DEDER GENERAL HOSPITAL

PEDIADTRICS OUTPATIENT DEPARTMENT (PEDI OPD)

Standard Treatment Guidelines (STG) Protocol

"Adapted from National STG 2021 4th Edition"

October 2024

Deder, Eastern Ethiopia

SMT APPROVAL SHEET

TITLE	**Title:** Pediadtrics Outpatient Department (PEDI OPD) Standard Treatment Guidelines (STG) Protocol **Version**: 1.0			
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REVIEW	**Reviewed and updated** **Review date: July 2018E.C**			

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SECTION 1:

INTRODUCTION

1.1 Background

This Standard Treatment Guideline (STG) for Pediatrics at Deder General Hospital is developed to standardize the clinical management of common pediatric conditions in the Outpatient Department (OPD) and inpatient units. It is adapted from the National Standard Treatment Guidelines (STG) 2021 – 4th Edition, with contextual modifications based on local epidemiology, resource availability, and clinical practice patterns at Deder General Hospital.

The guideline focuses on the top ten leading causes of pediatric morbidity and mortality observed in the hospital during the Ethiopian Fiscal Year (EFY) 2016, ensuring that care is both evidence-based and operationally feasible.

1.2 Purpose

The primary purpose of this pediatric STG is to:

Standardize clinical practice across all levels of healthcare providers in the Pediatrics Department.

Improve quality of care by reducing variability in diagnosis, treatment, and follow-up.

Promote rational use of medicines, particularly antibiotics, in alignment with national policies.

Support antimicrobial stewardship and infection prevention efforts.

Enhance patient safety through clear, evidence-based protocols.

Serve as a training tool for medical officers, nurses, pharmacists, and interns.

Facilitate monitoring and evaluation of clinical performance and treatment outcomes.

1.3 Scope of Application

This STG applies to:

All pediatric patients **aged 0–14 years** presenting to the Pediatric OPD or admitted to the Pediatrics Inpatient Department (IPD).

Common conditions managed in outpatient and inpatient settings, including but not limited to:

1. Pneumonia
2. Diarrheal diseases (including dehydration)
3. Malaria
4. Malnutrition (acute and chronic)
5. Seizures and febrile convulsions
6. Acute otitis media and otitis externa
7. Asthma and bronchiolitis
8. Sepsis and meningitis
9. Anemia
10. Intestinal parasitosis

For conditions not covered in this document, clinicians should refer to the National STG 2021 or relevant specialty guidelines.

1.4 Need for Hospital-Specific Pediatric STG

While the National STG provides a strong foundation, local adaptation is essential due to:

- **Local Disease Burden**: High prevalence of pneumonia, diarrhea, malnutrition, and malaria in the catchment area.
- **Resource Availability**: Limited access to advanced diagnostics, imaging, and certain medications.
- **Referral Challenges**: Geographic barriers and limited transport affect timely referral; hence, stabilization and initial management must be robust.
- **Staffing Patterns:** Frequent rotation of junior staff and interns necessitates clear, easy-to-follow protocols.
- **Integration with Existing Systems**: Alignment with hospital pharmacy formulary, laboratory capacity, and integrated emergency care.

1.5 Guiding Principles

This pediatric STG is built on six core principles:

Evidence-Based Practice – All recommendations are grounded in the National STG 2021 and WHO guidelines.

Patient-Centered Care – Treatment plans consider age, weight, comorbidities, and family circumstances.

Feasibility & Accessibility – Protocols use only medicines and diagnostics available at Deder General Hospital.

Safety & Efficacy – Emphasis on correct dosing, route, and duration to prevent adverse events.

Cost-Effectiveness – Prioritizes affordable, high-impact interventions.

Sustainability – Designed for long-term use with minimal external support.

1.6 Target Users

This guideline is intended for:

- Medical Officers and Pediatricians
- Nurses and Nurse Practitioners in OPD and IPD
- Pharmacists and Pharmacy Technicians
- Laboratory Technologists
- Interns and Health Officers
- Community Health Workers involved in follow-up

1.7 Exclusions

This STG does not cover:

- Obstetric and neonatal intensive care (managed under separate neonatal protocols)
- Surgical emergencies (managed under Surgical Department protocols)
- Chronic non-communicable diseases requiring long-term specialist follow-up (e.g., congenital heart disease, cerebral palsy)
- Mental health conditions

1.8 Development Methodology

The development process included:

- **Needs Assessment**: Review of EFY 2016 pediatric morbidity and mortality data.
- **Document Review:** Analysis of National STG 2021, WHO guidelines, and Ethiopian Essential Medicines List (EML).
- **Local Adaptation**: Adjustments made for drug availability, dosing, and referral pathways.
- **Stakeholder Validation**: Consultations with pediatricians, pharmacists, lab staff, and hospital management.
- **Approval:** Endorsed by the Hospital Medical Directorate and Oromia Regional Health Bureau.
- **Implementation Planning**: Training, distribution, and integration into daily workflows.

1.9 Alignment with National & Regional Policies

This STG supports:

- **National STG 2021 (4th Edition**) – Ensures consistency with MOH recommendations.
- **Ethiopian Essential Medicines List (6th Edition)** – All drugs listed are on the EML and available in hospital formulary.
- **Health Sector Transformation Plan II** (HSTP-II, 2020/21–2024/25) – Supports goals of reducing child mortality and improving quality of care.
- **National Antimicrobial Resistance (AMR) Strategy (2017–2027**) – Promotes rational antibiotic use.

1.10 Limitations

Despite its comprehensiveness, this STG has limitations:

- **Medicine Stockouts:** Intermittent unavailability may require substitution.
- **Diagnostic Gaps**: Limited access to culture, imaging, or PCR testing.
- **Staff Turnover:** Requires ongoing training and supervision.
- **Scope**: Focuses only on top 10 conditions; rare diseases require referral.
- **Evolving Evidence**: Will require regular updates to remain current.

1.11 Sustainability & Updating Plan

To ensure longevity and relevance:

- **Review Frequency:** Every two years, or earlier if national policy changes or new evidence emerges.
- **Responsible Body**: Pediatric STG Review Committee (including pediatricians, pharmacists, lab heads, and management).
- **Feedback Mechanism**: STG suggestion box in OPD and monthly staff meetings.
- **Training:** Included in orientation for new staff and interns.
- **Availability:** Printed copies in OPD, IPD, pharmacy, and lab; digital version on hospital intranet.

1.12 Ethical Considerations

All providers must uphold:

- **Informed Consent**: Explain diagnosis, treatment, risks, and alternatives to caregivers.
- **Confidentiality**: Protect patient information per national health data policies.
- **Equity**: Provide equal care regardless of socioeconomic status.
- **Child Protection**: Report suspected abuse or neglect per national guidelines.

1.13 How to Use This STG

1.13.1 General Use

Use as primary reference for managing common pediatric conditions.

Adapt treatment to individual patient needs within resource limits.

Refer to National STG 2021 for conditions not covered.

1.13.2 Format & Navigation

Each disease chapter includes:

- Definition
- Causes & Risk Factors
- Clinical Features
- Investigations
- Management (Pharmacologic & Non-Pharmacologic)
- Follow-Up
- Referral Criteria
- Prevention & Health Education

1.13.3 Symbols & Notations

[E] – Medicine on Ethiopian Essential Medicines List
[PO] – Oral administration
[IV] – Intravenous
[IM] – Intramuscular
[UR] – Use with caution in renal impairment
[P] – Use with caution in pregnancy (for caregivers)

1.13.4 Clinical Decision Support

- Use weight-based dosing charts.
- Apply IMCI-based triage for rapid identification of danger signs.
- Consult hospital antibiogram when prescribing antibiotics.

1.13.5 Documentation Requirements

For every patient:

- Document diagnosis, treatment, and follow-up plan.
- Record adverse drug reactions using national pharmacovigilance forms.
- Update electronic or paper-based records in DHIS2-compatible format.

SECTION 2:

PURPOSE, RATIONALE, AND PRINCIPLES OF GOOD PRESCRIBING & DISPENSING PRACTICE

2.1 Purpose

This section ensures safe, effective, and rational medicine use in pediatric care.

2.2 Rationale

Children are not small adults. Dosing errors, inappropriate formulations, and lack of adherence are common risks. A structured approach minimizes harm and improves outcomes.

2.3 Principles of Good Prescribing

1. **Confirm Diagnosis** – Base treatment on clinical and, when possible, laboratory findings.
2. **Choose the Right Drug** – Prefer oral over IV, narrow-spectrum antibiotics, and EML-listed medicines.
3. **Calculate Dose by Weight** – Always use mg/kg for pediatric dosing.
4. **Check for Allergies & Interactions** – Especially in children on multiple medications.
5. **Use Clear Instructions** – Include frequency, duration, and administration method.
6. **Educate Caregivers** – Explain purpose, side effects, and warning signs.
7. Monitor Response – Reassess within 24–72 hours for outpatient cases.

2.4 Principles of Good Dispensing Practice

1. Verify Prescription – Check dose, frequency, and legibility.
2. Use Age-Appropriate Formulations – Syrups, dispersible tablets, or suppositories as needed.
3. Label Clearly – Include child's name, drug, dose, frequency, and expiry.
4. Counsel Caregivers – Demonstrate use of spacers, nebulizers, or ORS preparation.
5. Avoid Stock-Outs – Report shortages promptly to pharmacy manager.
6. Document Dispensing – Maintain medicine register and patient record.

Section 3:

Antimicrobial Resistance, Patient Care, and Palliative Care

3.1 Antimicrobial Stewardship

3.1.1 Rational Antibiotic Use

- Prescribe only when bacterial infection is likely.
- Avoid antibiotics for viral illnesses (e.g., common cold, bronchiolitis).
- Use first-line agents as per STG unless contraindicated.
- Limit duration: e.g., 3–5 days for pneumonia, 5 days for UTI.

3.1.2 Key Practices

- Use narrow-spectrum antibiotics when possible.
- Prefer oral over IV unless severely ill.
- Educate caregivers on completing full course and not sharing antibiotics.
- Report treatment failures to AMR focal person.

3.1.3 Role of Hospital Antimicrobial Stewardship Program (ASP)

- Conduct monthly prescription audits in pediatric OPD/IPD.
- Provide feedback and mentoring to prescribers.
- Distribute annual local antibiogram.
- Organize CPD sessions on AMR and rational prescribing.

3.2 Patient Care Settings

3.2.1 Ambulatory (Outpatient) Care

- Focus on early diagnosis, oral treatment, and caregiver education.
- Use IMCI algorithms for triage.
- Provide clear follow-up instructions and warning signs (e.g., difficulty breathing, inability to drink).
- Link to TB, ART, and chronic care clinics when needed.

3.2.2 Inpatient Care

Admit if:

- Severe pneumonia (chest indrawing, $SpO_2 < 90\%$)
- Severe dehydration
- Convulsions not stopping
- Signs of sepsis or meningitis
- Severe malnutrition with complications
- Failure of outpatient treatment

Management includes:

- IV access, oxygen, monitoring
- Weight-based dosing
- Parenteral antibiotics if indicated
- Nutritional support
- Family involvement in care

SECTION 4:

DISEASE SPEFIC TOPICS

CHAPTER I
Diarrheal diseases

Acute diarrhea

- Acute diarrheal disease is the passage of loose, liquid or watery stool.
- Diarrhea is defined as passage of three or more loose or watery stools in 24-hour period.
- However, it is the recent change in consistency and character of stool than the number of stools that is more important.
- Its complications like dehydration, electrolytes disturbance and malnutrition are major causes of morbidity and mortality in developing countries.
- The leading cause of diarrhea in infants is the rotavirus followed by enteric adenoviruses.
- Shigella is a most common pathogen in children between 1 to 5 years with bloody diarrhea.
- Other bacterial pathogens include campylobacter, salmonella and Escherichia Coli.

Table 16. 3. Classification based on dehydration

Degree of dehydration	**Some**	**Severe**
a. Look for		
General condition Eyes Tears on cry Mouth and tongue Thirst	Restless, irritable Sunken Absent Dry Thirsty (drinks eagerly)	Lethargic, floppy, unconscious, Deeply sunken and dry Absent Very dry Very thirsty but (drinks poorly or unable to drink)
b. Feel for		
Skin pinch	Goes back slowly, takes 1 to 2 seconds	Goes back very slowly, takes more than 2 seconds
c. Decide	There is some dehydration (5-10% fluid loss).	There is severe dehydration (>10% fluid loss).
d. Treatment	Plan B With WHO recommended ORS solution to correct some dehydration.	Plan C With IV infusion urgently to correct severe dehydration and to prevent death

- **No dehydration:** if there are no enough signs to classify as ―some‖ or

–severe‖ dehydration. The degree of dehydration is less than 5 %.

Persistent diarrhea

- It can by classified based on duration:
  - **Severe persistent diarrhea**: If diarrhea lasts for 14 days or more and dehydration is present.
  - **Persistent diarrhea:** Diarrhea lasting for 14 days or more and there is no dehydration.

Dysentery

- Dysentery is a blood diarrheal stool.
- Dysentery can be an acute or persistent diarrhea and it can also be associated with dehydration.

Investigations

- Diagnosis is generally based on clinical profile.

Stool examination or stool culture may be indicated in children with dysentery or persistent diarrhea but is not commonly needed for acute watery diarrhea

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Treatment Objectives

- Prevent dehydration,
- Treat dehydration, when dehydration is present;
- Prevent nutritional damage, by feeding during and after diarrhea; and
- Reduce the duration and severity of diarrhea, and the occurrence of future episodes, by giving supplemental zinc.

Plan A

- Give fluid and food to treat diarrhea at home.
  - If the child is being breastfed, advise the mother to breastfeed frequently and for longer at each feed.
  - If the child is exclusively breastfed, give ORS solution or clean water in addition to breast milk.
  - After the diarrhea stops exclusive breastfeeding should be resumed, if appropriate to the child‘s age
  - In non-exclusively breastfed children, give one or more of the following:
    - ORS solution
    - Food-based fluids (such as soup, rice water and yoghurt drinks)
    - Clean water
- If the child cannot return to clinic, if diarrhea gets worse, teach the mother how to mix and give ORS and give the mother two packets of ORS to use at home.
- Show the mother how much fluid to give in addition to the usual fluid intake:
  - Up to two years- 50 to 100 ml after each loose stool
  - Two 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 diarrhea stops.

