when the child is able to take them.
- Treat and prevent low blood sugar.

Refer the child

- Explain to the caretaker the need for referral
- Calm the caretaker's fears and help resolve any problems
- Write a referral note
- Give the caretaker any supplies and instructions needed

7.3 Treat the Child

In this module you will learn, determining appropriate oral drugs and dosages for the sick child .Giving oral drugs and teaching the mother how and when to give oral drugs at home .Treating local infections and teaching the mother how and when to give the treatments at home .Checking a mother's understanding. Giving drugs administered in the clinic only, Preventing low blood sugar treating different classifications of dehydration, and teaching the mother about extra fluid to give at home and immunizing children.

7.5.2 Give appropriate antibiotic

Following classifications require oral antibiotic

- PNEUMONIA
 - Severe dehydration with cholera
 - Dysentery
 - Acute ear infection
 - HIV infection
1. Pneumonia, acute ear infection
 - a) 1st Line – Amoxycillin
 - b) 2nd Line – Erythromycin

2. Dysentery
 - a) 1st Line – Nalidixic Acid
 - b) 2nd Line – Cotrimoxazole
 3. Cholera
 - a) 1st Line – Erythromycin
- NB: Rehydration is very important in Cholera
4. **Cotrimoxazole for Prophylaxis**
 - a) Possible HIV infection/HIV exposed
 - b) Confirmed HIV infection and aged less than 12 months
 - c) Aged 12 months upto 5 years with HIV and WHO stage 2, 3, 4 or CD4 < 20% whether or not on ART
 - d) Aged 2 months upto 5 YEARS classified as HIV infection
 - e) Child with PCP or previously had PCP

- **Sometimes one drug can be used in more than one classifications**
- **1st line drugs are chosen because they are effective**
- **2nd line are given when the 1st line is O/S or if the child is not responding**

Give oral antimalaria

- First line: - Artemether-Lumefantrine (coartem) and sulfadoxine-pyrimethamine (fansider).
- Given per kg body weight
- Artemether-Lumefantrine not given if child is less than 5kg
- If Artemether-Lumefantrine is not available or child is less than 5kg give Sulphadoxine-pyrimethamine.
- Second line anti malarial is quinine

Give an oral antimalarial

Weight (kg)	Age (yrs) approx	No. Tabs per dose BD	coartem (A + L) / dose	Total No. Tabs over 3 days
<5	<2mths	Not recommended	N/A	N/A
5–15	2–5mths	1	20mg A + 120mg L	6
15–25	6–8mths	2	40mg A + 240mg L	12
25–35	9–12mths	3	60mg A + 360mg L	18
>35	>12mths	4	80mg A + 480mg L	24

Give an oral antimalarial

Weight (kg)	Age (yrs) approx	Sulfadoxine + Pyrimethamine Single dose in clinic
<5	<2mths	1/2
5 < 10	2mths up to 12mths	1/2
10 – <14	12mths up to 3 yrs	3/4
14 – 19	3yrs up to 5yrs	1

2/12/2015

By Courtesy of Eastern Province IMCI Team

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- Oral quinine 10mg/kg body weight 8hrly for 7 days

Treat other classifications

- Give paracetamol for fever
- Give mebendazole or albendazole
- Give sulfultamol
- Give vitamin A
- Give iron and folate
- Give pain relief

Use good communication skills

- Ask questions to find out what the mother is already doing for her child.
- Praise the mother for what she has done well.
- Advise her how to treat her child at home.
- Check the mother's understanding.
- **NB: - ADVISE AND CHECK are described in the slides that follow**

Check the mother's understanding	
GOOD CHECKING QUESTIONS	POOR QUESTIONS
How will you prepare the ORS solution?	Do you remember how to mix the ORS?
How often should you breastfeed your child?	Should you breastfeed your child?
On what part of the eye do you apply the ointment?	Have you used ointment on your child before?
How much extra fluid will you give after each loose stool?	Do you know how to give extra fluids?
Why is it important for you to wash your hands?	Will you remember to wash your hands?

7.5.1 Teach the mother to give oral drugs at home

Follow the instructions below for every oral drug to be given at home.

Also follow the instructions listed with each drug's dosage table.

- Determine the appropriate drugs and dosage for the child's age or weight.
- Tell the mother the reason for giving the drug to the child.
- Demonstrate how to measure a dose.
- Watch the mother practice measuring a dose by herself.
- Ask the mother to give the first dose to her child.
- Explain carefully how to give the drug, then label and package the drug.
- If more than one drug will be given, collect, count and package each drug separately.

- Explain that all the oral drug tablets or syrups must be used to finish the course of treatment, even if the child gets better
- Check the mother's understanding before she leaves the clinic.

Treat eye infection with tetracycline

eye ointment.

- Clean both eyes 3 times daily.
- Wash hands
- Ask the child to close the eyes.
- Use clean cloth and water to gently wipe away pus.
- Then apply tetracycline eye ointment in both eyes 4 times daily.
- Ask the child to look up
- Squirt a small amount of ointment on the inside of the lower lid.
- Wash hands again.
- Treat until redness is gone.
- Do not put anything else in the eye.

Dry the ear by wicking and treat chronic ear infection with ciprofloxacin ear drops.

- Dry the ear at least three times daily
- Roll clean absorbent cloth into a wick
- Place the wick in the child's ear
- Remove the wick when wet
- Replace the wick with a clean one and repeat these steps until the ear is dry

- Instill ciprofloxacin eardrops three times daily after drying the ear by wicking for two weeks

Treat mouth ulcers with gentian violet

- Treat the mouth ulcers twice daily
- Wash hands
- Clean the child's mouth with a clean soft cloth wrapped around the finger and wet with salt water
- Paint the mouth with 1/2 strength gentian violet (0.25% dilution)
- Wash hands again
- Continue using GV for 48 hours after the ulcers have been cured
- Give paracetamol for pain relief
- Follow up if not improving

Soothe the throat; relieve the cough with a safe remedy

Safe remedies to recommend:

- Breast milk for a breastfed infant
- Tea with sugar or honey
- Lemon tea

Harmful remedies to discourage:

- Cough syrup with codeine, ephedrine, atropine or alcohol

Determine priority of advice

- When a child has several problems, the instructions to mothers can be quite complex.
- Limit the instructions to what is most important.

Determine:

- How much can **this** mother understand and remember?
- Is she likely to come back for follow-up treatment?
- If so, some advice can wait until then. What advice is most important to get the child well?
- If you think that she will not be able to learn or remember all the treatment instructions
- Select only those instructions that are most essential for the child's survival.
- Giving antibiotic or antimalarial drugs

- Giving fluids to a child with diarrhoea.
- Teach the few treatments well and check that the mother remembers them.
- If necessary, omit or delay the following:
 - Feeding assessment and feeding counselling
 - Soothing remedy for cough or cold
 - Paracetamol*
 - Second dose of vitamin A*
 - Iron treatment
 - Wicking an ear

You can give the other treatment instructions when the mother returns for the follow-up visit.

Give these treatments in clinic only Explain to the mother why the drug is given.

- Determine the dose according to the drug tables.
- Use a sterile needle and sterile syringe.
- Measure the dose accurately.
- Give the drug as intramuscular injection.
- If child cannot be referred, follow the instructions given

If a child:

- is not able to drink or breastfeed, or
- vomits everything, or
- has convulsions, or
- is lethargic or unconscious,
- cannot take an oral

Give an intramuscular antibiotic

➤ Give An Intramuscular Antibiotic

- GIVE TO CHILDREN BEING REFERRED URGENTLY
- Give ampicillin (50 mg/kg) and gentamicin (7.5mg/kg)

AMPICILLIN

- Dilute 500mg vial with 2.1ml of sterile water (500mg/2.5ml)
- Where there is a strong suspicion of meningitis the dose of ampicillin can be increased 4 times

GENTAMICIN

- Use undiluted 2 ml vial (40mg/ml)
- Of the dose range provided below, use lower dose for children with weight at lower end of the category, and higher dose for children at the higher end of the category

AGE	WEIGHT	AMPICILLIN 500 mg vial	GENTAMICIN 2ml vial (at 40 mg/ml)
2 months up to 4 months	4 – <6 kg	1 ml	0.5 - 1.0 ml
4 up to 12 months	6 – <10 kg	2 ml	1.1 - 1.8 ml
12 months up to 3 years	10 – <14 kg	3 ml	1.9 - 2.7 ml
3 up to 5 years	14 – 19 kg	5 ml	2.8 - 3.5 ml

- IF REFERRAL IS NOT POSSIBLE OR DELAYED, repeat the ampicillin injection every 6 hours, and the gentamicin injection once daily

Give quinine for severe malaria

➤ Give Quinine for Severe Malaria

FOR CHILDREN BEING REFERRED WITH VERY SEVERE FEBRILE DISEASE:

- Check which quinine formulation is available in your clinic
- Give first dose of intramuscular quinine and refer child urgently to hospital

IF REFERRAL IS NOT POSSIBLE:

- Give first dose of intramuscular quinine
- The child should remain lying down for one hour
- Repeat the quinine injection at 4 and 8 hours later, and then every 8 hours until the child is able to take an oral antimalarial. Do not continue quinine injections for more than 1 week

AGE or WEIGHT	INTRAMUSCULAR QUININE	
	150 mg /ml* (In 2 ml)	300 mg /ml* (In 2 ml)
2 months up to 4 months (4 - < 6 kg)	0.4 ml	0.2 ml
4 months up to 12 months (6 - < 10 kg)	0.6 ml	0.3 ml
12 months up to 2 years (10 - < 12 kg)	0.8 ml	0.4 ml
2 years up to 3 years (12 - < 14 kg)	1.0 ml	0.5 ml
3 years up to 5 years (14 - 19 kg)	1.2 ml	0.6 ml

*quinine salt

Treat a convulsing child

➤ Give Diazepam to Stop Convulsions

- Turn the child to his/her side and clear the airway. Avoid putting things in the mouth
- Give 0.5mg/kg diazepam injection solution per rectum using a small syringe (like a tuberculin syringe) without a needle, or using a catheter
- Check for low blood sugar, then treat or prevent
- Give oxygen and REFER
- If convulsions have not stopped after 10 minutes repeat diazepam dose

WEIGHT	AGE	DOSE OF DIAZEPAM (10 mg / 2 ml)
< 5 kg	<6 months	0.5 ml
5 - < 10 kg	6 months up to 12 months	1.0 ml
10 - < 14 kg	12 months up to 3 years	1.5 ml
14 - 19 kg	3 years up to 5 years	2.0 ml

Treat the child to prevent low blood sugar

➤ Treat the Child to Prevent Low Blood Sugar

- If the child is able to breastfeed:
 - Ask the mother to breastfeed the child
- If the child is not able to breastfeed but is able to swallow:
 - Give expressed breast milk or breast-milk substitute
 - If neither of these is available give sugar water
 - Give 30-50 ml of milk or sugar water before departure

To make sugar water: Dissolve 4 level teaspoons of sugar (20 grame) in a 200-ml cup of clean water
- If the child is not able to swallow:
 - Give 50ml of milk or sugar water by naso-gastric tube

Extra fluid, Zinc supplements and continue feeding to diarrhoea

- Classify dehydration and select one of the following treatment plans:
- Plan A - Treat Diarrhoea at Home
- Plan B - Treat Some Dehydration with ORS
- Plan C - Treat Severe Dehydration Quickly

Plan A - Treat Diarrhoea at Home

Counsel the mother on the 4 Rules of Home Treatment:

1. Give Extra Fluid
 2. Give Zinc Supplements
 3. Continue Feeding
 4. When to Return
 5. Give extra fluid (as much as the child will take)
 6. Tell the mother:
 7. Breastfeed frequently and for longer at each feed
 8. If the child is exclusively breastfed, give ORS or clean water in addition to breast milk
 9. If the child is not exclusively breastfed, give one or more of the following: ORS, food-based fluids (such as soup, rice water, and yoghurt drinks).
- It is especially important to give ORS at home when:
 - the child has been treated with Plan B or Plan C during this visit
 - the child cannot return to a clinic if the diarrhoea gets worse
 - teach the mother how to mix and give **ORS**.
 - give the mother 2 packets of **ORS** to use at home.

Show the mother how much fluid to give in addition to the usual fluid intake:

- **Up to 2 years:** 50 to 100 ml after each loose stool
- **2 years or more:** 100 to 200 ml after each loose stool
- **Tell the mother to:**
 - • Give frequent small sips from a cup.
 - • If the child vomits, wait 10 minutes then continue - but more slowly
 - Continue giving extra fluid until the diarrhoea stops
- **2. Give Zinc**
- tell the mother how much zinc to give (20 mg tab) :
- Up to 6 months —— 1/2 tablet daily for 14 days
- 6 months or more —— 1 tablet daily for 14 days
- show the mother how to give zinc supplements
- Infants—dissolve tablet in a small amount of expressed breast milk, ORS or clean water in a cup
- Older children - tablets can be chewed or dissolved in a small amount of clean water in a cup
- Continue Feeding (exclusive breastfeeding if age less than 6 months)
- when to return

Plan B - Treat Some Dehydration with ORS

DETERMINE AMOUNT OF ORS TO GIVE DURING FIRST 4 HOURS

AGE*	Up to 4 months	4 months up to 12 months	12 months up to 2 years	2 years up to 5 years
WEIGHT	<6 kg	6-<10 kg	10-<12 kg	12-<19 kg
Amount of fluid (ml) over 4 hours	200-400	400-700	700-900	900-1400

- Use the child's age only when you do not know the weight.
- The approximate amount of ORS required (in ml) can also be calculated by multiplying the child's weight in kg times 75.
- If the child wants more ORS than shown, give more
- For infants below 6 months who are not breastfed, also give 100-200ml clean water during this period.

Show the mother how to give ors solution:

- • Give frequent small sips from a cup
- • If the child vomits, wait 10 minutes then continue - but more slowly
- • Continue breastfeeding whenever the child wants

After 4 hours:

- Reassess the child and classify the child for dehydration
- Select the appropriate plan to continue treatment
- Begin feeding the child in clinic

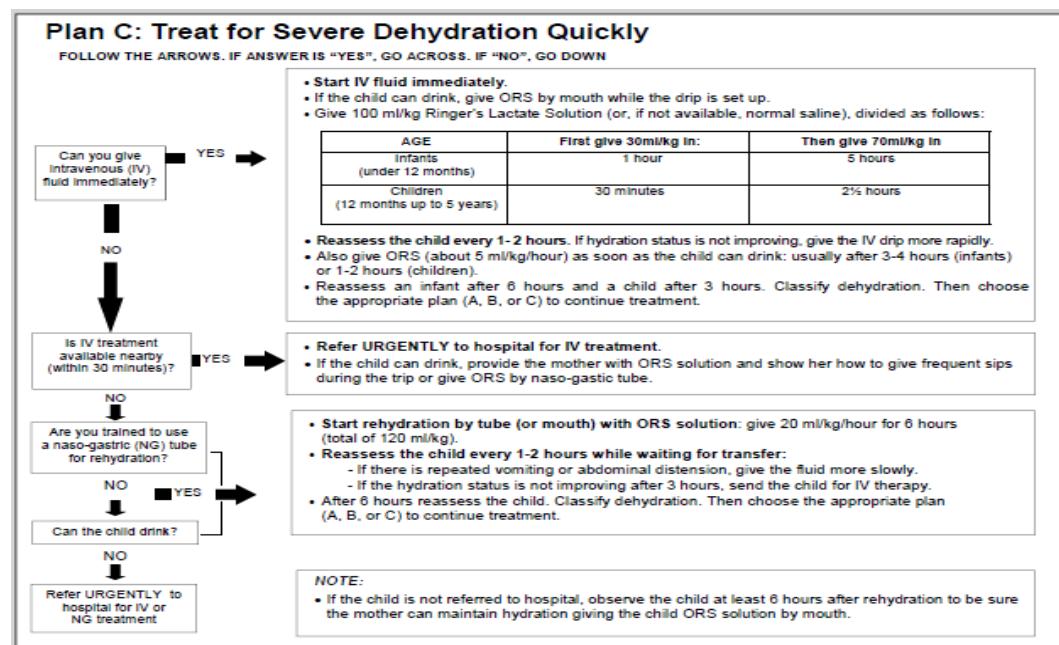
If the mother must leave before completing treatment:

- Show her how to prepare ORS solution at home
- Show her how much ORS to give to finish 4-hour treatment at home
- Give her instructions how to prepare salt and sugar solution for use at home

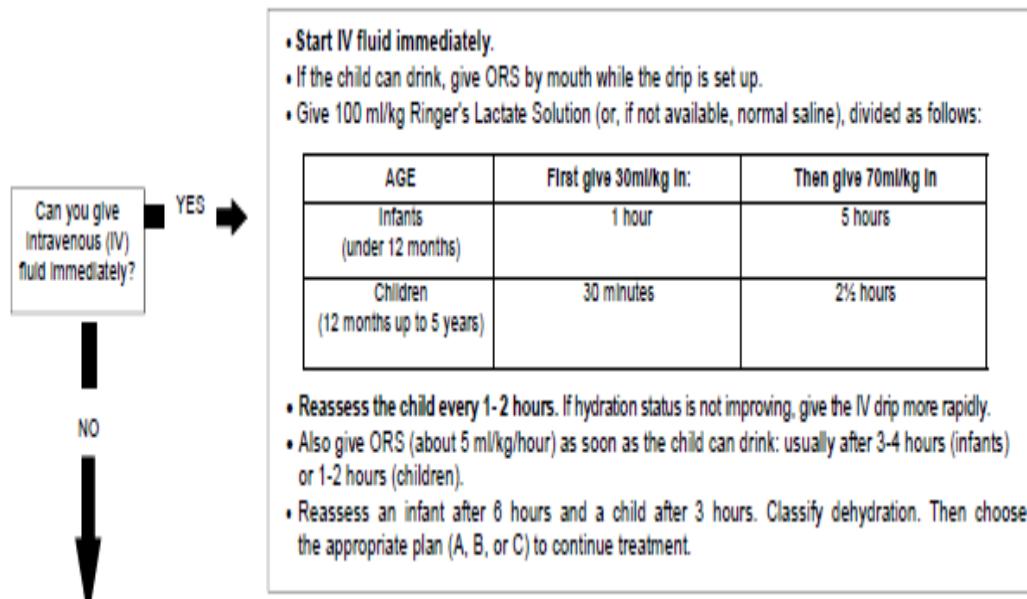
Explain the 4 Rules of Home Treatment:

- Give extra fluid
- Give zinc
- Continue feeding
- When to return

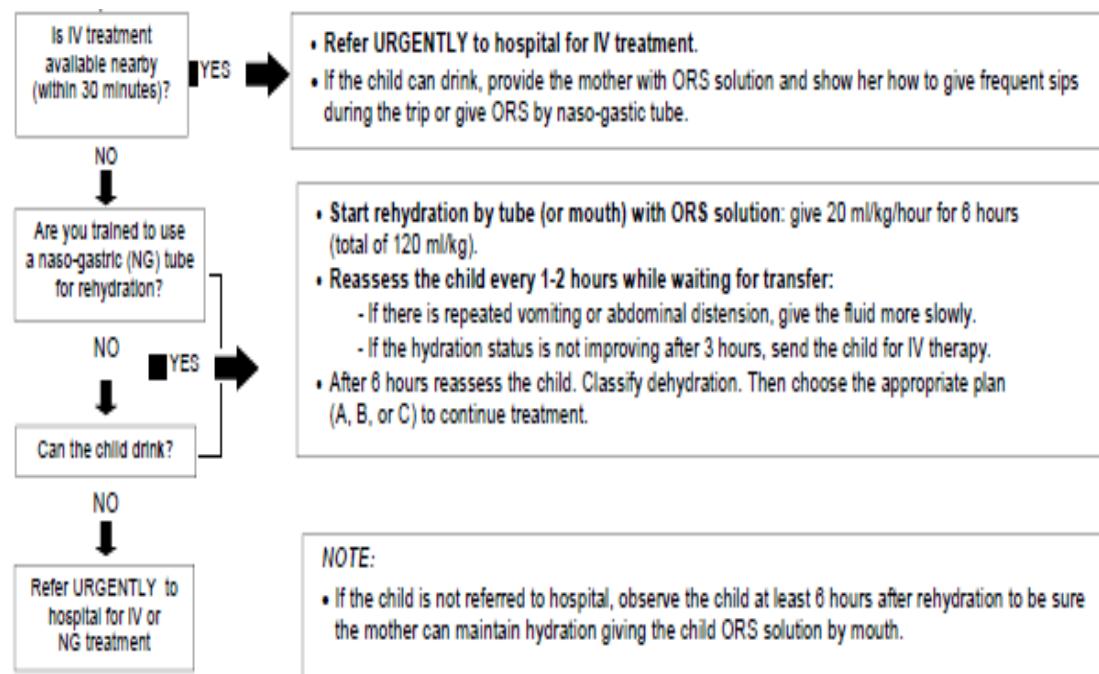
Plan C - Treat Severe Dehydration Quickly



FOLLOW THE ARROWS. IF ANSWER IS "YES", GO ACROSS. IF "NO", GO DOWN



Plan C - Treat Severe Dehydration Quickly



7.6 Counsel the care taker on the caring for the child's health growth and development.

In this module you will practice counselling the caretaker about feeding problems counselling the caretaker who has a child with HIV infection and arranging for pre and post test counselling for HIV advising the mother to increase fluid during illness and also advising the mother:

- When to return for follow-up visits,
- when to return immediately for further care,
- When to return for immunizations.
- When to return for vitamin A supplementations.

In practicing these tasks, you will focus on:

- Giving relevant advice to each caretaker
- Using good communication skills
- Using a Caretaker's Card as a communications tool

Recommendations for ages up to 6 months

- The best way to feed a child from birth to at least 6 months of age is to **breastfeed exclusively**.
- Child takes only breast milk and no additional food, water, or other fluids (exception of medicines and vitamins, if needed).
- Breastfeed children at this age as often as they want, day and night.

This will be at least 10 times in 24 hours

Advantages of breastfeeding are:

- Breast milk contains exactly the nutrients needed by an infant.
- These nutrients are more easily absorbed from breast milk
- Breast milk provides all the water an infant needs, even in a hot, dry climate.
- Breast milk protects an infant against infection.
- Breastfeeding helps a mother and baby to develop a close, loving relationship.
- Breastfeeding protects a mother's health.
 - Child spacing Reduces risks of ovarian and breast cancer
 - Uterine contractions

Disadvantages of artificial feeding are: -

- Reduces the amount of breast milk produced or taken.
- other food or fluid may contain germs

- Food or fluid may be too dilute, so that the infant becomes malnourished.
- Iron is poorly absorbed from cow's and goat's milk.
- The infant may have difficulty digesting animal milk

Activity 5

Well class, thank you for your good participation, we can now do activity 4

1. List advantages of breastfeeding
2. List the disadvantages of artificial feeding

Good, now compare your answers with what is in the booklet

Recommendations for ages up to 6 months – HIV exposed or possible HIV infection

- There are two options: -
- **Exclusive breast feeding** – unless replacement feeding meets **AFASS** (Acceptable, Feasible, Affordable, Sustainable and Safe) **criteria**
- **Exclusive replacement feeding** – e.g. infant formula when AFASS is met

Special situations

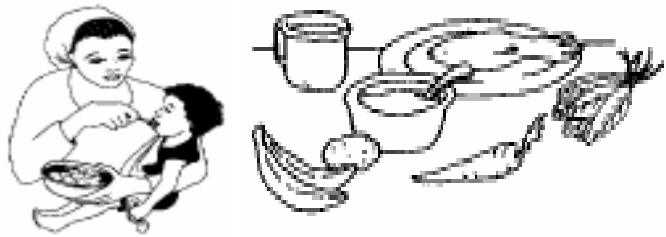
onths



- a) **Heat treated Expressed Breast milk**
- b) **Wet nursing**

Recommendations for ages 6 months up to 12 months

- Breastfeed as often as the child wants atleast 8 times in 24hrs.
- Give adequate servings of complementary feeds
- 3 times per day if breastfed plus snacks
- 5 times per day if not breastfed.