Dangerous fluids not to be given

- Drinks sweetened with sugar
- Commercial carbonated beverages
- Commercial fruit juices
- Sweetened tea
- Fluids with stimulant, diuretic or purgatives effects (e.g., coffee)
- Some medicinal teas or infusions
-

Plan B

Treat some dehydration with ORS in Clinic

- Give the recommended amount of ORS over 4-hour period

- Amount of Use the child's age only when you do not know the weight. The approximate ORS required (in ml) can be calculated by multiplying the child's weight (in kg) times 75.
- If the child wants more ORS than shown, give more
- If the child vomits, wait 10 minutes. Then continue, but more slowly.
- Continue breastfeeding whenever the child wants.

Table 16. 4. Amount of ORS to be given during the first 4 hours depending on age of the child

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
ORS in ml	200-400	400-700	700-900	900-1400

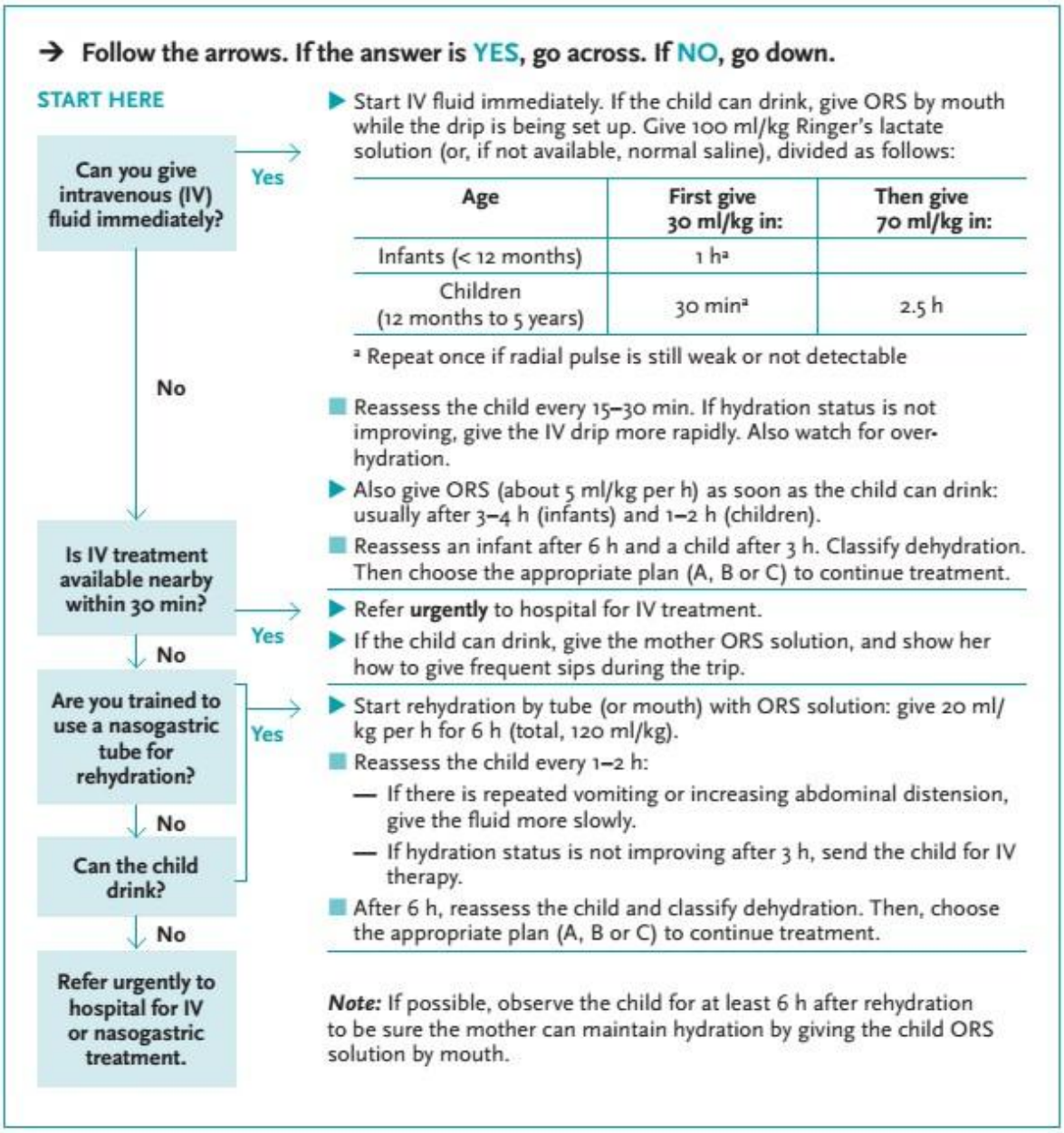
After 4 hours:

- 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 enough ORS packets to complete rehydration. Also give her 2 packets as recommended in Plan A.
- Explain the 3 components of home treatment.

Treatment plan C: treat severe dehydration quickly



Pharmacologic

- Antibiotics should not be used routinely.
  - They are reliably helpful only in children with bloody diarrhea, probable shigellosis, and suspected cholera with severe dehydration.

Zinc supplements

- It has been shown that zinc supplements during an episode of diarrhea reduce the duration and severity of the episode and lower the incidence of diarrhea in the following 2-3 months.
- WHO recommends zinc supplements as soon as possible after diarrhea has started.
- Dose up to 6 months of age is 10 mg/day and age 6 months and above 20mg/day, for 10-14 days.

Reference

- Haileamlak A. Why is the Acute Watery Diarrhea in Ethiopia attaining extended course? Ethiopian journal of health sciences. 2016;26(5):408.
- IMNCI hand book

Sepsis in children

Brief description

- **Pediatric sepsis** is generally considered to comprise a spectrum of disorders that result from infection by bacteria, viruses, fungi, or parasites or the toxic products of these microorganisms.
- Early recognition and intervention clearly improve outcome for infants and children with conditions that lead to **sepsis**.

Causes

- Common pathogens in infant <1month of age
  - E. coli
  - Group B streptococci
  - Listeria monosytogens
- However, these pathogens can still be cause of sepsis up to 3 months of age

Common pathogens in older children

- Neisseria meningitides
- Streptococcus pneumonia
- Haemophilus influenza type b
- Staphylococcus aureus
- Group A streptococci
- Community acquired MRSA

High-risk groups include:

- Neonates
- Immuno-compromised children
- Children on prolonged broad spectrum antibiotic use
- ICU admissions
- Children with central venous access devices
- Children on immunosuppressive drugs

Septic children may present with:

- Cold shock characterized by a narrow pulse pressure and prolonged capillary refill. The underlying hemodynamic abnormality is septic myocardial dysfunction, which is more common in infants and neonates.
- Warm shock characterized by a wide pulse pressure and rapid capillary refill. The underlying hemodynamic abnormality is vasoplegia, which is more common in older children and adolescents.

Clinical manifestation

- Fever or hypothermia
- Tachycardia
- Tachypnea +/- hypoxia
- Altered state of consciousness
- Cold shock: narrow pulse pressure, prolonged capillary refill more in infant
- Warm shock: wide pulse pressure rapid capillary refill more common in older children and adolescent.

Investigation

- CBC with differential, CRP/ESR
- Urinalysis
- CSF analysis

- If it is available➔One set (2 bottles) of blood cultures (1 aerobic, 1 anaerobic, from 2 different sites), urinalysis and urine culture should be collected before the 1st dose of antibiotics

Diagnosis of sepsis

- Clinically, the Systemic Inflammatory Response Syndrome (SIRS) is the occurrence of at least two of the following criteria: **fever** >38.0°C or hypothermia <36.0°C, tachycardia, tachypnea, leucocytosis >12*10^9/l or leucopoenia <4*10^9/l.

Treatment Objective

- Early administration of empiric intravenous antibiotics (within 30-60min of

presentation

- Empiric antibiotic recommendations may change based on evolving medical knowledge.
- Remove infectious source (catheter, drain abscess/fluid collections)
- Modify antibiotic based on culture results
- Carefully titrated fluid resuscitation
- Peripherally administered inotrope / vasopressor

Non-Pharmacologic

- Secure IV line,
- If the patient is in shock➔Initial fluid 20ml/kg of 0.9% N/S if needed 60ml/kg IV
- Consider blood transfusion if hemoglobin is less than 10mg/dl and FFP if the patient has high PT, PTT and INR.
- If the patient is in shock and has malnutrition
  - Volume is 15ml/kg 0.45%NS with 5% dextrose Or RL with 5% dextrose.
  - Can be repeated once if there is no sign of fluid overload

Pharmacologic

- The amount of fluid to be given depends on the cause of shock (febrile illness versus shock caused by GI loss, hemorrhage or any cause the depletes the intravascular volume), availability of Intensive care units in the specific set up, the degree of shock (normotensive/compensated or hypotensive/decompensated shock) and presence or absence of comorbidities like severe acute malnutrition and severe anemia.
- **If PICU is available**, give 40-60ml/kg crystalloids (10-20ml/kg per bolus) over the first hour with titration of fluid based on clinical parameters of cardiac output and discontinue the fluid if signs fluid overload develops.
- **If PICU is not available**, in children with shock (fulfilling all the three WHO criteria for shock cold extremities, fast weak pulse, and prolonged capillary refill time>3seconds) without hypotension may not benefit from fluid bolus can be put on maintenance fluid. But a subset of patients who develops the shock in the setting of causes which result in volume depletion (diarrhea, vomiting, bleeding, excessive diuresis) will benefit from the fluid bolus
- If there is no PICU but the child has hypotensive shock fluid bolus up to 40ml/kg (10-20ml/kg per bolus) in the first hour has to be give with titration base on clinical parameters of cardiac output. Stop the IV fluid if the patient develops signs of fluid overload.
- For children shock and malnutrition, 10-15ml/kg IV fluid over 1 hour.
  - If the patient improves after the first bolus, ReSomal can be continued via Nasogasrtic tube.
  - If the patient does not respond after the first bolus, consider transfusion with 10 ml/kg of cross matched blood slowly (over 3 hours)

- If the child has severe anemia (hemoglobin<5g/dl r hematocrit <15%) has shock, transfuse as soon as possible and give IV fluid only to maintain the normal hydration (maintenance fluid).
- Antibiotic should be started within an hour of initiating management for sepsis to cover the likely etiologic agents.
  - Age >1 month's Ceftriaxone or Cefotaxime 50-75mg/kg and Gentamycin 5mg/kg
  - For patients with septic shock (sepsis with CV organ dysfunction)
  - Inotrope/vasopressin Adrenaline/Noradrenaline 0.15Mic g/kg/hr (N/S 5%DW) 10 ml/hr. 0.05Micgram/kg/hr.
  - Respiratory support BiPAP, CPAP; If there is altered state consciousness intubation

Reference

- Surviving Sepsis campaign international guideline, 2020
- WHO pediatric ETAT guideline, 2016
- Negussie A, Mulugeta G, Bedru A, Ali I, Shimeles D, Lema T, Aseffa A. Bacteriological profile and antimicrobial susceptibility pattern of blood culture isolates among septicemia suspected children in selected hospitals Addis Ababa, Ethiopia. International journal of biological and medical research. 2015 Nov; 6(1): 4709

CHAPTER 2
Pneumonia in children

Bacterial pneumonia

Brief description

- Pneumonia defined as an acute infection and inflammation of lung parenchyma.
- WHO recommends diagnosis of pneumonia when children under five have acute on-set cough with tachypnea.
- There are two major types:
  - **Bronchopneumonia**: involves both the lung parenchyma and the bronchi. It is common in children and the elderly.
  - **Lobar pneumonia**: involves one or more lobes of the lung. It is common in young people

Causes

- Causative agents can be viral, bacterial or parasitic.
- Pathogens vary according to age, patient‘s condition and whether infection was acquired in the community or hospital (Gram negative are more common in hospital).
  - Neonates: group B streptococcus, Klebsiella, E.coli, Chlamydia and S. aureus
  - Children <5 years: Pneumococcus, Haemophilus influenzae, less frequently: S. aureus, M. catarrhalis, M. Pneumoniae, viruses (RSV, influenza, measles)

- If the child has severe anemia (hemoglobin<5g/dl r hematocrit <15%) has shock, transfuse as soon as possible and give IV fluid only to maintain the normal hydration (maintenance fluid).
- Antibiotic should be started within an hour of initiating management for sepsis to cover the likely etiologic agents.
  - Age >1 month's Ceftriaxone or Cefotaxime 50-75mg/kg and Gentamycin 5mg/kg
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Predisposing factors

- Malnutrition, lack immunization
- Rickets, preceding upper respiratory tract infection
- Exposure to cigarette smokers, indoor air pollution
- Immunosuppression (HIV, cancer, alcohol dependence)
- Measles, pertussis, preexisting lung or heart disease, diabetes

Clinical features

- According to the WHO 2013 guideline and national IMNCI guideline classification, a child presenting with cough or difficult breathing is classified as having severe pneumonia, pneumonia or no pneumonia (cough or cold).

Severe pneumonia:

- Cough or difficult breathing
- Lower chest in drawing,
- Nasal flaring,
- Grunting in young infants.
- Fast breathing or abnormal breath sounds may also be present.

Pneumonia:

- Cough
- Fast breathing
- But no signs for severe pneumonia

No pneumonia:

- Cough or cold, if no sign for pneumonia or severe pneumonia.

Investigations

- The decision to treat a child who has pneumonia is usually made clinically
- Do a Chest X ray and look for complications
- Sputum: For Gram stain, Ziehl-Neelsen (ZN) stain, culture for AFB
- Blood: Complete blood count

Pneumonia in an Infant (up to 2 months)

- Consider all children < 2 months with pneumonia as SEVERE disease.

Clinical features

- Rapid breathing (≥60 breaths/minute)
- Severe chest in drawing, grunting respiration
- Inability to breastfeed
- Stridor in a calm child, wheezing
- Fever may or may not be present
- Cyanosis and apnoeic attacks (SpO2 less than 90%)

Management

- Admit, keep baby warm
- Prevent hypo glycaemia by breastfeeding/giving expressed breast milk/NGT
- If child is lethargic, do not give oral feeds. Use IV fluids with care
- Give oxygen to keep SpO2 >94%
- Antibiotics: Ampicillin + Gentamycin

Dose:

- Ampicillin is 50mg/kg IV Q12 for those <14days old, QID for those > 14 days, for sepsis,
- for meningitis 150mg/kg/dose BID for those <14 days old, 100mg/k/dose QID for >14 days;
- gentamicin 5 mg/kg IV once daily
- In severely ill infants Ceftriaxone 100 mg/kg IV once daily

Duration

- Continue treatment for at least 7 days
- If septicemia is suspected, continue for 10 days
- If meningitis is suspected, continue for 21 days.