- Breastfeed as often as the child wants.
- • Give adequate servings of family foods 3 or 4 times per day plus snacks.

Give nutritious complementary foods or family foods 5 times a day

Recommendations for ages 2 years and older

- Give family foods at 3 meals each day. Also, twice daily, give nutritious food between meals,
- Two times a day between meals



Assessing feeding

- Assess feeding of children who:
- Are classified as having anaemia or very low weight, or
- Are less than 2 years old
- If the mother has already received many treatment instructions you may delay assessing feeding and counselling until a later visit.

Identify feeding problems

- Based on the mother's answers to the feeding questions, identify any differences between the child's actual feeding and the recommendations.

These differences are problems

Identify feeding problems

<i>CHILD'S ACTUAL FEEDING</i>	<i>RECOMMENDED FEEDING</i>
A 3-month-old is given sugar water as well as breastmilk.	A 3-month-old should be given only breastmilk and no other food or fluid.
A 2-year-old is fed only 3 times each day.	A 2-year-old should receive 2 extra feedings between meals, as well as 3 meals a day.
An 8-month-old is still exclusively breastfed.	A breastfed 8-month-old should also be given adequate servings of a nutritious complementary food 3 times a day.

Food

Assess the Child's Feeding

Ask questions about the child's usual feeding and feeding during this illness. Compare the mother's answers to the ***Feeding Recommendations*** for the child's age in the box below.

Ask:

- If the mother does breastfeed the child?
- If she does, how many times during the day?
- If she also breastfeeds during the night?
- If the child takes any other food or fluids?
- If yes, what food or fluids?
- How many times per day?
- What she uses to feed the child?
- If very low weight for age: How large are servings? Does the child receive his own serving?

Who feeds the child and how?

- During this illness, has the child's feeding changed? If yes, how?

Counsel the Mother about Feeding Problems

- **If the child is not being fed as described in the above recommendations, counsel the mother accordingly. In addition:**
- **If the mother reports difficulty with breastfeeding, assess breastfeeding.**
- **As needed, show the mother correct positioning and attachment for breastfeeding.**

If the child is less than 4 months old and is taking other milk or foods:

- Build mother's confidence that she can produce all the breast milk that the child needs.
- Suggest giving more frequent, longer breastfeeds day or night, and gradually reducing other milk or foods.

If other milk needs to be continued, counsel the mother to:

- Breastfeed as much as possible, including at night.
- Make sure that other milk is a locally appropriate breast milk substitute.
- Make sure other milk is correctly and hygienically prepared and given in adequate amounts.
- Finish prepared milk within an hour.

If the mother is using a bottle to feed the child:

- Recommend substituting a cup for bottle.
- Show the mother how to feed the child with a cup.

If the child is not being fed actively, counsel the mother to:

- Sit with the child and encourage eating.
- Give the child an adequate serving in a separate plate or bowl.

If the child is not feeding well during illness, counsel the mother to:

- Breastfeed more frequently and for longer if possible.
- Use soft, varied, appetizing, favourite foods to encourage the child to eat as much as possible, and offer frequent small feedings.
- Clear a blocked nose if it interferes with feeding.
- Expect that appetite will improve as child gets better.
- **Follow-up any feeding problem in 5 days.**

Fluid

Advise the Mother to Increase Fluid during Illness

Use a care taker's card

- A Caretaker's Card can be given to each mother to help her remember
 - Appropriate food and fluids
 - When to return to the health worker.
 - The Caretaker's Card has words and pictures that illustrate the main points of advice.

For any sick child:

- Breastfeed more frequently and for longer at each feed.
- Increase fluid. For example, give soup, rice water, yoghurt drinks or clean water.

For child with diarrhoea:

- Giving extra fluid can be lifesaving.
- Give fluid according to Plan A or Plan B on **Treat the child chart**.
- **Advise the** mother when to return to health worker

Follow-Up Visit

- Advise the mother to come for follow-up at the earliest time listed for the child's problems.

Follow up visits

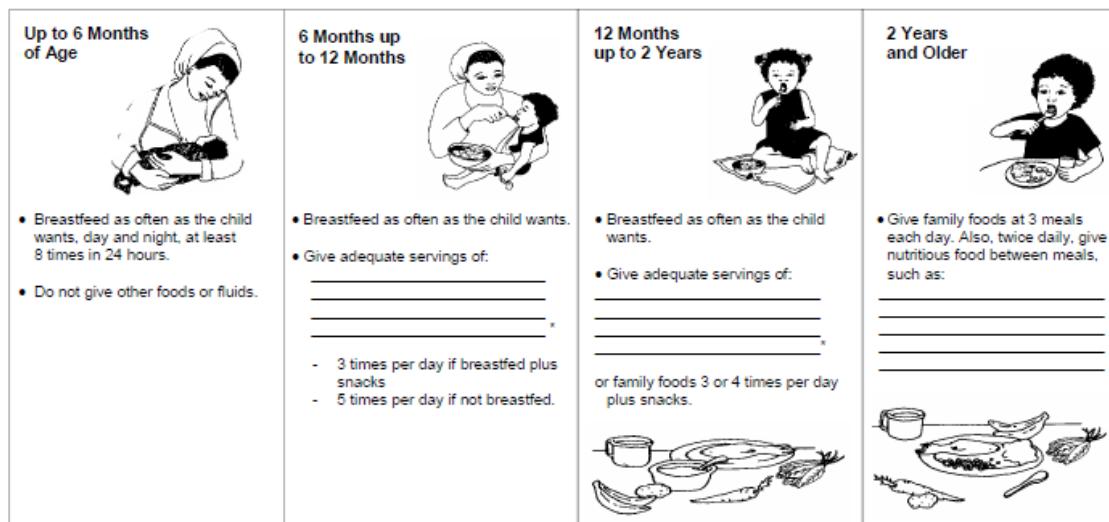
If the child has	Return for follow up in:
PNEUMONIA DYSENTERY MALARIA, if fever persists FEVER-MALARIA UNLIKELY, if fever persists MEASLES WITH EYE OR MOUTH COMPLICATIONS	2 Days

Persistent diarrhoea Acute ear infection Chronic ear infection Feeding problem Any other illness, if not improving	5 days
Pallor	14 days
Very low weight for age	30 days

Advise mother when to return for next immunization according to immunization schedule.

Use a care taker's card

FEEDING RECOMMENDATIONS DURING SICKNESS AND HEALTH



* A good quality diet should be adequate in quantity and include an energy-rich food (for example, thick cereal with added oil); meat, fish, eggs or pulses; and fruits and vegetables.