Pneumonia in a Child of 2 months-5 years

Clinical features

- Fever, may be high, low grade or absent (in severe illness)

Pneumonia

- Cough
- Fast breathing (2-12 months: ≥ 50 bpm, 1-5 years: ≥ 40 bpm)
- Mild chest wall in-drawing

Severe pneumonia

Clinical features

- As above plus at least one of the following
  - Central cyanosis (blue lips, oral mucosa, finger nails or oxygen saturation < 90% using a pulse oximeter)
  - Inability to feed, vomiting everything
  - Convulsions, lethargy, decreased level of consciousness
  - Severe respiratory distress (severe chest in drawing, grunting, nasal flaring)
  - Extra pulmonary features, e.g., confusion or disorientation, may predominate and may be the only signs of pneumonia in malnourished or immunosuppressed children

Treatment

Objectives

- Alleviate symptoms
- Prevent respiratory failure
- Prevent complications

Non-pharmacologic

- Soothe the throat; relieve the cough with a safe remedy
- Safe remedies to recommend include:
- Breast milk for exclusively breast-fed infant
- Home fluids such as tea with honey, fruit juices
- Give oxygen if SpO2 < 90% with nasal prongs and monitor through pulse oximetry for those in respiratory distress via nasal cannula
- Gentle suction of thick secretions from upper airway

Pharmacologic

Antipyretic

- Paracetamol, 10-15mg /kg P.O., up to 4-6 times a day for the relief of high fever

Alternatives

- Ibuprofen, 5 – 10mg/kg/dose every 6 – 8hr P.O. (max. 40mg/kg/24hours).

Non-severe pneumonia

- **Antibiotic**

First-line

- **Amoxicillin**, 30-50mg/kg every 12hourss P.O for 5 days

Alternatives

- **Azithromycin**, 10mg/kg/24 P.O., once daily for 3 days mainly on patients have afebrile pneumonia syndrome.
- **Reassess child for progress after 3 days**

Severe pneumonia

- **Benzyl penicillin,** 50,000units/kg/24hours IV QID for at least 3 days
- **N.B.** When the child improves switch to oral Amoxicillin: 30-50mg/kg/24 hours 3 times a day. The total course of treatment is 5-7days.
- If the child doesn't improve within 48 hours, switch to ceftriaxone 80mg/Kg/24 hours IM/IV for 5 days
- If staphylococcus is suspected (empyema, pneumatocele at X ray), give gentamicin 5 mg/kg once daily plus cloxacillin 50 mg/kg IV every 6-hour
- **Zinc** supplementation in children <5years with severe pneumonia

Atypical pneumonia

- It is a mild form of pneumonia that can be life threatening for some people.
- The illness is rare in children younger than 5 years old.

Causes

- Viruses or bacteria can cause atypical pneumonia.
- The most common cause of the illness in school-aged children is the bacteria Mycoplasma pneumoniae. It also causes bronchitis and chest colds.

Clinical features

- Fever, often low grade, Tiredness (fatigue), headache
- Skin rash, general feeling of sickness
- Cough, dry to phlegmy ear infections
- Croup, sinus infection, sore throat
- Wheezing in children who have an airway problem such as asthma
- These symptoms may appear anywhere from 1 to 4 weeks after exposure to the viruses or bacteria. They may last from a week to a month.

Diagnosis

- Clinical.
- Some time may need a chest X-ray and CBC

Treatment

- Treatment also depends on the cause of the illness.
- Antibiotics if the infection is from the bacteria.
- If the illness is from a virus, then antibiotics won't work.

Non- pharmacologic

- **Relaxes.** Stay at home from school until symptoms get better.
- **Drinks plenty of fluids.** Water, soups, and warm tea can help prevent dehydration.
- A humidifier can help with breathing problems.

Pharmacologic

- **Paracetamol for** fever or pain.
- **Azithromycin,** 10mg/kg P.O., on day 1, 5mg/kg on day 2-5, for children <6 months of age 10mg/kg/day for 5 days

Aspiration pneumonia

Brief description

- Aspiration pneumonia is a complication of pulmonary aspiration.

Clinical features

- Chest pain, fever, shortness of breath, wheezing, fatigue
- Blue discoloration of the skin
- Cough possibly with green sputum, blood or foul odor
- Bad breath
- Excessive seating
- Physical exam, such as a decreased flow of air, rapid heart rate, and a crackling sound in lungs.

Risk factors

- Pneumonia from aspiration can occur when the defenses are impaired. This impairment may be due to:
  - Neurological disorders
  - Use of sedatives or anesthesia
  - Aweakened immune system
  - Esophageal disorders
  - Dental problems that interfere with chewing or swallowing
- Impaired consciousness
- Lung disease, seizure, stroke, dental problems
- Impaired mental status, swallowing dysfunction

- Gastroesophageal reflux diseases (GERD)

Diagnosis

- High index of suspicion with the following investigation
  - CXR PA and Lateral, CBC
  - If it is available bronchoscopy and CT scan may be needed

Treatment Objectives

- Alleviate symptoms
- Prevent respiratory failure
- Prevent complications

Non-pharmacologic

- Give oxygen if SpO2 < 90% with nasal prongs and monitor through pulse oximetry for those in respiratory distress via nasal cannula
- Gentle suction of thick secretions from upper airway

Pharmacologic

- Ceftriaxone 80mg/Kg/24 hours IM/IV + Metronidazole 7.5mg/kg every 8 hours
- Refer the patient for possible removal

Hospital and Ventilator Associated Pneumonia (HAP)

Brief description

- New respiratory symptoms (cough, dyspnea, purulent sputum), fever and/or leukocytosis in a patient admitted for >48 hours. Chest x-ray or scan with a NEW pulmonary infiltrate (admitted >48h)

Clinical features

- Similar with bacterial pneumonia

Causes

- Frequent etiologies of HAP: Enterobacteriaceae, *Pseudomonas*, *Acinetobacter*, other GNR, *S aureus*

Diagnosis and investigations

- Sputum/Endotracheal secretions to send to micro lab for gram stain and culture
- If it is available: blood culture x2 (please collect from 2 different sites)

Treatment

- **Patients at lower risk of drug resistant organisms, ie those with:** No IV antibiotics

within previous 3 months, no structural lung damage**,** few or no co-morbidities, not known MRSA carriers

- Ceftazidime Total daily dose 75 mg/kg IV (divided into 2 doses per day) AND
- Gentamicin 3 – 5 mg/kg/day IV (given once daily) for 7 days

- **Patients at higher risk of drug resistant organisms, i.e. those with:** history of IV antibiotic use within previous 3 months**, s**tructural lung damage (Bronchiectasis, COPD, lung fibrosis), prior co-morbidities (cancer, advanced liver or renal disease, immunocompromised), known MRSA carrier
  - Piperacillin-Tazobactam 100 mg/kg IV q 8 hours for 7 day

Reference

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- Walker CL, Rudan I, Liu L, Nair H, Theodoratou E, Bhutta ZA, O'Brien KL, Campbell H, Black RE. Global burden of childhood pneumonia and diarrhoea. The Lancet. 2013 Apr 20;381(9875):1405-16.

Pleural effusion and empyema

Brief description

- Pleural effusions are a common finding in patients with pneumonia.
- More than 40% of patients with bacterial pneumonia and 60% of patients with pneumococcal pneumonia develop parapneumonic effusions.
- While treatment with antibiotics leads to resolution in most patients, some patients develop a more fibrinous reaction, with the presence of frank pus in the most severe cases. The latter is referred to as an empyema or empyema thoracis.
- Empyema thoracis: This develops as frank pus accumulates in the pleural space.

Etiology

- Virtually any type of pneumonia (e.g., bacterial, viral, atypical) can be associated with a parapneumonic pleural effusion.
- However, the relative incidence of parapneumonic pleural effusions varies with the organism.
- Viral pneumonia and Mycoplasma pneumonia cause small pleural effusions in 20% of patients.
- For thoracic empyema, bacterial pneumonia is the cause in 70%.

Risk factors

- Risk factors for empyema thoracis include age (children), debilitation, pneumonia requiring hospitalization, and comorbid diseases, such as bronchiectasis, diabetes and gastroesophageal reflux disease.

Laboratory Studies

- The presence of pleural fluid may be suggested based on physical examination findings; however, small pleural effusions may not be detected during the physical examination.

Chest radiography

- In this case, any significant effusion can be visualized using 2-view (ie, posteroanterior, lateral) chest radiography. Lateral chest radiography usually demonstrates the presence of a significant amount of pleural fluid.
- Sputum should be submitted for culture, especially if purulent
- The infecting organism may be suggested based on Gram stain results. Mixed florae are often seen in anaerobic infections.

- As with any infection, leukocytosis may be present (>12,000/µL) however, it should decrease with adequate antibiotic therapy.
- Diagnosing a complicated parapneumonic effusion and/or empyema is crucial for optimal management because a delay in drainage of the pleural fluid substantially increases morbidity.
- Ultrasonography can be used to localize fluid for a thoracentesis. Fluid appears dark or black on ultrasound images, and most bedside ultrasonography devices permit measurement of the depth of location from the chest wall.
- Complex fluid (purulent or viscous) may have more density or shadows within in the pleural fluid collection. Sometimes, fibrinous strands can be seen floating in the pleural fluid.

Other tests

- While no diagnostic serum laboratory tests are available for a parapneumonic effusion, serum total protein and lactic dehydrogenase (LDH) levels should be obtained to help characterize whether the pleural fluid is an exudate or transudate. The ratio of pleural fluid/serum protein and LDH is used to distinguish between these two entities.

Procedures

- Thoracentesis is recommended when the suspected parapneumonic pleural effusion is greater than or equal to 10 mm thick on a lateral decubitus chest radiograph.

Pleural fluid studies

- Blood cell count (WBC count) and differential: Results generally are not diagnostic, but most transudates are associated with a WBC counts of less than 1000 cells/µL and empyemas are exudates, with WBC counts generally greater than 50,000 cells/µL.
- Pleural fluid total protein, LDH, and glucose (corresponding serum protein and LDH): Exudates are defined by pleural/serum total protein ratio of greater than 0.5 and a pleural/serum LDH ratio of greater than 0.6 or a pleural fluid LDH value greater than two thirds the upper limit of normal. One criterion is sufficient to classify fluid as an exudate.
- Pleural fluid pH (iced blood gas syringe): Values of less than 7.20 are suggestive of a complicated pleural effusion.

- Other laboratories suggestive of complicated pleural effusion or empyema: These include (1) an LDH value of greater than 1000 U/L, (2) a pH of less than 7.00, and (3) a glucose level of less than 40 mg/dL.

Microbiology (Gram stain, bacterial culture)

- Acid-fast bacilli and fungal infections may cause pleural effusions or empyema, but these organisms are more difficult to culture from pleural fluid.

Histologic Findings

- Multiple granulocytes are typically identified on histologic examination. Necrotic debris may be present. Bacteria are seen in the pleural fluid in severe infections.

Treatment

Objectives

- Alleviate symptoms
- Avoid life-threatening complications

Non-pharmacologic

Chest tubes (tube thoracostomy)

- Insert chest tubes immediately after a complicated parapneumonic pleural effusion or empyema thoracis is diagnosed. The key to resolution involves prompt drainage of pleural fluid because delay leads to the formation of loculated pleural fluid.

Pharmacologic

- Selection of an appropriate antibiotic that will cover likely pathogens.
- For a patient with community-acquired pneumonia, the recommended agents are second- or third-generation cephalosporins in addition to a macrolide.
- For patients hospitalized with severe community-acquired pneumonia, initiate treatment with a macrolide plus a third-generation cephalosporin with anti- pseudomonal activity.

Reference

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Press.

Meningitis in children

Brief description

- Meningitis is acute inflammation of the meninges (the membranes covering the brain). Bacterial meningitis is a notify able disease.
- This is an acute and one of the most potentially serious infections in infants and children that affects the central nervous system.

Causes

- Most common bacterial: *S. pneumoniae. H. influenza type b (mainly in young children), N meningitides* and Enteric bacilli.
- Viral (HSV, enteroviruses, HIV, VZV etc.)
- Cryptococcus neoformans (in the immune-suppressed)
- Mycobacterium tuberculosis

Clinical features

- In infants whose cranial sutures are still open, budged fontanel
- Rapid onset of ever
- Vomiting
- Irritability, lethargy, convulsion, coma
- Bulging of the anterior fontanel
- Haemorrhagic rash (N. meningitidis infection)
- In older children focal neurologic signs, such as: A sixth nerve palsy, may be more prominent
- Signs of meningeal irritation, such as nuchal rigidity, kerning‘s sign or Brudziniski sign are usually present.

Differential diagnosis

- Brain abscess
- Space-occupying lesions in the brain
- Drug reactions or intoxications
- Cerebral malaria
- Viral meningitis

- Poisoning

Investigations

- CSF: Increased number of white cell count, low level of CSF glucose and elevated protein level are the usual findings. Indian-ink staining (for Cryptococcus), gram stain, culture and sensitivity will reveal the microorganism.
- Blood: For serological studies and full blood count
- Neuroimaging u/s of brain, CT or MRI
- Chest X-ray and ultrasound to look for possible primary site

Treatment

Objectives

- Decrease the risk of grave complications and mortality
- Avoid residual sequelae
- Shorten hospital stay

Non-pharmacologic

- Restrict fluid intake to 70% of calculated maintenance.
- Monitor urine output and daily weight
- Support feeding (NGT if necessary)
- Monitor vital signs

Pharmacologic

First line

Ceftriaxone, 100mg/kg, IV once daily for 10 days for all cases

Alternative

- **Cefotaxime**, 225-300mg/kg/ day divided every 6 or 8 hrs

N.B. Antibiotic treatment may be modified when culture and sensitivity results are collected.

Causative organisms identified

- Streptococcus pneumoniae (10 to 14-day course; up to 21 days in severe case)
- Benzyl penicillin 100,000 IU/kg per dose IV or IM every 4 hours Or ceftriaxone 100 mg/kg daily dose IV or IM every 12 hours

• Haemophilus influenzae (10-day course) Ceftriaxone hours100 mg/kg per dose

• IV or IM every 12, only if the isolate is reported to be susceptible to the particular drug

Or ampicillin Child: 50 mg/kg per dose

• Neisseria meningitidis (5-7 day course)

• Benzylpenicillin 100,000-150,000 IU/kg every 6 hours Or Ceftriaxone 100 mg/kg daily dose

Note: Consider prophylaxis of close contacts (especially children < 5 years): Ceftriaxone 125mg IM stat.