Use good communication skills

- **Use the following skills:** -
- Ask and listen
- Praise
- Advise
- Check understanding

When to return immediately

Advise mother to return immediately if the child has any of these signs	
Any sick child	<ul style="list-style-type: none">• Not able to drink or breastfeed• Becomes sicker• Develops a fever
If child has NO PNEUMONIA: COUGH OR COLD, also return if:	Fast breathing <ul style="list-style-type: none">• Difficult breathing
If child has Diarrhoea, also return if:	<ul style="list-style-type: none">• Blood in stool• Drinking poorly

Counsel the caretaker of a child with HIV infection

- Refer for counseling and testing

Council the mother about her own health

- If the mother is sick, provide care for her or refer her for help
- If she has a breast problem (such as engorgement, sore nipples, breast infection) provide care for her or refer her for help.
- Advise her to eat well to keep up her own strength and health
- Check the mother's immunization status and her tetanus toxoid in needed
- Make sure she has access to:
 - Family planning
 - Counseling on STI and AIDS prevention.
- Encourage every mother to be sure to know her own HIV status and to seek HIV testing

Advise the caretaker when to return to a health worker

■ **Next well-child visit**

Remind the caretaker of the next visit his/her child needs for immunization **unless** the mother already has a lot to remember and will return soon anyway

7.7 Management of the sick young infants aged up to 2 months.

In this module you will practice : Checking a young infant for very severe disease and local infection, Assessing and classifying a young infant with diarrhoea, Checking young infant for jaundice, Checking young infant for HIV infection, Checking for a feeding problem or low weight, assessing breastfeeding and classifying feeding. It will also look at treating a young infant with oral or intramuscular antibiotics, giving fluid for treatment of diarrhoea, teaching the mother to treat local infections at home, teaching correct positioning and attachment for breastfeeding and finally advising the care taker how to give home care for the young infant

Assess:

Ask the mother what the problem for the infants is.

- Determine if this is an initial visit or a follow up visit.
- If the follow up visit use the follow up instructions
- If initial visit assess the young infant as follows:

ASK

- If the infant had convulsions.

Look listen and feel

- Count the breaths for one minute and repeat if deviated
- Look for severe chest in drawing
- Look for nasal flaring
- Look and listen for grunting
- Look and feel for bulging
- Check for pus draining from the ear
- Look at the umbilicus , is it red or draining pus) does the redness extending to the skin
- Measure the axillary temperature or feel for fever or low body temperature
- Look for skin pustules, are there many or severe pustules?
- See if the young infant is lethargic or unconscious
- Look at the young infants movements, are they less than normal?

During the assessment the young infant must be calm.

Classify

If the following signs are present

- Convulsions or

- Fast breathing(60 b/m or more) or
- Severe chest in- drawing or
- Nasal flaring
- Grunting
- Bulging fontanelle or
- Pus draining from the ear
- Umbilicus redness extending to the skin
- Fever(37.5°C or above or feels hot) or low body temperature less than 35.5°C feels cold or
- Many or severe skin pustules.
- Lethargic or unconscious
- Less than normal movements

Classify as possible severe bacterial infection

Treatment

Then treat as follows:

- Give first dose of intramuscular antibiotics.
- Treat to prevent low blood sugar
- Advise the mother on how to keep the infant warm on the way to the Hospital
- Refer ***urgently*** to the Hospital

If the infant has:

- A red umbilicus or
- Pus draining from the ear
- Skin pustules

Classify as local bacterial infection

Treatment

- Give an appropriate oral antibiotic
- Teach the mother to treat local infection at home
- Advise mother to give care to the young infant
- Follow up in two days

Classify ALL sick young infants for very severe disease and local infection

SIGNS	CLASSIFY AS	TREATMENT (Urgent pre-referral treatments are in bold print)
Any one of the following signs: <ul style="list-style-type: none"> • Not feeding well or • Convulsions or • Fast breathing (60 breaths per minute or more) or • Severe chest indrawing or • Grunting or • Movement only when stimulated or no movement even when stimulated or • Fever (37.5°C* or above)* or • Low body temperature (less than 35.5°C*) 	VERY SEVERE DISEASE	<ul style="list-style-type: none"> ➤ Give first dose of intramuscular antibiotics. ➤ Treat to prevent low blood sugar (see page 16) ➤ Advise mother how to keep the infant warm on the way to the hospital. ➤ Refer URGENTLY to hospital. **
<ul style="list-style-type: none"> • Umbilicus red or draining pus • Skin pustules 	LOCAL BACTERIAL INFECTION	<ul style="list-style-type: none"> ➤ Give an appropriate oral antibiotic. ➤ Teach the mother to treat local infections at home. ➤ Advise mother to give home care for the young infant. ➤ Follow up in 2 days.
None of the signs of very severe disease or local bacterial infection	SEVERE DISEASE OR LOCAL INFECTION UNLIKELY	<ul style="list-style-type: none"> ➤ Advise mother to give home care for the young infant.

Then ask if the young infant have diarrhea

What is diarrhoea in a young infant? A young infant has diarrhoea if the stools have changed from usual pattern and are many and watery (more water than fecal matter).
The normally frequent or semi-solid stools of a breastfed baby are not diarrhoea

If yes ask:

- For how long the infant has had diarrhea
- Find out if there is blood in stool

Look and feel for:

- Look at the infant's general condition. Is the infant lethargic or unconscious?
- Does the infant move only when stimulated?
- Does the infant not move even when stimulated?

Restless and irritable.

- Look for sunken eyes

- Pinch the skin of the abdomen. Does it go back very slowly(longer than 2 seconds) ? Or slowly?

Classify diarrhea and dehydration

Presence of two of the following signs:

- Lethargic or unconscious
- Sunken eyes
- Skin pinch goes back very slowly

Then classify as severe dehydration

Treat as follows

- If infant does not have ***possible serious bacterial infection***
- Give fluids for severe dehydration(plan C)
Or
- If infant has also possible serious bacterial;
- Refer ***urgently*** to hospital with mother giving frequent sips of ORS on the way.
- Advise mother to continue breast feeding.

Check if two of the following signs are present:

- Restless, irritable
- Sunken eyes
- Skin pinch goes back slowly

Then classify the infant as having diarrhea with some dehydration

Treat as follows:

- Give fluid and food for some dehydration(Plan B)
- If infant also has ***possible serious bacterial infection.***
- Then refer ***urgently*** to Hospital with mother giving frequent sips of ORS on the way.
- Advise the mother to continue breastfeeding

If there is not enough signs to classify as some or severe dehydration,

Classify as no dehydration

Treat as follows:

- Give fluids to treat diarrhea at home (Plan A).

If the diarrhea lasts for more than 14 days

Classify as severe persistent diarrhea

And give the following treatment:

- If the young infant is dehydrated
- Treat dehydration before referral unless the infant has also possible serious bacterial infection
- Refer to hospital

And if there is blood in stool,

Classify as dysentery

Treatment

- Treat with an oral antibiotic recommended for shigella for 5 days.
- Follow up in two days.

Having finished assessing the young infant, you have classified and treated the infant you can now check for feeding problems or low weight.

Ask:

- If there is any feeding problems
- If the infant is breastfed. If yes how many times in 24hrs?
- If the infant usually receives any other foods or drinks?
- The mother what she uses to feed the infant?

Look listen feel:

- Look at the young infant's general condition:
- Does the infant move only when stimulated?
- Does the infant not move even when stimulated?
- Is the infant restless and irritable?
- Look for sunken eyes.
- Pinch the skin of the abdomen. Does it go back:
- Very slowly (longer than 2 seconds)?
- Or slowly?

Check the young infant for Jaundice

- Jaundice is a yellow staining of the skin and mucous membranes due to increased amounts of bilirubin in the body

- Increased amounts of bilirubin may cause brain damage – **KERNICTERUS** – leading to death
- Infants who survive may have handicap – **CEREBRAL PALSY, MENTAL RETARDATION and DEAFNESS**

LOOK, ASK:

- Look for jaundice (yellow eyes or skin)
- If present, did it appear within 24hrs of birth.
- THEN look at the young infant's palms and soles. Are they yellow?

Classify for Jaundice

SIGNS	CLASSIFY AS	TREATMENT <small>(Urgent pre-referral treatments are in bold print)</small>
Two of the following signs: <ul style="list-style-type: none">• Movement only when stimulated or no movement even when stimulated• Sunken eyes• Skin pinch goes back very slowly.	SEVERE DEHYDRATION	> If the infant does not have VERY SEVERE DISEASE <ul style="list-style-type: none">- Give fluid for severe dehydration (Plan C). > If the infant also has VERY SEVERE DISEASE : <ul style="list-style-type: none">- Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way.- Advise mother to continue breastfeeding
Two of the following signs: <ul style="list-style-type: none">• Restless, irritable• Sunken eyes• Skin pinch goes back slowly.	SOME DEHYDRATION	> Give fluid and breast milk for some dehydration (Plan B)> If the infant also has VERY SEVERE DISEASE : <ul style="list-style-type: none">- Refer URGENTLY to hospital with mother giving frequent sips of ORS on the way,- Advise mother to continue breastfeeding > Advise mother when to return immediately> Follow up in 2 days if not improving
• Not enough signs to classify as some or severe dehydration.	NO DEHYDRATION	> Give fluids and breast milk to treat for diarrhoea at home (Plan A)> Advise mother when to return immediately> Follow up in 2 days if not improving

Check & assess young infant for HIV infection

- ALL sick young infants should be assessed for HIV infection
- **ASK:**
- If the mother or the infant has had an HIV test?
- What was the result?

Classify HIV

SIGNS	CLASSIFY AS	TREATMENT <small>(urgent pre-natal treatments are in red)</small>
▪ Child has positive virological test	CONFIRMED HIV INFECTION	<ul style="list-style-type: none"> ➢ Give cotrimoxazole prophylaxis from age 4-6 weeks ➢ Assess the child's feeding and counsel as necessary ➢ Refer for staging and assessment for ART ➢ Advise the mother on home care ➢ Follow-up in 14 days
One or both of the following conditions: ▪ Mother HIV positive ▪ Child has positive HIV antibody test (sero-positive)	POSSIBLE HIV INFECTION/HIV EXPOSED	<ul style="list-style-type: none"> ➢ Give co-trimoxazole prophylaxis from age 4-6 weeks ➢ Assess the child's feeding and give appropriate feeding advice ➢ Refer/do virological test to confirm infant's HIV status at least 6 weeks after breastfeeding has stopped ➢ Consider presumptive severe HIV disease (p 9)
Negative HIV test for mother or child	HIV INFECTION UNLIKELY	<ul style="list-style-type: none"> ➢ Treat, counsel and follow-up existing infections ➢ Advise the mother about feeding and about her own health

Check for feeding problems or low weight

■ **ASK:**

- Is the infant breastfed? If yes, how many times in 24 hours?
- Does the infant usually receive any other foods or drinks? If yes, how often?
- What do you use to feed the infant?

■ **LOOK:**

- Determine weight for age
- Use weight for age chart
- For young infant use the Low Weight For Age Line
- Age of the young infant is stated in weeks

Assess breastfeeding

- **IF AN INFANT:**
- Is less than 7 days old
- Is breastfeeding less than 8 times in 24 hours
- Is taking any other foods or drinks or
- Is low weight for age
- and
- Has no indications to refer urgently to hospital
- Assess breastfeeding:
- Has the infant breastfed in the previous hour?
- If not, ask the mother to put her infant to the breast. Observe the breastfeed for 4 minutes.
- (If was fed, ask the mother if she can wait and tell you when the infant is willing to feed again.)

Is the infant able to attach well?

- **Not well attached Good attachment**

To Check Attachment, Look For: -

- Chin touching breast
- Mouth wide open
- Lower lip turned outward
- More areola visible above than below the mouth
- (All of these signs should be present if the attachment is good).
- Is the infant suckling effectively (that is, slow deep sucks, sometimes pausing)?
- Not suckling effectively Suckling effectively
- Clear a blocked nose if it interferes with breastfeeding.
- Look for ulcers or white patches in the mouth (thrush).

Activity 6

Alright, now we move to activity number 5 on successful breast feeding

1. Mention for important things to consider for successful breast feeding

2. Define exclusive breast feeding

Good work, now we can compare our answers with what is in our notes

Classify feeding

SIGNS	CLASSIFY AS	TREATMENT (Urgent pre-referral treatments are in bold)
<ul style="list-style-type: none"> ▪ Not well attached to breast or not suckling effectively <p>OR</p> <ul style="list-style-type: none"> ▪ Less than 8 breastfeeds in 24 hours <p>OR</p> <ul style="list-style-type: none"> ▪ Receives other foods or drinks <p>OR</p> <ul style="list-style-type: none"> ▪ Low weight for age <p>OR</p> <ul style="list-style-type: none"> ▪ Thrush (ulcers or white patches in mouth) 	FEEDING PROBLEM OR LOW WEIGHT	<ul style="list-style-type: none"> ➢ If not well attached or not suckling effectively, teach correct positioning and attachment. <ul style="list-style-type: none"> • If low weight and still not able to attach well, teach the mother to express breastmilk and feed by a cup ➢ If breastfeeding less than 8 times in 24 hours, advise to increase frequency of feeding. Advise her to breastfeed as often and for as long as the infant wants, day and night. ➢ If receiving other foods or drinks, counsel mother about breastfeeding more, reducing other foods or drinks, and using a cup. <ul style="list-style-type: none"> • If not breastfeeding at all: <ul style="list-style-type: none"> - Refer for breastfeeding counselling and possible relactation. - Advise about correctly preparing breastmilk substitutes and using a cup. ➢ Advise the mother how to keep the low weight infant warm at home. ➢ If thrush, teach the mother to treat thrush at home (page 13). ➢ Advise mother to give home care for the young infant. ➢ Follow-up any feeding problem or thrush in 2 days. ➢ Follow-up low weight for age in 14 days.
▪ Not low weight for age and no other signs of inadequate feeding.	NO FEEDING PROBLEM	<ul style="list-style-type: none"> ➢ Advise mother to give home care for the young infant. ➢ Praise the mother for feeding the infant well.

* Look for ulcers or white patches in the mouth (thrush)

Assess feeding problems or low weight for infants receiving no breastmilk (infants on replacement feeding)

- Replacement feeding may be used by some caretakers when AFASS criteria are met
- Assess when an HIV positive mother has chosen not to breastfeed

ASK:

- What milk are you giving?
- How many times during the day and night?
- How much is given at each feed?
- How are you preparing the milk? Let mother demonstrate or explain how a feed is prepared, and how it is given to the infant.
- Are you giving any breast milk at all?
- What foods and fluids in addition to replacement feeds is given?
- How is the milk being given? Cup or bottle?
- How are you cleaning the feeding utensils?

LOOK:

- Determine the weight for age.
- Look for ulcers or white patches in the mouth (thrush).

Classify feeding

SIGNS	CLASSIFY AS	TREATMENT (Urgent pre-referral treatments are in bold)
<ul style="list-style-type: none"> ▪ Milk incorrectly or unhygienically prepared Or ▪ Giving inappropriate replacement feeds ▪ Giving insufficient replacement feeds Or ▪ An HIV positive mother mixing breast and other feeds before 6 months Or ▪ Using a feeding bottle Or ▪ Thrush Or ▪ Low weight for age 	FEEDING PROBLEM OR LOW WEIGHT FOR AGE	<ul style="list-style-type: none"> ➢ Counsel about feeding ➢ Explain the guidelines for safe replacement feeding ➢ Identify concerns of mother and family about feeding. ➢ If mother is using a bottle, teach cup feeding ➢ If thrush, teach the mother to treat it at home (page 37) ➢ Follow-up FEEDING PROBLEM or THRUSH in 2 days ➢ Follow up LOW WEIGHT FOR AGE in 7 days ➢ Vitamin A
<ul style="list-style-type: none"> ▪ Not low weight for age and no other signs of inadequate feeding 	NO FEEDING PROBLEM	<ul style="list-style-type: none"> ➢ Advise mother to continue feeding, and ensure good hygiene ➢ Praise the mother for feeding the infant well

Then check the young infant's immunization status

- Check immunization status just as you would for an older infant or young child.
- Remember that you should not give OPV0 to an infant who is more than 13 days old.
- If an infant has not received OPV0 by the time he is 14 days old, until he is 6 weeks old and give OPV 1 together with DPT-HepB-Hib 1.