• Listeria mono cytogenes (at least 3 weeks course)

- Common cause of meningitis in neonates and immunosuppressed children
- Ampicillin 50mg/kg IV every 6 hours.

Adjunct to treatment with antibiotics

• **Dexamethasone** 0.6mg/kg/day divided QID for two-four days in cases of suspected H. influenza meningitis.

- It should be administered just before or with antibiotics

Note:

• Because of the potential severity of the disease, refer all patients to hospital after prereferral dose of antibiotic.

• Carry out lumbar puncture promptly and initiate empirical antibiotic regimen

Prevention

• Avoid overcrowding

• Improve sanitation and nutrition

• Prompt treatment of primary infection (e.g., in respiratory tract)

• Immunization as per national schedules

• Mass immunization if N. Meningitis epidemic

CHAPTER 3: DIABETES MELLITUS

Brief description

- Diabetes mellitus describes a group of disorders, which are phenotypically characterized by persistently high blood glucose levels.

Causes

- Type 1: decreased insulin production due to autoimmune destruction of the pancreas. Usually starts at a young age
- Type 2: insulin resistance usually combined with insufficient production of insulin as the disease progresses. Usually starts in adulthood
- Secondary diabetes: due to other identifiable causes, e.g., Cushing's syndrome, chronic pancreatitis, etc.

Risk factors

- Type 1: genetic factors, environmental factors (e.g., some viral infections)
- Type 2: family history, unhealthy diet, obesity, lack of exercise, smoking

Clinical features

- Large amounts of urine (polyuria)
- Thirst and excessive drinking of water (polyuria)
- Unexplained weight loss (especially in type 1)
- Blurred vision
- Recurrent skin infections
- Recurrent itching of the vulva
- Symptoms related to chronic complications
- Abnormal sensory / motor neurologic findings on extremities
- Foot abnormalities (various deformities, ulcers, ischemia)
- Visual impairment

Note: Type 2 diabetes often only presents with minor a specific symptom, and it is diagnosed either by screening or when the patient presents with complications.

Investigations

- Newly diagnosed patient

- Fasting or random blood glucose
- Urine ketones
- Urine protein
- Blood urea, electrolytes and creatinine
- Fasting lipid profile

Note: In the absence of severe hyperglycemia, the diagnosis of Diabetes Mellitus should be confirmed with repeat fasting blood sugar determination.

Current diagnostic criteria for the diagnosis of diabetes mellitus:

- Fasting plasma glucose (FPG) ≥126 mg/dl
- Hemoglobin A1C ≥6.5%
- A random plasma glucose ≥200 mg/dl, in patients with classic symptoms of hyperglycemia or hyperglycemic crisis
- Two-hour plasma glucose ≥200 mg/dl during an oral glucose oral tolerance test after 75gm anhydrous glucose dissolved in water of glucose

Note: In the absence of unequivocal hyperglycemia (very high levels of blood sugar), criteria 1-3 should be confirmed by repeated testing. One single slightly elevated blood sugar in the absence of symptoms IS NOT DIAGNOSTIC for diabetes.

Complications

- Acute coma due to diabetic ketoacidosis, or hyperosmolar hyperglycemia (see next section), or hypoglycemia
- Stroke, ischemic heart disease, kidney failure
- Blindness, impotence, peripheral neuropathy
- Diabetic foot which may lead to amputations
- Differential diagnosis
- Diabetes insipidus, HIV/AIDS, TB

Type 1 diabetes

Treatment of Type 1 Diabetes Mellitus

Objectives

- Relieve symptoms

- Prevent acute hyperglycemic complications
- Prevent chronic complications of diabetes
- Prevent treatment-related hypoglycemia

Achieve and maintain appropriate glycemic targets

Ensure weight reduction in overweight and obese individuals

Non-pharmacologic

Medical Nutrition Therapy (MNT)

- Avoid refined sugars as in soft drinks, or adding to their teas/other drinks.
- Be encouraged to have complex carbohydrates.
- Low in animal fat.
- Increase in the amount of fiber e.g., vegetables, fruits and cereals
- Exercise
- Regular moderate-intensity aerobic physical activity for at least 30 minutes at least 5 days a week or at least 150 min/week.
- Encouraged to resistance training three times per week for type -2 diabetes
- Self-blood glucose monitoring (SBGM)

Screening and treatment of micro and macro vascular complications Pharmacologic

- Mixed insulin (70% NPH insulin + 30% regular insulin)
- The dose of starting insulin depends on the age of the patient and whether the patient has presented with DKA or not.

Initiation - 0.2 to 0.4units/ kg/ day twice daily injection**-** before breakfast and before supper
Maintenance – **highly variable** roughly 0.6 to 0.7 units/kg/day

Table 16. 14. Properties of common insulin preparations and insulin analogues

Preparation	**Onset (hr.)**	**Peak(hr.)**	**Effective Duration(hr.)**
Short acting			
Regular (more intermediate than short	0.5–1.0	2–3	4–6
Long acting			
NPH	1–4	6–10	10–16
Mixed			

70/30 = 70% NPH + 30% Regular	0.5–1.0	Dual peak (as regular + as NPH)	10 -16

Diabetic ketoacidosis

Acute metabolic complications of diabetes mellitus: DKA is characterized by ketosis, acidosis, and hyperglycemia. It is more common in type 1 diabetes.

Risk factors

- Newly diagnosed diabetes
- Loss of diabetic control resulting in significant glucosuria, ketonuria and volume depletion.
- May be initiated by intercurrent illness, stress,
- Missed insulin.

Clinical features

- Acute onset:
  - Polyuria, polydipsia, polyphagia, weight loss
  - Emesis, abdominal pain, fruity breath
  - Labored respirations (deep breathing, acidotic)
  - Dehydration, hypotension
  - Sweet, acetone smell on the breath (from Ketones)
  - Altered mental status - stupor, coma
- Free water losses exceed salt depletion.
- Hyperglycemia (-1.6 mEq NA+/1 per change 100mg/dl glucose)
- Usual ANION GAP is 20-30 mEq/L: (Na-Cl-CO2)

Differential diagnosis

- Other causes of ketoacidosis/hyperglycemia
- Other causes of acute abdominal pain
- Other causes of coma

Investigations

- Blood sugar

- Urine analysis (for ketones, positive)
- Full blood count
- Renal function and electrolytes (Na, K)

Treatment objectives

- Relieve symptoms
- Prevent acute hyperglycemic complications
- Achieve and maintain appropriate glycemic targets

Treatment

- Brief history, physical examination, and assessment of mental status and degree of dehydration. Accurate weight.
- Use diabetic flow sheet to document fluids, insulin, and lab results.

First hour:

- IV fluids: normal saline - 20 ml/kg bolus over the first hour
- Regular Insulin after one hour of rehydration 0.05-0.1 units/kg/hr if continuous IV infusion if not first dose of insulin 0.5u/kg/d give ½ IM and ½ IV, Subsequent doses should be 0.5u/kg/d SC every 4-6 hours. Dose adjustment in case of a rapid fall in RBS>100mg/dl, and hypokalemia that has persisted despite administration of K+ by ½
- NPO until substantial clinical improvement is seen
- Nasogastric tube and Foley catheter for (1) shock or (2) stupor/coma
- Maintain accurate Intake and Output.
- Cardiac monitor if K+ abnormal or pH <7.20.
- Mannitol at bedside for severe DKA

Second hour

- Repeat glucose and electrolytes one hour after insulin and IV fluids initiated. Continue hourly glucose and electrolytes until patient is ready for discharge or admission.
- Fluid/Insulin

Table 16. 15. Fluid and insulin administration in diabetic ketoacidosis

	pH >7.25 and TCO_2>15	pH <7.25 and/pr TCO_2<15
Fluids	PO fluids. If emesis: follow guidelines for pH <7.25	**A. IV rate:** • Patients initially presenting to ED • [(85 cc/kg + maint) - bolus]23 • Patients given IV fluids prior to treatment in ED [(85 cc/kg + maint) - IV fluids prior to arrival] 24 - # of hours of IV fluid administration prior to arrival • Slow rehydration is the current recommendation **B. Fluid** • BG >250: 0.45 NS with 20 mEq/L K phosphate and 20 mEq/L K acetate • BG <250: RBS <250MG/DL change fluid type to 0.45%NS with D5W
Insulin	SQ Insulin	• 0.1 units/kg/hr IV continuous infusion until pH and electrolytes corrected. • Adjust insulin dose to lower blood glucose no greater than 100 mg/dl/hr and to stabilize at 150-200 mg/dl. • The insulin infusion can be lowered by 50-75% if needed.

- **Third hour**
  - Repeat electrolytes (as necessary), glucose, and pH
  - Continue Fluid/Insulin recommendations as per second hour.
- Adjunctive therapy.
  - Close observation of mental status is critical. The potential for cerebral edema in severe DKA is significant (2%). For sudden CNS deterioration give Mannitol l g/kg IV bolus.
  - Bicarbonate administration is rarely indicated. Please consult an endocrinologist prior to its use.
- Discharge home if:

- Bicarbonate >15 and pH >7.30 and po tolerated.
- For new diabetic-eligibility criteria must be met, endocrinologist notified, and follow-up arranged.

- Indications to temporarily stop insulin infusions during DKA therapy: uncontrolled hypoglycemia severe

Hypokalemia

- Treatment for Hypokalemia (K < 3.5mEq/l)
- Attempt IV 0.5-1.0 mEq/kg of K-lyteor
- If unable to tolerate PO, increase IV K+ to 60-80 mEq/L and maintain the same IV rate.

BE ALERT FOR THESE SIGNS AND ANY CENTRAL NERVOUS SYSTEM DETERIORATION:

- Any decrease in serum Na with therapy: SIADH?
- Any deterioration of alertness or orientation; headache or "fussy" behavior.
- Onset of stupor or coma. Development of Babinski reflex or hyperreflexia.
- Decrease or lack of continuous improvement in pH or bicarbonate after first hour of fluid therapy (may need to increase insulin drip)

Prevention

- Early detection
- Good control of diabetes
- Prompt treatment of infections
- General education

Hypoglycemia in diabetic children

- A clinical condition due to reduced levels of blood sugar (glucose). Symptoms generally occur with a blood glucose <3.0 mmol/L (54mg/dl).

Causes

- Overdose of insulin or anti-diabetic medicines
- Sepsis, critical illnesses
- Hepatic disease
- Starvation
- Tumors of the pancreas (insulinomas)
- Certain drugs e.g., quinine
- Hormone deficiencies (cortisol, growth hormone)

Clinical features

- Early symptoms: hunger, dizziness, tremors, sweating, nervousness and confusion
- Profuse sweating, palpitations, weakness
- Convulsions
- Loss of consciousness

Differential diagnosis

- Other causes of loss of consciousness (poisoning, head injury etc.)

Investigations

- Blood sugar (generally <3.0 mmol/L)
- Specific investigations: to exclude other causes of hypoglycemia

Treatment

Objectives

- Relieve symptoms
- Prevent acute hypoglycemic complications
- Achieve and maintain appropriate glycemic targets

Non-pharmacologic

- If patient is able to swallow
- Oral glucose or sugar 10-20 g in 100-200 ml water (2-4 teaspoons) is usually taken initially and repeated after 15 minutes if necessary

Pharmacologic

- If patient is unconscious: Dextrose 10% IV 2-5 ml/kg If patient does not regain consciousness after 30 minutes, consider other causes of coma
- Monitor blood sugar for several hours (at least 12 if hypoglycemia caused by oral antidiabetics) and investigate the cause – manage accordingly

Note

- After dextrose 50%, flush the IV line to avoid sclerosis of the vein (dextrose is very irritant)
- Preparation of Dextrose 10% from Dextrose 5% and Dextrose 50%:
- Remove 50 ml from Dextrose 5% bottle and discard
- Replace with 50 ml of Dextrose 50%. Shake
- Follow normal aseptic techniques
- Use immediately, DO NOT STORE

Prevention

- Educate patients at risk of hypoglycemia on recognition of early symptoms e.g., diabetics
- Advise patients at risk to have regular meals and to always have glucose or sugar with them for emergency treatment of hypoglycemia

- Advise diabetic patients to carry an identification tag

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Type 2 diabetes in children and adolescents

Treatment of Type-2 Diabetes Mellitus

Non-pharmacologic

- Medical Nutrition Therapy (MNT)
  - Avoid refined sugars as in soft drinks, or adding to their teas/other drinks.
  - Be encouraged to have complex carbohydrates.
    - Low in animal fat.
    - Increase in the amount of fiber e.g., vegetables, fruits and cereals
- Exercise
  - Regular moderate-intensity aerobic physical activity for at least 30 minutes at least 5 days a week or at least 150 min/week.
  - Encouraged to resistance training three times per week for type -2 diabetes
- Self-blood glucose monitoring (SBGM)
- Screening and treatment of micro and macro vascular complications

Table 16. 16. Glycemic Targets for Children

Fasting plasma glucose (capillary)	**70-130 mg/dl**
Postprandial (1–2 h after the beginning of the meal) plasma glucose	**< 180 mg/dl**
Hemoglobin A1C	**< 7%**

Pharmacologic

- Oral blood glucose lowering drugs

Metformin

- It is the first line drug for initiation of therapy
- If intolerant to metformin or have a contraindication to it, sulfonylureas can be the initial drugs to start treatment.
- **Metformin**, 500 mg, p.o.daily with meals. Titrate dose slowly depending on blood glucose levels or HbA1C to a maximum dose 2000 -2500mg
- **ADRs**: abdominal discomfort and diarrhea, lactic acidosis

- **C/Is**: Serum creatinine >1.5 mg/dL (men) >1.4 mg/dL (women), CHF, radiographic Iodinated contrast studies, seriously ill patients, acidosis, hepatic failure
- If blood sugar targets are not achieved - Option of referral for patients who fail to respond to metformin

ADD

- **Sulfonylureas**
  - **Glibenclamide**, 2.5 mg -5mg, p.o.daily 30 minutes before breakfast
  - Titrate dose slowly depending on HbA1c and/or fasting blood glucose levels to 15 mg daily.
  - When 7.5 mg per day is needed, divide the total daily dose into 2, with the larger dose in the morning.
  - Avoid in patients with renal impairment.

N.B- **If postprandial hyperglycemia remains high with good fasting blood sugar while patient is on basal insulin regimen as depicted above; pre meal short acting agents can be added.**

- **If poorly controlled with the above treatment, refer for further therapy**

Management of other cardiovascular risks

- Aspirin, 75–162 mg, p.o, once/day
  - Indications:
    - Increased cardiovascular risk (10-year risk >10%)
    - Men >50 years of age or women >60 years of age who have at least one additional major risk factor (Hypertension, Smoking, Dyslipidemia, Albuminuria and family history of CVD)
- Antihypertensive (See treatment of hypertension)
  - ACE inhibitors or ARBS are the drugs of choice

Prevention of Type-2 Diabetes Mellitus

Obesity in children and adolescents

Brief description

- Overweight and obesity are an abnormal or excessive fat accumulation that presents a risk to health.
- It is a risk factor for many diseases and is linked to many deaths.
- Body mass index (BMI) is a simple index of weight-for-height used to classify overweight and obesity.

BMI = Weight (in kilograms)
Height (in meters) squared (m2)

Table 16. 17. In children, age needs to be considered when defining overweight and obesity

CLASSIFICATION	CRITERIA
Underweight	BMI < -2 Z score
Healthy body weight	BMI 18 to 25 Adolescents
Overweight	WFH >2 Z score WHO Child Growth Standards median
Obesity	WFH >3 Z score WHO Child Growth Standards median

Causes

- High energy (i.e., calorie) intake: eating too much, eating a lot of fatty food
- Low expenditure of energy: sedentary lifestyle, no exercise or limited activity
- Disease: hypothyroidism, diabetes mellitus, pituitary cancer

Raised BMI is a major risk factor for:

- Cardiovascular disease: heart disease and stroke
- Diabetes mellitus
- Musculoskeletal disorders: osteoarthritis
- Some cancers: endometrial, breast, ovarian, prostate, liver, kidney, gallbladder, kidney
- Obstructive sleep apnoea
- Fatty liver, gallstones

Clinical features

- Overweight, difficulty breathing, poor sleeping patterns
- Joint damage due to weight, low fertility
- Poor self-image, antisocial, depression
- In children, also increased risk of fractures, hypertension, cardiovascular disease, insulin resistance

Investigation

- Blood pressure, blood glucose, cholesterol

Treatment

Objectives

- Prevent complications
- Ensure weight reduction in overweight and obese individuals

Non-pharmacologic

- Advise patient to reduce carbohydrate and fat intake and increase fruit, fiber and vegetable intake
- Refer patient to a nutritionist for individualized diet counseling, and to compile a diet plan
- Advise patient to control appetite, participate in hobbies, treat any depression
- Advise patient to increase physical activity and exercise daily.
- Advise to start slowly and build up gradually
- Warn the patient of their high risk of diabetes, heart disease, hypertension, stroke, and general poor health
- Encourage patient not to give up even when the weight loss process is slow

Prevention and health education

- Limit energy intake from total fats and sugars: reduce fatty meat, palm cooking oil (replace with sunflower, olive, corn oil)
- Increase consumption of fruits and vegetables, as well as legumes, whole grains and nuts
- Engage in regular physical activity (60 minutes a day for children and 150 minutes spread through the week for adolescent)

CHAPTER 3:

CHILDHOOD MALNUTRITION

SEVERE ACUTE MALNUTRITION

BRIEF DESCRIPTION

- Malnutrition is a significant contributor to morbidity and mortality among children under 5 years in Ethiopia.
- It also makes the prognosis of other diseases poor.
- The term "malnutrition" commonly refers to under nutrition, and is used as such in these guidelines.
- Although malnutrition can affect all ages, however, the early stages, including, foetus, infants and children, are most vulnerable to the effects of under nutrition during the period of their most rapid physical growth and development during the first two years of life.

CAUSES/CONTRIBUTING FACTORS TO MALNUTRITION

Immediate causes:

- Diet and disease
  - Inadequate quantity and quality of food
  - Lack of knowledge on appropriate foods provided to children, poor food preparation, food taboos
  - Infections: reduce appetite, increase energy and nutrient utilization, and limit the ability to absorb or retain nutrients e.g. in diarrhea, intestinal parasites

ROOT CAUSES:

- Food insecurity, poor health services, poor environmental sanitation, natural disasters, and excessive workload for women,

- poor weaning practices, culture, inadequate water supply, low literacy levels, low nutrition advocacy/education

UNDERLYING CAUSES:

- poverty, corruption, poor governance, poor infrastructure.

CONSEQUENCES OF MALNUTRITION

- Impaired growth, physical and mental and development
- Impaired body resistance/immune system
- Increased risk of adult chronic diseases
- Increased risk of mortality
- Increased risk for the cycle of inter-generational malnutrition
- Poor economic well-being for the individual and country

DIFFERENTIAL DIAGNOSIS

- Nephrotic syndrome (nephritis)
- Liver disease
- Heart disease
- Mal-absorption syndrome
- Malignancy (e.g., gastrointestinal tract cancer, liver cancer/hepatocellular carcinoma)

CLASSIFICATION OF MALNUTRITION

Acute

- Is an indicator of current nutritional status, reflecting recent weight changes or disruption in nutrient intake
- Most appropriate indicator to use in an emergency setting (e.g. due to sudden/sharp period of food shortage)
- Associated with loss of body fat and severe wasting

- Children are thinner than their comparable age group of same height
- Classified as Moderate or Severe based on anthropometry (measurement of the size, weight and proportions of the human body), biochemistry and clinical assessment

CHRONIC

- Is an indicator of the nutritional status overtime; chronically malnourished children are shorter (stunted) than their comparable age group

CLINICAL FEATURES OF MALNUTRITION

- Non edematous **(Marasmus)**:
    - Severe wasting, old man's face, excess skin' hangs around the buttocks, ribs and zygoma bones are prominent, scapular blades and extremities (limbs), eyes are sunken
    - Apathetic or irritable, appetite is fairly good, skin is almost normal, hair demonstrates some changes but not as dramatic as in Kwashiorkor, organomegaly is rare (liver and spleen enlargement)
- Edematous (**Kwashiakor)**:
    - Pitting feet oedema, skin desquamation, hair changes, presence of bilateral pitting oedema (oedema of both feet), moon face
    - Appears adequately nourished due to excess extra cellular fluid, but is very miserable, apathetic
    - Skin changes (dermatosis, flaky paint dermatitis)
    - Hair changes: Silky, straight, sparsely distributed; easily, painlessly pluck able
    - Severe pallor of the conjunctiva, mucous membranes, palms, and soles, loss of skin turgor (dehydration)
    - Organomegaly (liver, spleen) is common
- M**arasmus-kwashiakor**:
    - Most common form,

- presents with features of both Marasmus and Kwashiorkor

Table 16. 18. Diagnostic criteria for malnutrition

Age	• Criteria
Moderate Acute Malnutrition	• WFH/L between -3 and -2z-scores • Or MUAC 115 up to 125 mm Or low weight for age
Severe Acute Malnutrition 6 months to 18 years	**Without complications** • Oedema of both feet (kwashiorkor with or without severe wasting) OR • WFH/L less than -3 zscores OR • MUAC less than 115 mm OR • Visible severe wasting AND • able to finish RUTF **With complications** • Oedema of both feet OR • WFH/L less than -3 zscores OR • MUAC less than 115 mm OR • Visible severe wasting AND • Any one of the following: • Medical complication present OR • Not able to finish RUTF

Infants < 6 months or <3kg	• The infant is too weak or feeble to suckle effectively (irrespective of his/her weight-for-length, weight-for-age or other anthropometry) or • The infant is not gaining weight at home (by serial measurement of weight during growth monitoring, i.e. change in weight-for-age) or • W/L (Weight-for-Length) less than <-3 Z-score, or • Presence of bilateral pitting oedema.

******The aim of treatment of these patients is to return them to full exclusive breastfeeding. Thus, the admission criterion is failure of effective breastfeeding and the discharge criterion is gaining weight on breast milk alone (anthropometry is not used as primary admission criterion).*

INVESTIGATIONS

- Children with SAM should always be first assessed with a full clinical examination to confirm presence of any danger sign, medical complications, and tested for appetite.
- Assess patient's history of:
  - Recent intake of food, loss of appetite, breastfeeding
  - Usual diet before current illness
  - Duration, frequency and type of diarrhea and vomiting
  - Family circumstances: Cough >2 weeks and contact with TB, Contact with measles
  - Known or suspected HIV infection/exposure
- Initial examination for danger signs and medical complications:

A. Shock: lethargy or unconscious, cold hands, slow capillary refill (<3 seconds), weak pulse, low blood pressure

B. Signs of dehydration, Severe palmar pallor, Bilateral pitting oedema, Eye signs of vitamin A deficiency: dry conjunctiva, corneal, ulceration, keratomalacia, photophobia

C. Local signs of infection: ear, throat, skin, pneumonia, Signs of HIV

D. Fever (≥37.5) or hypothermia (rectal temp <35.5)

E. Mouth ulcers

F. Skin changes of kwashiorkor:hypo- or hyperpigmentation,desquamation, ulcerations all over the body, exudative lesions (resembling burns) with secondary infection (including candida)

LABORATORY TESTS

- Blood glucose
- Complete blood count or Hgb, malaria, HIV, electrolytes
- Stool microscopy for ova and cysts, occult blood, and parasites
- Chest X-ray:Look for evidence of tuberculosis or other chest abnormalities
- Conduct an appetite test:
  - Assess all children ≥6 months for appetite at the initial visit and at every follow up visit to the health facility
- Determine WFH/L:
  - Measure the child's height and weight and plot the score on the appropriate chart (boy or girl).
  - Match the value to the z-score on the right y-axis to determine the child's z-score.
- Measure MUAC:
  - Using a MUAC tape, measure the circumference of the child's upper arm and plot the score on the appropriate chart (boy or girl.
  - Please note: 1 cm=10 mm, so 11.5 cm = 115 mm.

TREATMENT

- For details in the management of severe malnutrition in this group of infants, the reader is advised to refer to the Integrated Management of Newborn and Childhood illnesses, WHO, 2011.

OBJECTIVE

- Treat life-threatening complications
- Rehabilitate with nutrition
- Achieve catch-up growth

GENERAL PRINCIPLES OF MANAGEMENT

- Admit all children with any danger sign, medical complications, pitting oedema or those who fail appetite tests for inpatient care and treatment for complicated SAM.
- Keep them in a warm area separated from infectious children, or in a special nutrition area.
- Children with good appetite and no medical complications can be managed as outpatients for uncomplicated SAM.
- Grade + and ++ edema can be admitted to OTP center if the following holds true: without medical complication, with MUAC >11.5cmWHL/H> 3 Z score
- Adequate facilities and staff to ensure correct preparation of therapeutic foods, and to feed child regularly day and night, should be available.
- Accurate weighing machines and MUAC tapes should be available
- Proper records of feeds given and child's measurements should be kept so that progress can be monitored
- Explain to patient/care-giver to handle the child gently

Table 16. 19. Criteria for admission to in-patient or outpatient care

Factor	Inpatient care	Outpatient care
Anthropometry	6 months to 18 yrs.: • W/H or W/L <70% OR • MUAC <110mm with length >65cm • MUAC <180mm with recent weight loss or underlying chronic illness OR • MUAC<170mm OR • BMI <16	
Bilateral pitting edema	• Bilateral pitting edema grade 3(+++) • Marasmic – kwashiorkor	• Bilateral pitting edema Grade 1 to 2 (+ and++)
Appetite	• Poor appetite	• Good appetite
Choice of caregiver	• Chooses to start, continue or transfer to inpatient treatment • No suitable or willing caregiver	• Chooses to start, continue transfer to outpatient treatment reasonable home circumstance and a willing caregiver
Skin	• Open skin lesions	• No open skin lesions

MODERATE ACUTE MALNUTRITION

DIAGNOSTIC CRITERIA

- WFH/L between -3 and -2 z-scores Or MUAC 115 up to 125 mm OR low weight for age

TREATMENT OF MODERATE MALNUTRITION

- Assess the child's feeding and counsel the mother on the feeding recommendations
- If child has any feeding problem, counsel and follow-up in 7 days
- Assess for possible TB infection.
- Advice mother when to return immediately (danger signs)

FOLLOW-UP CARE

- Follow-up in 30 days
- Reassess child and re-classify
- If better, praise mother and counsel on nutrition.
- If still moderate malnutrition, counsel and follow up in 1 month.
- If worse, losing weight, or feeding problem: Admit/refer

MANAGEMENT OF SEVERE ACUTE MALNUTRITION

- Management involves three phases: initial stabilization for 1 week, transition and rehabilitation (for weeks 2-6).
- Prevent hypo glycaemia by giving small sips of sugar water, keep the child warm, first dose of antibiotics (ampicillin + gentamicin).
- Triage the children to fast-track seriously ill patients for assessment and care: treat shock, hypo glycaemia, and corneal ulceration, immediately.

PHASE I (INPATIENT FACILITY)

- Poor appetite and/or major medical complications.
- Formula used during this phase is F75.

- Weight gain at this stage is dangerous.

TRANSITION PHASE

- Avoid a sudden change to large amount of diet before physiological function is restored.
- Patients start to gain weight as F100 is introduced.
- The quantity of F100 given is equal to the quantity of F75 given in phase1.

PHASE II (REHABILITATION)

- Good appetite
- No major medical complications
- Can occur at inpatient or outpatient setting
- F100 (inpatient only) or ready to use therapeutic feeding (RUTF).

TREATMENT OF COMPLICATIONS

Dehydration

- "Therapeutic window" is narrow in a patient with severe acute malnutrition
- Quickly go from having depleted circulation to over-hydration with fluid overload and cardiac failure
- IV infusions should be avoided whenever possible except in case of shock.
- The standard protocol for the well-nourished dehydrated child should not be used.
- A supply of modified ORS or ReSoMal should never be freely available for the caretakers to give to the child whenever there is a loose stool.

A. NON-EDEMATOUS (MARASMIC) PATIENT

- The usual signs of dehydration are not reliable.
- History is more important than physical examination.
- A definite history of significant recent fluid loss – usually diarrhea, which is clearly like, water (not just soft or mucus) and frequent with sudden onset

within the past few hours or days.