Assess infant's other problems

- Assess any other problems mentioned by the mother or observed by you.
- Refer to any guidelines on treatment of the problems.
- If you think the infant has a serious problem, or you do not know how to help the infant, refer the infant to a hospital

Assess caretaker's health needs

- Then **CHECK** the caretaker's other health needs
- **TREAT** caretakers problems
- **REFER** the caretaker if you cannot treat

Identify appropriate treatment

- Determine if the young infant needs urgent referral

- Very severe disease
- Severe jaundice
- Severe dehydration (and does not have Very severe disease or Severe jaundice), the infant needs rehydration with IV fluids according to Plan C.
- If you can give IV therapy, you can treat the infant in the clinic. Otherwise urgently refer the infant for IV therapy.
- If a young infant has both Severe Dehydration and Very severe disease and Severe jaundice, refer the infant urgently to hospital. The mother should give frequent sips of ORS on the way and continue breastfeeding.

Identify treatments for young infant who does not need urgent referral

- Identify treatments for each classification by reading the chart.
- Record treatments, advice to give the mother, and when to return for a follow-up visit.

Identify appropriate treatment

Identify urgent pre-referral treatment needed

- Before urgently referring a young infant to hospital, give all appropriate pre-referral treatments.
- Urgent pre-referral treatments are in bold print on the chart. Some treatments should not be given before referral because they are not urgently needed and would delay referral.
- For example,
- Do not teach a mother how to treat a local infection before referral.
- Do not give immunizations before referral.
- Treat to prevent low blood sugar.
- Refer urgently to hospital with mother giving frequent sips of ORS on the way. Advise mother to continue breastfeeding.

Refer the young infant

- Use the same procedures for referring a young infant to hospital as for referring an older infant or young child.

Treat the young infant and counsel the caretaker

- **Give an appropriate oral antibiotic**
- Refer to the box on the **YOUNG INFANT** chart for the recommended antibiotic for local bacterial infection and determine the dose based on the young infant's weight.
- **Give first dose of intramuscular antibiotics**
- Young infants get two intramuscular antibiotics: intramuscular Gentamycin and intramuscular Benzyl penicillin.

Treat the young infant and counsel the caretaker

- Young infants with Very severe disease are often infected with a broader range of bacteria than older infants.

Treat the young infant and counsel the caretaker

- **Treat diarrhoea**
- **Plan A: Treat Diarrhoea at Home**
- All infants and children who have diarrhoea need extra fluid and continued feeding to prevent dehydration and give nourishment.
- Breastfeed more often and for longer at each breastfeed.
- Additional fluids are ORS solution and clean water.

Treat the young infant and counsel the caretaker

- If an infant is exclusively breastfed, it is important **NOT** to introduce a food-based fluid.
- Show the mother how much ORS to give the infant after each loose stool.
- She should first offer a breastfeed, and then give the ORS solution.
- Remind the mother to stop giving ORS solution after the diarrhoea has stopped.

Plan B: Treat Some Dehydration

- ORS solution – Plan B.
- During the first 4 hours of rehydration, encourage the mother to pause to breastfeed the infant whenever the infant wants, then resume giving ORS.
- Give a young infant who does not breastfeed additional **100-200 ml clean water** during this period.

Immunize every sick young infant, as needed

- Administer any immunizations that the young infant needs today.

- Tell the mother when to bring the infant for the next immunizations.
- Remember to give vitamin A supplementation to the mother within 6 weeks of delivery if she has not received since delivery

Teach the mother to treat local infections at home

- An umbilicus which is red or draining pus
- Skin pustules
- Thrush.
- Twice each day, the mother cleans the infected area and then applies gentian violet.
- Half-strength gentian violet must be used in the mouth.

Teach correct positioning and attachment for breastfeeding

Good positioning

- Infant's neck is straight or bent slightly back
- Infant's body is turned towards the mother
- Infant's body is close to the mother, and
- Infant's whole body is supported.

Poor positioning

- Infant's neck is twisted or bent forward,
- Infant's body is turned away from mother,
- Infant's body is not close to mother, or
- Only the infant's head and neck are supported

Correct attachment

- Chin touching breast
- Mouth wide open
- Lower lip turned outward
- More areola visible above than below the mouth
- (All of these signs should be present if the attachment is good).

Advise mother to give home care for the young infant

Food and fluids:

- Frequent breastfeeding will give the infant nourishment and help prevent dehydration.
- Teach how to Express Breast Milk

- Make sure the young infant stays warm at all times:
- Low temperature alone can kill young infants.
- Teach how to keep the infant warm

Advise mother to give home care for the young infant

- **When to return:**
- Tell the mother when to return for a **follow-up visit**.
- Also teach the mother **when to return immediately**

7.15 follow up the young infant

In this module you will practice the steps for conducting a follow-up visit: Deciding if the child's visit is for follow-up. If the child has been brought for follow-up, assessing the signs specified in the follow-up box for the child's previous classification. Selecting treatment based on the child's signs and if the child has any new problems, assessing and classifying them as you would in an initial visit.

a) Conduct a follow-up visit for pneumonia

After 2 days:

- Check the child for general danger signs.
- Assess the child for cough or difficult breathing.

ASK:

- Is the child breathing slower?
- Is there less fever?
- Is the child eating better?
- Assess for HIV infection

Treatment:

- If chest indrawing or a general danger sign, give a dose of second-line antibiotic or
- Intramuscular chloramphenicol. Then refer **URGENTLY** to hospital.
- If breathing rate, fever and eating are the same or worse, change to the second-line antibiotic and advise the mother to return in 2 days or refer.
- If this child had measles within the last 3 months or is known or suspected to have Symptomatic HIV Infection, refer.)

- If breathing slower, less fever, or eating better, complete the 5 days of antibiotic.

Conduct a follow-up visit for persistent diarrhoea

- After 5 days:

ASK:

- - Has the diarrhoea stopped?
- - How many loose stools is the child having per day?

Assess for HIV infection

- **Treatment:**

- If the diarrhoea has not stopped (child is still having 3 or more loose stools per day)
- Do a full assessment of the child.
- Give any treatment needed, then refer to the next level
- If the diarrhoea has stopped (child having less than 3 loose stools per day), tell the mother to follow the usual feeding recommendations for the child's age.
- She/he should also continue giving zinc supplement and multivitamins.

Conduct a follow-up visit for dysentery

After 2 days:

- **Assess the child for diarrhoea**

ASK:

- Are there fewer stools?
- Is there less blood in the stool?
- Is there less fever?
- Is there less abdominal pain?
- Is the child eating better?

- **Treatment:**

- If the child is dehydrated, treat for dehydration.
- Advise the caretaker to continue giving zinc supplements until it is given for 14 days.
- If number of stools, blood in the stools, fever, abdominal pain, or eating is the same or worse.
- Change to second-line oral antibiotic recommended for shigella.
- Give it for 5 days. Advise the mother to return in 2 days.

- Exceptions: if the child is less than 12 months old or was dehydrated on the first visit, or had measles within the last 3 months, **refer to hospital**.
- If fewer stools, less fever, less abdominal pain, and eating better, continue giving ciprofloxacin until finished.

Conduct a follow-up visit for oral thrush

- After 2 days:

LOOK for mouth ulcers or thrush

- If thrush is worse give 100,000 iu of oral Nystatin 4 times daily for 7 days
- If thrush is the same or better continue half strength gentian violet for a total of 7 days.

Conduct a follow-up visit for malaria

If fever persists after 2 days, or returns within 14 days:

- Do a full reassessment of the child
- Assess for other causes of fever.

Treatment:

- If the child has any general danger sign or stiff neck, treat as Very severe febrile disease.
If the child has any cause of fever other than malaria, provide treatment.
- If malaria is the only apparent cause of fever:
- Do RDT or microscopy. If positive or unable to do test:
 - Change to oral quinine
 - Give paracetamol if fever present
 - Advise the mother to return again in 2 days if the fever persists.
- Quinine is not available refer to hospital
- If fever has been present for 7 days, refer for assessment.