- History of a recent change in the child's appearance.
- If the eyes are sunken then the mother must say that the eyes have changed to become sunken since the diarrhea has started.
- The child must not have any edema.
- Shock may be diagnosed when there is definite dehydration plus a weak or absent radial or femoral pulse, and cold hands and feet, and decrease in level of consciousness.

TREATMENT

- Rehydration should be **oral** whenever possible.
    - IV infusions should be avoided except when there is shock or loss of consciousness from confirmed dehydration
- Weight is the best measurement of fluid balance.
- Before starting any rehydration treatment, weigh the child; mark the edge of the liver and the skin with indelible pen and record respiratory rate.
- Start with 5ml/kg of Rehydration salt for malnourished (ReSoMal), every 30 minutes for the first 2 hours orally or by NG – tube and then adjust according to the weight change observed.
    - If continued weight loss, increase the rate of administration of ReSoMal by 10ml/kg/hr.
    - Weigh child every hour and assess liver size, respiration rate, and pulse rate and pulse volume.
- **Note**: Be alert for signs of over hydration: dangerous and can lead to heart failure.
    - Check for:
    - Weight gain (make sure it is not quick or excessive).
    - If increase in pulse rate by 25/minute, respiratory rate by 5/minute is present, stop ReSoMal.

- Reassess after 1 hour:
  - ✓ Urine frequency (if child urinated since last check),
  - ✓ Enlarging liver size on palpation,
  - ✓ frequency of stools and vomit

- To make ReSoMal half strength (45 mmol Na/L) from the new 75 mmol Na/L WHO-ORS, add 1.7 L of cooled boiled water to each 1-litre sachet of WHO-ORS, add 33ml electrolyte mineral solution and 40g sugar.

B. KWASH PATIENT

- All children with edema have an increased total body water and sodium.
  - They are over-hydrated.
- Edematous patients cannot be dehydrated although they are frequently Hypovolemic.
- If a child with kwashiorkor has definite watery diarrhea and the child is deteriorating clinically (excessive weight loss, more than 2% of the body weight per day), then the fluid lost can be replaced on the basis of 30ml of ReSoMal per day.

SEPTIC SHOCK

- A fast weak pulse with cold extremities
- Disturbed consciousness
- Give broad – spectrum antibiotics
- Keep warm to prevent or treat hypothermia
- Give sugar – water by mouth or nasogastric tube as soon as the diagnosis is made.
- Full blown septic shock – treat as in the Marasmic patient.
- Treat hypothermia, severe anemia, severe pneumonia and any major medical complication

PREVENTION

- Same as in dehydration in well-nourished child, except that ReSoMal is used instead of standard ORS. Give 30-50 ml of ReSoMal (for child <2 years) and 100 ml (for child ≥2 years) after each watery stool

FURTHER READING

1. World Health Organization. Guideline: updates on the management of severe acute malnutrition in infants and children. World Health Organization; 2013.

2. Trehan I, Goldbach HS, LaGrone LN, Meuli GJ,Wang RJ, Maleta KM, Manary MJ. Research Article (New England Journal of Medicine) Antibiotics as part of the management of severe acute malnutrition. Malawi Medical Journal. 2016;28(3):123-30.

CHAPTER 4: EAR CONDITIONS

ACUTE OTITIS MEDIA

BRIEF DESCRIPTION

- Acute otitis media is the rapid onset of signs and symptoms of inflammation of the middle ear cleft mostly following URTIs.
- The most common causative bacterial organism are Streptococcus Pneumonia, Haemophilus Influenza A and Moraxella catarrhalis. Viral infection, commonest etiologies, may commonly prepare the way for secondary bacterial infection.
- The younger the child, the more severe the generalized symptoms are and the more discrete the local signs are. On occasions, the gastrointestinal symptoms are the most pressing.
- **Risk factors:** crowed conditions, day care, passive smoking, bottle feeding, low socioeconomic status,

CLINICAL FEATURES

Symptom

- Symptoms vary according to patients' age
- Neonates only present with irritability and/ or feeding difficulty
- Infants and older children can present with fever (with or without prior history of URTI) and otalgia, or tugging on the ear.
- In severe cases, rigors and occasionally meningismus can occur in children.
- Adults and older children can present with otalgia (mostly worse by night),

sometimes fever and impaired hearing.

- Both adults and children can present with ear discharge lasting <2 weeks Pain often improves after the onset of discharge.

Signs

- Otoscopy shows hyperemia, bulging and opacity of the surface of tympanic membrane,
- Perforation of the tympanic membrane can be seen in advanced case mostly in the posterior quadrant of the tympanic membrane.
- Pneumatic Otoscopy can be performed to asses for tympanic membrane mobility.

Investigation and Diagnosis

- The Diagnosis of acute Otitis media is mostly clinical.

Additional tests

- Ear swab for culture and sensitivity

TREATMENT

Goal

- Relieve symptoms or pain
- Return hearing to normal
- Prevent chronicity and complications (like perforation, meningitis, brain abscess, etc).

Non pharmacologic

- Advise on keeping the ear dry. I.e. apply Vaseline soaked cotton during bathing.

Pharmacologic treatment

First line

- Pediatrics:Amoxicillin high dose 80-90 mg/kg/day po divided every 12 hour or every 8 hours for 10 days. (Adult: 1000mg BID or TID for 7 to 10 days)

Alternative, for non-responders to Amoxacillin

- Amoxicillin-clavulanate extra strength oral suspension 90/6.4 mg/kg/day po divided bid (preferred)

Second line drug

- **Ceftriaxone 50 mg/kg** IV or IM once daily x 3 days (is preferred in pediatrics), others agents in adults include: **cefuroxime axetil, cefpodoxime proxetil, cefixime**.
- If beta-lactamase allergy:**Azithromycin** 10 mg/kg per day orally (maximum 500 mg/day) as a single dose on day 1 and 5 mg/kg per day (maximum 250 mg/day) for days 2 through 5.

PAIN MANAGEMENT

- Paracetamol, 30-40mg/kg/24hrs in four divided doses to relieve pain. Alternative Ibuprofen

PREVENTION

- Parent education about risk factors
- Antibiotic prophylaxis – amoxicillin or macrolide shown effective at half therapeutic dose
- Pneumococcal and influenza vaccine
- Surgery: choice of surgical therapy for recurrent AOM depends on whether local factors (Eustachian tube dysfunction) are responsible (use ventilation tubes), or regional disease factors (tonsillitis, adenoid hypertrophy, sinusitis) are responsible

MASTOIDITES

BRIEF DESCRIPTION

- Poorly treated or untreated OM that last more than two weeks can lead to extension of the infection form mid era cavity to the mastoid air space leading to mastoiditis.

CLINICAL FEATURES

- Fever
- Profuse ear discharge
- Retro auricular swelling with tenderness

Investigations and diagnosis

- Culture and sensitivity tests

TREATMENT

Objective

- Eliminate the foci of infection in the temporal bone and the middle ear cavity.

Pharmacologic

- Patients with acute mastoidites should be admitted to the hospital and administered IV antibiotics active against resistant microorganisms, with bed rest and IV fluid. If not Acute mastoidites, it should be referred within 48 hours. Antibiotics should be considered with non-pharmacologic managements like drainage and surgery.
- If it is sub-per-ostial abscess, abscess drainage should be considered and referred for definitive management (cortical mastoidectomy)

ANTIBIOTICS FOR ACUTE MASTOIDITES

- If no recurrent AOM or no recent antibiotic use (3 to 6 months),
- **Vancomycin (15 mg/kg** intravenously [IV] every 6 hours; maximum 1 g per dose)
- If recurrent AOM (most recent episode within six months) or recent antibiotic administration,
- **Vancomycin PLUS Ceftazidime/cefepime 50 mg/kg** per dose IV every 8 hours (maximum 2 g per dose)

DURATION OF ANTIMICROBIAL THERAPY:

- Totally four weeks IV treatment may be continued for 7 to 1o days or IV to PO conversion should be done approximately after a clinical improvement.

Non pharmacologic

- Surgery if the inflammation is no longer confined to the mucosa but has extended to the bone

Prevention

- Early, adequate treatment of acute otitis media (AOM)
- Preventing recurrent AOM
- Immunization with the pneumococcal conjugate vaccine

Chronic Suppurative Otitis Media

- Chronic otitis media is defined as long-standing inflammation of the middle ear cleft in which characterized by chronically discharging ears for > 12 weeks (3 months).

CLINICAL FEATURES

Symptoms

- Constant or intermittent discharge (usually odorless) from the ear mostly not accompanied by otalgia.
- Hearing impairment in the affected ear

Signs

- Otoscopy: Tympanic membrane Perforation
- Tuning fork test (Rhinee and Webers Test): Conductive Hearing Loss
- Symptoms of impending complications like fever, lethargy, headache, vomiting, neck pain, changing mentation, dizziness, vertigo).

Investigations

- Culture of the ear discharge.

Treatment

Goals

- Keep the ear dry
- Eliminate the foci of infection in the temporal bone and the middle ear
- Construct the sound–conducting apparatus.

Non pharmacologic

- Instruct patients to keep the ear dry (Vaseline gauze, dry it after showering)
- Aural toilet (recommended together with topical antibiotics)

Pharmacologic

N.B. In acute exacerbations only Antibiotic treatment, whenever possible, must be directed by the results of culture and sensitivity of the ear discharge.

First line

Topical:

- **Ciprofloxacin ear drop**, 0.3%, 5ml. 2 – 3 drops twice daily for 02 weeks.
- N.B; Ciprofloxacin and other quinolone like Norfloxacin or Ofloxacin with or without steroid combination can be used,
- If initial topical antibiotic therapy failed: culture directed systemic therapy should be tried (refer if no microbiology laboratory).
- **Refer** patients to ENT specialists for

Prevention

- Cornerstone of therapy
- Promptly and appropriately treating AOM
- Strict water precautions for prevention and management of recurrence
- Education on the risk factors like passive smoke exposure, contaminated water, and malnutrition might help.

OTITIS EXTERNA

- Otitis External diffuse inflammation of the external ear canal which may involve the pinna or the tympanic membrane.
- The most common causative agents being Pseudomonas A., Staphylococcus aureus and other gram-negative microbes occurring as a polymicrobial infection.
- Fungal otitis external can occur in the setting of repeated antibiotic use.
- Frequent Swimming, Rigorous ear cleaning, excessive use of air phone and underlying dermatological conditions can be risk factors for otitis externa

ACUTE OTITIS EXTERNA

CLINICAL FEATURES

Symptoms

- Itching and Pain aggravated by movement and pressure on the auricle
- Rarely mucoid ear discharge
- Hearing impairment and aural fullness
- Posterior auricular lymphadenopathy

Signs

- Tragal tenderness,
- Otoscopic tenderness
- Erythematous and inflamed external ear canal,
- Posterior auricular Lymphadenopathy
- Diffuse edema of the External ear canal, with apparent granulation tissue and trisumus should alert the health care worker to consider malignant Otitis externa (Skull Base Osteomellitus) and seek immediate referral.

INVESTIGATIONSAND DIAGNOSIS

- Diagnosis of Otis external is clinical

- Culture and sensitivity studies can be mandated in recurrent cases and those unresponsive to antibiotics.

TREATMENT

Goal

- To relive pain and other symptoms
- To treat the infection
- To prevent complications

Non-pharmacologic treatment

- Keep the ear dry
- Clean the ear until dry with ear wicks or suction if available cotton wicks by the physician

PHARMACOLOGIC TREATMENT

First line

- **Ciprofloxacin 0.2% and dexamethasone 0.1%** otic suspension 2 – 3 drops twice daily for a total of 02 weeks (better tolerability).

OR

- **Neomycin 0.35%, Polymyxin B 10,000 units/mL,** and **hydrocortisone 0.5%** otic solution2 – 3 drops twice daily for a total of 02 weeks.

NB; Apply ear wicks to keep the external ear canal open for the first 3 days in diffusely edematous and narrow canal. Mild cases with only minor discomfort and pruritus, non-antibiotic topical preparation containing an acidifying agent and a glucocorticoid (eg,Acetic acid 2% and hydrocortisone 1% otic solution) can be used. Avoid use of acidifying antiseptic agents if tympanic membrane is perforated.

- Aminoglycoside topical solutions can be used when ciprofloxacin and other quinolone are not available however avoid usage in perforated tympanic membranes due to ototoxicity.

- Systemic antibiotic (in addition to topical) can be considered in severe cases and when Malignant OE is suspected (IV antibiotics recommended), immunosuppression, regional lymphadenopathy, systemic symptoms like fever until patient can be referred.

CHRONIC OTITIS EXTERNA

- Usually caused by vegivores ear cleaning or total absences of ear wax.The cause can be infectious (bacterial or fungal) or non-infectious.

CLINICAL FEATURES

Symptom

- Long standing ear itching

Sign

- Dry, wide external oditerium mities with complete absence of wax (non-infectious)
- Hypertrophic external olitory canal or Fungal Hyphae can be seen in the canal in cases of otomycosis.

TREATMENT

Non-infectious

Non-pharmacologic:

- Acidifying agents like acetic acid
- Treat the underling conditions like
- applying cerumenolytic agent's alcohol, glycerin
- dermatologic conditions

For infectious

- Topical antifungals with cleaning or debridement

CERUMEN (WAX) IMPACTION

BRIEF DESCRIPTION

- Ear wax is a mixture of secretions from ceruminous and sebaceous glands, epithelial debris and dust.
- Ear wax is part of the body physiological defense mechanisms and needs removal only when it is symptomatic.

CLINICAL FEATURES

- Aural fullness, Itching and decreased hearing.
- Occasionally tints, vertigo
- Otoscopy can reveal wax obliterating the ear canal.

TREATMENT

- Cerumenolytic drops like Hydrogen per oxide, Olive oil
- Syringing or manual irrigation (contraindications like previous history of ear discharge/tympanic membrane perforation, previous history of ear surgery, the only hearing ear). The only and rare complication of syringing is tympanic membrane perforation. It can be managed in a conservative way by advising the patient to keep the ear dry and distance themselves from other individuals with upper respiratory infections. NB traumatic tympanic membrane perforation usually heals by itself with conservative management.
- Manual removal by an expert

N.B., Syringing and manual irrigation should be done by a Luke warm water (body temperature, 37 degree Celsius) and whenever possible after the usage of ceruminlytics for 2-3 days.

FOREIGN BODIES IN THE EAR

BRIEF DESCRIPTION

- The majority of patients with foreign bodies in the ear are children.
- The organic or inorganic objects may give rise to otitis externa (especially

organic) by local irritation of the epithelium of the mental walls.

CLINICAL FEATURES

- Any suspicion for foreign body
- Foreign body detected on Otoscopic examination.

INVESTIGATIONS

- Diagnosis is clinical

TREATMENT Goals

- Open the ear canal which is completely or partially closed by removing the foreign body.
- Eliminate secondary infections

Non pharmacologic

- Irrigation of the suspected ear with water by ENT specialist if there is no perforation of the tympanic membrane.
- Cerails can be irrigated if fride, unfride Cerails should not be irrigated because it get swollen
- **N.B.** Foreign bodies that cannot be removed by irrigation should be removed manually, using general anesthesia in small children.
- Ears with vegetable foreign bodies should not be irrigated, since this may cause the matter to swell.
- Live insects can be killed rapidly by instilling alcohol, 2% lidocaine (Xylocaine), and Olive oil. Before removal is attempted.
- Inorganic foreign body especially lithium button battery should be removed urgently within 2 hours
- Manual removal is another approach.
- If the foreign body is in the middle ear early referral is advisable

TINNITUS

BRIEF DESCRIPTION

- An auditory meaningless perception in the absence of external source of sound, likely related to loss of stimuli to the central auditory pathways.
- (Meaning less perception in the absence of external auditory sound is tinnitus, If meaning full perception in the absence of external auditory sound is auditory hallucination)
- It can occur on 1 or both sides of the head.
- Mostly happens in the setting of Sensory Neural Hearing Loss (SNHL).
- Could be intermittent or persistent (> 6 month)
- Could be Primary or idiopathic and Secondary i.e with identifiable underlying cause)
- Could be subjective or objective
- Could be pulsatile or non-pulsatile
- Could be caused by local or systemic disease
- Could affect the patient's quality of life and lead to depression, anxiety and other mental health issues.

THE SOUNDS CAN BE EXPRESSED AS THE FOLLOWING MEANINGLESS SOUNDS

- Hissing, roaring Buzzing, tingling sounds in one or both ears
- Local causes
- It can have associated hearing Impairment, vertigo, aural fullness
- Any history of ototoxic drug intake

SYSTEMIC CAUSES

- Psychogenic: Associated mental health disturbances i.e sleep disturbance , emotional disturbances , anxiety , anger , frustration

- Organic: History of Diabetic, Hypertension and Dyslipidemia, neurologic disorders

Signs

- Examine for signs of inner, middle ear and external disease on Otoscopy i.e Tympanic membrane Perforation, Otorrhea, cerumen impaction, objective peripheral vertigo.
- Neurological examination
- Hear murmur, head and neck masses (carotid bruits), and Vascular sounds

Investigation and diagnosis

For local causes-

- Hearing assessment is part of tinnitus evaluation
- Tunning Fork test
- Audiometric evaluation (to assess for the type and degree of hearing loss)
- Imaging Studies only when underlying organic lesion is suspected or pulsatile tinnitus.
- Workup for systemic causes (CBC, VDRL, thyroid function test, Doppler ultrasound, etc)

TREATMENT

Non-pharmacologic

- Avoid ototoxic medications
- Treat underlying cause if identified
- Provide counseling for patients with bothersome symptoms and if needed psychiatric evaluation and treatment.
- Recommend Hearing Aids for individuals with hearing impairment (N.B; Hearing aids should be encouraged even for elderly patients as its improves their quality of life greatly)

ascites, edema, astrexis and mental status change

Investigations and diagnosis

- AST, ALT, alkaline phosphatase, serum bilirubin, serum albumin, PT or INR
- Hepatitis viral markers - HBSAg, anti HCV antibody, HAV Igm
- Autoimmune markers - ANA
- Abdominal Ultrasound

Treatment of acute hepatitis

Objectives

- Identify and treat cause
- Identify and treat precipitants
- Relieve symptoms

Non-pharmacological treatment- treatment of acute hepatitis is mainly supportive

- Withdrawal of hepatoxic drugs or herbal preparation
- Bed rest or hospitalization (if patient has poor oral intake, significant vomiting, signs of encephalopathy)
- High calorie fluids - glucose drinks, fruit juices, light porridge
- Intravenous dextrose (5-10%) infusion – when patient‘s oral intake is poor or if there is vomiting
- Decrease protein intake- if there is risk of encephalopathy
- Avoid constipation

Pharmacological treatment

- Refer patients with progressive hepatitis to specialist.

Reference

- Tegegne D, Desta K, Tegbaru B, Tilahun T. Seroprevalence and transmission of Hepatitis B virus among delivering women and their new born in selected health facilities, Addis Ababa, Ethiopia: a cross sectional study. BMC research notes. 2014 Dec 1;7(1):239.

CHAPTER 5:

SEIZURE DISORDERS AND EPILEPSY

Febrile seizures

Brief description

- A generalized tonic-clonic and sometimes focal seizure which is associated with a rapid rise in temperature due to an extracranial illness.
- It is a diagnosis of exclusion: specific conditions (cerebral malaria, meningitis, epilepsy) should be excluded.
- It commonly affects children from age 3 months to 6 years.

Causes

- Malaria
- Respiratory tract infections
- Urinary tract infections
- Other febrile conditions

Clinical features

- Elevated temperature (>38 ºC)
- Convulsions usually brief and self-limiting (usually <5 minutes, and may be prolonged for more than 15 minutes in complex febrile seizure) but may recur if temperature remains high
- No neurological abnormality in the period between convulsions
- Generally benign and with good prognosis

Differential diagnosis

- Epilepsy, brain lesions, meningitis, encephalitis
- Trauma (head injury)
- Hypoglycemia
- If intracranial pathology cannot be clinically excluded (especially in children <2 years) consider lumbar puncture or treat children empirically for meningitis

Investigations

- Blood: Slide/RDT for malaria parasites
- Random blood glucose
- Full blood count
- Urinalysis, culture and sensitivity
- LP and CSF examination

- Indications for LP:
  - Non-immunized or incomplete immunization
  - Age <6 months
  - Was on antibiotics prior to onset of sz (may mask the clinical signs of meningitis)

Treatment

Objectives

- Alleviate symptoms
- Prevent complications

Non-pharmacologic

- Use tepid sponging to help lower temperature

Pharmacologic

- Give an antipyretic: paracetamol 15 mg/kg every 6 hours until fever subsides
- If convulsing: Give diazepam 500 micrograms/kg rectally (using suppositories/rectal tube or diluted parenteral solution) Maximum dose is 10 mg, Repeat prn after 10 minutes
- If unconscious: Position the patient on the side (recovery position) and ensure airways, breathing and circulation (ABC)

Prevention

- Educate caregivers on how to control fever (tepid sponging and paracetamol)

Reference

- Assogba K, Balaka B, Touglo FA, Apetsè KM, Kombaté D. Febrile seizures in one-five aged infants in tropical practice: Frequency, etiology and outcome of hospitalization. Journal of pediatric neurosciences. 2015 Jan;10(1):9.
- Fetveit A. Assessment of febrile seizures in children. European journal of pediatrics. 2008 Jan 1;167(1):17-27.

Status epilepticus

Brief description

- Status epilepticus generally refers to the occurrence of a single unremitting seizure with duration longer than 5 to 10 minutes or frequent clinical seizures without an interictal return to the baseline clinical state.

Investigations

- Complete blood count, blood culture (in febrile children), serum electrolytes, and blood glucose.
- Blood glucose should also be checked at the bedside and 5 mL/kg 10% dextrose

administered if blood glucose is less than 54mg/dl

Treatment

Objectives

- Alleviate symptoms
- Prevent complications

Non-pharmacologic

- Use tepid sponging to help lower temperature
- Stabilization of the airway, maintenance of adequate ventilation (with oxygen administered as necessary), and circulatory support.
- Intravenous access should then be established as this permits the most rapid delivery of a drug to the brain. If no intravenous access within 3 minutes, then intraosseous access should be established
- The initial laboratory for meningitis and reversible derangements of metabolis

Pharmacologic

- Dextrose 10%5 mL/kg children
- Diazepam as above in febrile convulsion, repeated after 5-10 min
- If not responsive, Phenytoin 15-18 mg/kg over 1 hour. It is very caustic so use a good IV line. Extravasation will cause tissue damage
- If no response consider Phenobarbital 10-15 mg/kg slowly IV. Dilute the solution with 10 times its volume of water for injections and give VERY SLOWLY (at a rate ≤0.1mg/minute)
- Monitor BP and respiration, be ready to administer IV fluids if hypotension develops and ventilate with Ambu bag in case of respiratory depression Or
- If no response, consider ICU admission.

NOTE

- Diazepam. Intravenous diazepam should be administered over 2 minutes because the risk of respiratory depression is increased with more rapid administration and with more than two doses.
- Rectal diazepam is absorbed rapidly and attains a therapeutic level in 10 minutes
- A longer-acting antiepileptic drug should also be administered because of the relatively short duration of action of diazepam, Phenytoin is preferred over phenobarbital, which is more likely to cause respiratory depression and to alter the child‘s level of consciousness.
- In children who are receiving phenytoin prior to the onset of status epilepticus, we recommend the use of a smaller dose

Reference

- Glauser T, Shinnar S, Gloss D, Alldredge B, Arya R, Bainbridge J, Bare M, Bleck T, Dodson WE, Garrity L, Jagoda A. Evidence-based guideline: treatment of convulsive

status epilepticus in children and adults: report of the Guideline Committee of the American Epilepsy Society. Epilepsy currents. 2016 Jan;16(1):48-61.

- Chin RF, Neville BG, Peckham C, et al. Incidence, cause, and short-term outcome of convulsive status epilepticus in childhood: Prospective population-based study. Lancet 2006;368(9531):222-229.

Seizure disorders in children, non-febrile

Brief description

- A chronic condition characterized by recurrent unprovoked seizures.
- Seizures are caused by abnormal discharges in the brain and present in two different forms: convulsive and non-convulsive forms.
- Consider a diagnosis of epilepsy if:
  - person has had at least 2 unprovoked seizures in the last year calendar.
  - One episode of unprovoked seizure with the following
    - Abnormal neurologic exam
    - Abnormal neuroimaging or EEG finding
    - A diagnosis of epilepsy syndrome
- Seizures during an acute event (e.g., meningitis, acute traumatic brain injury) are not epilepsy.

Causes

- Genetic, congenital malformation, birth asphyxia, brain tumour
- Brain infections, cysticercosis, trauma (acute or in the past)
- Metabolic disorders
- In some cases, no specific causes can be identified

Clinical features

- Depending on the type of epilepsy:

A. Generalized epilepsy:

- Seizure involves whole brain, and consciousness is lost at the onset.
- **Tonic Clonic (grand-mal) or convulsive epilepsy**
  - May commence with a warning sensation in the form of sound, light or abdominal pain (aura).
  - There may be a sharp cry followed by loss of consciousness and falling.
  - Tonic contraction (rigidity) of muscles occurs followed by jerking movements (clonic phase)
  - There may be incontinence of urine or faeces, frothing, and tongue biting.
  - A period of deep sleep follows
- **Absence seizures (petit mal)**
  - Mainly a disorder of children
  - The attack is characterized by a brief loss of consciousness (5-10 seconds) in which posture is retained but other activities cease
  - The child has a vacant stare

- Previous activities are resumed at the end of the attack
- Several attacks may occur in a single day

- **Atonic or tonic seizures (drop attacks)**
  - Sudden loss of muscular tone, of brief duration (15 seconds), with consciousness maintained or
  - Sudden stiffening of muscle
- **Myoclonus Epilepsy**:
  - Abnormal jerking movements occurring usually in the limbs but may involve the whole body

B. Focal Epilepsy

- Seizure activity starts in one area of the Brain
- **Simple:**
  - Patient remains alert but has abnormal sensory, motor, psychic or autonomic manifestation e.g., jerking of a limb, deja vu, nausea, strange taste or smell, signs of autonomic nerve dysfunction i.e., sweating, flushing, and gastric sensation, motor contraction or sensory change in a particular point of the body)
- **Complex:**
  - Altered awareness and behavior e.g., confusion, repetitive movements

Differential diagnosis

- Syncope, hypoglycemia
- Hypocalcemia
- Conversion disorder, hyperventilation and panic attacks

Investigations

- A complete medical assessment including psychiatric history
- Electroencephalogram (EEG)
  - Useful in petit mal and temporal lobe epilepsy
  - To be done at specialist level (RR and NR)
- Other investigations are guided by suspected cause

Treatment

Objectives

- Alleviate symptoms
- Prevent complications

Non-pharmacologic

- All suspected cases of non-convulsive epilepsy should be confirmed and treated by a specialist
- Convulsive epilepsy can be diagnosed at hospital/health center level but drug refills should be available at lower level
- One brief isolated seizure does not need further treatment but review at 3 months and re-assess.
- Treat patients with repeated episodes as per definition
- Treatment can effectively control epilepsy in most cases

- Acute seizure and status epilepticus
  - First aid for acute seizure
  - Do not restrain or put anything in the mouth
  - Protect person from injury: make sure they are in a safe place away from fire or other things that might injure them
  - DO NOT leave patient alone.

- Seek help if possible
- After the crisis, check airway, breathing and circulation and, while unconscious, put the person in recovery position (on their side)

Pharmacologic

- Most seizures resolve spontaneously.
- If lasting >3 minutes, give diazepam 10 mg IV or rectal. Child: 0.05 mg/kg rectally, 0.02 mg/kg IV

Pharmacologic

- Children <2 years: phenobarbital or carbamazepine or phenytoin
- Children >2 years: carbamazepine or valproate
- Absence seizures: Valproate or ethosuximide

Principle of AED therapy

- Start with mono therapy. The effective dose must be reached progressively and patient monitored for tolerance and side effects. Aim at the lowest dose able to control (prevent) the seizures
- If treatment is ineffective (less than 50% reduction in crisis) try another monotherapy (slowly reduce the current antiepileptic and introduce the new one)
- If high doses with side effects are required and seizures are anyway infrequent, less than complete control can be the goal
- Follow up monthly until stable, then every 3 months
- Warn patient that treatment interruptions can trigger seizures or even status epilepticus
- If no seizure for 2 years and no known cause like head trauma or infection, consider possibility of stopping treatment (over 2 months). Discuss with the patient
- If 2 mono therapy trials fail, refer to specialist

Note

- In children, look for presence of associated intellectual disability or behavioral problems.
- If present, consider carbamazepine or valproate. (avoid phenobarbital and phenytoin) and manage associated intellectual disability or behavioral problem

Health education

- Health education to patients, careers and community
- Advice on management of seizures and safety precautions
- In children, look for and manage presence of associated intellectual disability or behavioral problems

Prevention

- Good antenatal care and delivery
- Avoid causative factors

Reference

- This step can be accomplished with early use of continuous positive airway pressure (CPAP) given nasally, by nasal mask, or by using an endotracheal tube when mechanical ventilation and/or surfactant is administered

- Avoidance of hyperoxia or hypoxia with the aid of pulse oximetry:
  - Always use blended oxygen with an oxygen saturation target range (SaO 2) of 90-95%.
- Early administration (age <2 hours) of surfactant is recommended when indicated.