Conduct a follow-up visit for measles with eye or mouth complications

- After 2 days:
- Look for red eyes and pus draining from the eyes.
- Look at mouth ulcers.

- Smell the mouth.
- Treatment for Eye Infection:
 - If pus is draining from the eye, ask the mother to describe how she has treated the eye infection.
 - If treatment has been correct, refer to hospital.
 - If treatment has not been correct, teach mother correct treatment.
 - If no pus or redness, stop the treatment.
- Treatment for Mouth Ulcers:
 - If mouth ulcers are worse, or there is a very foul smell coming from the mouth, refer to hospital.
 - If mouth ulcers are the same or better, continue using half-strength gentian violet for a total of 5 days

Conduct a follow-up visit for ear infection

- After 5 days:
- Reassess for ear problem.
- Measure the child's temperature.
- For chronic ear infection check for HIV infection if it was not done
- Treatment:
 - If there is tender swelling behind the ear or high fever (38.5°C or above), refer urgently to hospital.
 - **Acute ear infection:** if ear pain or discharge persists, treat with 5 more days of the same antibiotic. Continue wicking to dry the ear. Follow-up in 5 days.
 - **Chronic ear infection:** Check that the mother is wicking the ear correctly. Encourage her to continue.
 - **No ear pain or discharge**, praise the mother for her careful treatment. Tell her to use all of it before stopping.

Conduct a follow-up visit for feeding problem After 5 days:

- Reassess feeding
- Ask about any feeding problems found on the initial visit.
- Counsel the mother about any new or continuing feeding problems.

- If you counsel the mother to make significant changes in feeding, ask her to bring the child back again in 5 days.
- If the feeding has been corrected, but the child is very low weight for age, ask the mother to return 30 days after the initial visit to measure the child's weight gain.

Conduct a follow-up visit for very low weight

- After 30 days:
- Weigh the child and determine if the child is still very low weight for age or growth faltering.
- Reassess feeding.
- Check for HIV infection.
- Treatment:
- If the child is no longer very low weight for age, praise the mother and encourage her to continue.
- If the child is still very low weight for age, counsel the mother about any feeding problem found.
- Ask the mother to return again in one month. Continue to see the child monthly until the child is feeding well and gaining weight regularly or is no longer very low weight for age.

Exception:

- If you do not think that feeding will improve, or if the child has lost weight, refer the child.

Conduct a follow-up visit for pallor

- After 14 days:
- Give iron. Advise mother to return in 14 days for more iron.
- Continue giving iron every 14 days for 2 months.
- If the child has palmar pallor after 2 months, refer for assessment

Conduct a follow up visit for HIV infection

- First follow up in 14 days
- Repeat monthly follow up visits

Give follow-up care for the sick young infant

- Local Bacterial Infection

- After 2 days:
- Look at the umbilicus. Is it red or draining pus? Does redness extend to the skin?
- Look at the skin pustules. Are there many or severe pustules?
- Treatment:
- If umbilical pus or redness remains same or is worse, refer to hospital.
- **Give follow-up care for the sick young infant**
- If pus and redness are improved, tell the mother to continue giving the 5 days of antibiotic and continue treating the local infection at home.
- If skin pustules are same or worse, refer to hospital.
- If improved, tell the mother to continue giving the 5 days of antibiotic and continue treating the local infection at home.

1. Jaundice

- After 2 days
- Look for jaundice. Check if the palms and soles are yellow.

Treatment.

- If the palms and soles are yellow refer to hospital
- If the palms and soles are not yellow, advise home care and when to return immediately.

2. Diarrhoea

- After 2 days

Ask:

- If the diarrhoea stopped

Treatment

- If the diarrhoea has not stopped, assess and treat the young infant for diarrhoea
- If the diarrhoea has stopped, tell the caretaker to continue feeding the child.

3. Feeding Problem

- After 2 days

Reassess feeding

- Ask about any feeding problems found on the initial visit
- Counsel about new or continuing problem
- If low weight for age ask the care taker to return 14 days after initial visit
- Refer if no improvement

4.Low Weight

- Weigh the young infant and determine if the infant is still low weight for age.
- Reassess feeding
- If the infant is no longer low weight for age, praise the mother and encourage her to continue.
- If the infant is still low weight for age, but is feeding well, praise the mother
- Ask her to have her infant weighed again within 14 days or when she returns for immunization, whichever is the earlier.
- If the infant is still low weight for age and still has a feeding problem, counsel the mother about the feeding problem.
- Ask the mother to return again in 14 days (or when she returns for immunization if this is within 2 weeks).
- Continue to see the young infant every few weeks until the infant is feeding well and gaining weight regularly and is no longer low weight for age.

5. Thrush

- Look for white patches in the mouth (thrush).
- Reassess feeding
- If thrush is worse check that treatment is being given correctly, consider HIV
- If the infant has problems with attachment or suckling, refer to hospital.
- If thrush is the same or better, and the baby is feeding well, continue with Nystatin (or gentian violet) for a total of 5 days

6. Possible HIV/HIV Exposed

- Follow-up: in 14 days, then monthly for 3 months, then every 3 months or as per immunization schedule

Do a full re-assessment at each follow-up visit and reclassify for HIV on each follow-up visit

- Counsel about feeding practices
- Follow co-trimoxazole prophylaxis as per national guidelines
- Follow national immunization schedule

- Follow Vitamin A supplements from 6 months of age every 6 months
- Monitor growth and development
- Virological Testing for HIV infection as early as possible from 6 weeks of age
- Refer for ARVs if infant develops severe signs suggestive of HIV
- Counsel the mother about her own HIV status and arrange counselling and testing for her if required

Self evaluation test 5

Well learners, having looked at a possible HIV exposed infant, let us do this activity

List important things that need to be done during a follow up visit of a possible HIV exposed infant

Answers to the above activity

Job well done, we can now compare our answers to the answers listed below so that we can make corrections

- Do a full re-assessment at each follow-up visit and reclassify for HIV on each follow-up visit
- Counsel about feeding practices
- Follow co-trimoxazole prophylaxis as per national guidelines
- Follow national immunization schedule
- Follow Vitamin A supplements from 6 months of age every 6 months
- Monitor growth and development
- Virological Testing for HIV infection as early as possible from 6 weeks of age
- Refer for ARVs if infant develops severe signs suggestive of HIV

Counsel the mother about her own H

Summary

Well learners, we have come to the end of unit 7 on integrated management of childhood illnesses (IMCI). In this unit, we discussed that the IMCI strategy has four components which include improving case management skills of health workers, improving the health system to

deliver IMCI essential drug supply and management and improving family and community practice. We also discussed on how a sick child who is six months up to five years can be assessed, classified, how treatment can be identified and how the care taker can be counseled. We went on to look at the sick young infants up to 2 months. In our discussion, we also looked at how the delivery area of the mother and child can be prepared and the essential needs of the new born. We further looked at severe disease and local bacterial infection, jaundice, diarrhoea and HIV. In our discussion, we looked the 3 rules of treating diarrhoea at home which include giving the child fluids than usual to prevent dehydration, giving the child plenty of foods to prevent malnutrition and taking the child to the health workers if he does not get better or develops any of the symptoms such as many watery stools, eating or drinking poorly and repeated vomiting, fever, marked thirsty and blood in stool. We further looked at a possible HIV exposed infant in which we said that the child should be followed up in 14 days, then monthly for 3 months, every 3 months or as per immunization schedule. We said that on every follow up visit a full re-assessment should be done and reclassify the child for HIV. Counsel about feeding practices, follow up co-trimoxazole prophylaxis as per national guidelines immunization schedule, Vitamin A supplements from 6 months of age every 6 months monitor growth and development, virological Testing for HIV infection as early as possible from 6 weeks of age, refer for ARVs if infant develops severe signs suggestive of HIV. We further discussed that the mother should be counseled about her own HIV status and arrange counselling and testing for her if required.

References

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