Thermoregulation

- Use radiant warmers with skin probes to regulate the desired temperature (in general, a normal body temperature of 36.5 ºC -37.5ºC.

- A heated and humidified isolette is ideal for ELBW infants.

Fluid and electrolyte management

- Preterm infants require close monitoring of their fluid and electrolyte levels for several reasons (eg immature skin increases transepidermal water loss; immature kidney function; the use of radiant warming, phototherapy, mechanical ventilation).
- The degree of prematurity dictates the initial fluid management.
- The following are general principles of fluid and electrolyte management when caring for premature infants:
  - The initial fluid should be a solution of glucose and water
  - Calcium may be added in the initial fluid
  - Iron and vitamin supplementation
  - Screening for ICH…cranial U/S

Reference

- Muhe LM, McClure EM, Nigussie AK, Mekasha A, Worku B, Worku A, Demtse A, Eshetu B, Tigabu Z, Gizaw MA, Workneh N. Major causes of death in preterm infants in selected hospitals in Ethiopia (SIP): a prospective, cross-sectional, observational study. The Lancet Global Health. 2019 Aug 1;7(8):e1130-8.
- Berhane M, Workineh N, Girma T, Lim R, Lee KJ, Nguyen CD, Neal E, Russell FM. Prevalence of low birth weight and prematurity and associated factors in neonates in Ethiopia: results from a hospital-based observational study. Ethiopian journal of health sciences. 2019;29(6).

16.13.7. Respiratory distress in the newborn

Brief description

- Neonatal respiratory distress syndrome (RDS) is a problem often seen in premature babies.
- Neonatal RDS occurs in infants whose lungs have not yet fully developed.

Causes

- The disease is mainly caused by a lack of a slippery substance in the lungs called surfactant.
  - This substance helps the lungs fill with air and keeps the air sacs from deflating.
  - Surfactant is present when the lungs are fully developed.
- Neonatal RDS can also be due to genetic problems with lung development.
- Most cases of RDS occur in babies born before 37 to 39 weeks.
  - The more premature the baby is, the higher the chance of RDS after birth.
  - The problem is uncommon in babies born full-term (after 39 weeks).
- Other factors that can increase the risk of RDS include:
  - Siblings who had RDS
  - Diabetes in the mother
  - Cesarean delivery or induction of labor before the baby is full-term
  - Problems with delivery that reduce blood flow to the baby
  - Multiple pregnancy (twins or more)
  - Rapid labor

Clinical features

- Most of the time, symptoms appear within minutes of birth. However, they may not be seen for several hours.
- Symptoms may include:
  - Bluish color of the skin and mucus membranes (cyanosis)
  - Brief stop in breathing (apnea)
  - Decreased urine output
  - Nasal flaring
  - Rapid breathing
  - Shallow breathing
  - Shortness of breath and grunting sounds while breathing
  - Unusual breathing movement (such as drawing back of the chest muscles with breathing)

Investigation

- Blood gas analysis -- shows low oxygen and excess acid in the body fluids.
- Chest x-ray -- shows a "ground glass" appearance to the lungs that is typical of the disease. This often develops 6 to 12 hours after birth.
- Lab tests -- help to rule out infection as a cause of breathing problems.

Treatment

Objectives

- Decrease the risk of grave complications and mortality
- Shorten hospital stay

Non-pharmacologic

- Babies who are premature or have other conditions that make them at high risk for the problem need to be treated at birth by a medical team that specializes in newborn breathing problems.
- Infants will be given warm, moist oxygen. However, this treatment needs to be monitored carefully to avoid side effects from too much oxygen.
- Having a calm setting, Gentle handling
- Carefully managing fluids and nutrition

Pharmacologic

- A treatment called continuous positive airway pressure (CPAP) may prevent the need for assisted ventilation or surfactant in many babies.
- CPAP sends air into the nose to help keep the airways open. It can be given by a ventilator (while the baby is breathing independently) or with a separate CPAP device.
- Treating infections right away
- Giving extra surfactant to a sick infant has been shown to be helpful.
- Assisted ventilation with a ventilator (breathing machine) can be lifesaving for some babies.

Prognosis

- The condition often gets worse for 2 to 4 days after birth and improves slowly after that. Some infants with severe respiratory distress syndrome will die. This most often occurs between days 2 and 7.
- Long-term complications may develop due to:
  - Too much oxygen.
  - High pressure delivered to the lungs.
  - More severe disease or immaturity. RDS can be associated with inflammation that causes lung or brain damage.
  - Periods when the brain or other organs did not get enough oxygen.

Complications

- Air or gas may build up in:
  - The space surrounding the lungs (pneumothorax)
  - The space in the chest between two lungs (pneumomediastinum)
  - The area between the heart and the thin sac that surrounds the heart (pneumopericardium)
- Other conditions associated with RDS or extreme prematurity may include:
  - Bleeding into the brain
  - Bleeding into the lung (pulmonary hemorrhage; sometimes associated with surfactant use)
  - Problems with lung development and growth

- Delayed development or intellectual disability associated with brain damage or bleeding
- Problems with eye development and blindness

Prevention

- Taking steps to prevent premature birth can help prevent neonatal RDS.
- The risk of RDS can also be lessened by the proper timing of delivery.
- A lab test can be done before delivery to check the readiness of the baby's lungs.
- Medicines called corticosteroids can help speed up lung development before a baby is born. They are often given to pregnant women between 24 and 34 weeks of pregnancy who seem likely to deliver in the next week.
- At times, it may be possible to give other medicines to delay labor and delivery until the steroid medicine has time to work.

Alternative Names

- Hyaline membrane disease (HMD); Infant respiratory distress syndrome; Respiratory distress syndrome in infants; RDS - infants

References

- Kamath-Rayne BD, Jobe AH. Fetal lung development and surfactant. In: Resnik R, Lockwood CJ, Moore TR, Greene MF, Copel JA, Silver RM, eds. *Creasy and Resnik's Maternal-Fetal Medicine: Principles and Practice*. 8th ed. Philadelphia, PA: Elsevier; 2019:chap 16.
- Klilegman RM, St. Geme JW, Blum NJ, Shah SS, Tasker RC, Wilson KM. Diffuse lung diseases in childhood. In: Kliegman RM, St. Geme JW, Blum NJ, Shah SS, Tasker RC, Wilson KM, eds. *Nelson Textbook of Pediatrics*. 21st ed. Philadelphia, PA: Elsevier; 2020:chap 434.
- Mengesha HG, Sahle BW. Cause of neonatal deaths in Northern Ethiopia: a prospective cohort study. BMC public health. 2017 Dec 1;17(1):62.

16.13.8. Resuscitation of the newborn

Brief description

- For some babies the need for resuscitation may be anticipated:
  - those born to mothers with chronic illness, where the mother had a previous fetal or neonatal death,
  - a mother with pre-eclampsia, in multiple pregnancies,
  - in preterm delivery, in abnormal presentation of the fetus, with a prolapsed cord, or
  - where there is prolonged labor or rupture of membranes, or meconium-stained liquor.
- However, for many babies the need for resuscitation cannot be anticipated before delivery.
- Start resuscitation within one minute of birth if baby is not breathing or is gasping for breath

CHAPTER 6

Renal and urologic diseases in children

Acute glomerulonephritis

Brief description

- Acute post streptococcal glomerulonephritis is one of the non-suppurative complications of streptococcal leading to acute inflammation of renal glomeruli (small blood vessels in the kidney).

Cause

- An immune reaction often follows streptococcal throat infection by a latent period of 1-2 weeks and skin infection by 4–6 weeks.
- The condition is characterized by a sudden onset of hematuria, oliguria, edema and hypertension.
- Common in children >3 years and adolescents

Clinical features

- Hematuria (usually described as smoky or cola colored)
- Edema (usually periorbital and pretibial, but may be generalized)
- Discomfort in the kidney area (abdominal or back pain), Anorexia, General weakness (malaise)
- Hypertension (may complicate to hypertensive encephalopathy or Heart Failure)
- Decreased urine output
- Evidence of primary streptococcal infection:
  - Usually as acute tonsillitis with cervical adenitis
  - Less often as skin sepsis

Investigations

- Urinalysis: Macroscopic or microscopic hematuria (RBC>5/hpf), RBC casts, WBC, cellular casts
- Proteinuria: Rarely exceeding 3+
- Blood chemistry: BUN, Creatinine, sodium, potassium levels
- EKG for evidence of hyperkalemia
- ESR or C-reactive protein
- Complete Blood Count, ASO titer
- Renal ultrasound (not essential to diagnosis)

Treatment

Objectives

- Avoid complications of hypertension and hyperkalemia

- Relieve edema
- Treat renal failure

Non-pharmacologic

- Input and output monitoring chart and daily weight measurements
- Salt restriction and regulate protein
- Restrict fluid input: determine 24-hour fluid requirement (400ml/m2/24hours + urine output+ any other losses)
- Giving maintenance fluid orally unless there is indication to give intravenously

Pharmacologic

- Treat any continuing hypertension
- Treat primary streptococcal infection (10-day course): Amoxicillin 20 mg/kg per dose every 8 hours for 10 days
- If allergic to penicillin: Erythromycin 15 mg/kg per dose every 6 hours for 10days
- For fluid overload (oedema): Furosemide 1 mg/kg IV (slow bolus) every 6-12 hours
- If furosemide is not enough to control the blood pressure, add nifedipine 0.25-0.5mg/kg/dose Q6hours (maximum dose 10mg/dose or 3mg/kg/24hours).,
- If hyperkalemia (serum potassium > 5.5mmol/liter), give calcium gluconate 10%, 0.5ml/kg IV over 10 minutes, OR Glucose 5-10ml/kg of 10% dextrose over 1 hour and regular insulin 0.1-0.2units/kg as a bolus Refer: for peritoneal dialysis if the above measures fail.

Prevention

- Treat throat and skin infections promptly and effectively
- Avoid overcrowding
- Adequate ventilation in dwellings

Reference

- Gebreyesus LG, Aregay AF, Gebrekidan KG, Alemayehu YH. Factors associated with treatment outcome of acute post streptococcal glomerulonephritis among patients less than 18 years in Mekelle City, Public Hospitals, North Ethiopia. BMC research notes. 2018 Dec 1;11(1):693.
- Abdissa A, Asrat D, Kronvall G, Shitu B, Achiko D, Zeidan M, Yamuah LK, Aseffa A. Throat carriage rate and antimicrobial susceptibility pattern of group A Streptococci (GAS) in healthy Ethiopian school children. Ethiop Med J. 2011 Apr;49(2):125-30.

Nephrotic syndrome

Brief description

- Nephrotic syndrome is characterized by heavy proteinuria (40mg/m2/hour on timed urine collection or spot urine protein to urine Creatinine ratio > 2, or dipstick on early

morning urine sample of 3+ or 4+), hypoalbuminemia (<2.5gm/dl), hypercholesterolemia (> 200mg/dl) and edema.

Causes/epidemiology

- About 90% of children beyond one year of age and less than 12 years of age, with nephrotic syndrome have minimal change disease with steroid responsiveness.
- The commonest age at presentation is 2 – 6 years.
- After an apparent response to steroid treatment a patient may have relapse, which is defined as proteinuria of 3+ or more on dipstick for 3 consecutive days with or without edema. Other causes are congenital (rare).
- Secondary: Due to post-streptococcal acute glomerulonephritis, malaria, allergy, UTI, hepatitis B, HIV

Clinical features

- Periorbital and pedal edema
- Generalized edema, including ascites and pleural effusion in some patients
- Hypertension: Generally rare but can occur in some patients

Investigations

- Urine dipstick (protein, blood)
- Early morning spot urine protein to creatinine ratio or 24hour urine protein quantification
- Serum albumin, cholesterol, BUN, Creatinine
- Complete blood count

Differential diagnosis

- Cardiac failure, liver disease
- Malnutrition with oedema e.g., kwashiorkor
- Malabsorption syndrome
- Allergic states causing generalized body swelling
- Chronic glomerulonephritis

Treatment

Objectives

- Relieve symptoms
- Alleviate proteinuria
- Spare the kidney from damage by proteinuria

Non-pharmacologic

- While the child is edematous, restrict salt (2g daily, i.e. less than a half TSP/day) and reduce maintenance fluid to 70% of normality.

- Critical assessment of temperature, blood pressure, and pulse, capillary refill time and weight changes
- Educate the child and family about the disease, its management and its prognosis.

Pharmacologic

- **Prednisolone**, 60mg/m2 or 2mg/kg (maximum dose of 80mg) once daily for 6 weeks,
  - followed by 40mg/m2 (1.5mg/kg) given as a single dose on alternate days for a further 6 weeks after a meal to prevent gastrointestinal upsets.
  - Gradually reduce the dose after the first 4 weeks, e.g., reduce by 0.5 mg/kg per day each week
- When oedema has subsided and if still hypertensive:
  - Give appropriate treatment
  - Furosemide: 1-2 mg/kg per dose each morning to induce diuresis
  - Caution is needed when diuretics are prescribed because of hypovolemia, risk of hypercoagulability
- If clinical signs of/suspected streptococcal infection:
  - Give antibiotic as in Acute glomerulonephritis
- If patient from area of endemic schistosomiasis:
  - Praziquantel 40 mg/kg single dose
- **If no improvement after 4 weeks or patient relapses:**
  - Refer for further management

Treatment steroid resistance

- If a patient fails to respond to 4 weeks of steroid treatment, then steroid resistance is diagnosed and the patient should be referred for renal biopsy and further treatment.
- If the child is edematous, give empirical **amoxicillin** 50mg/kg in two divided doses till the edema disappears.
- If slightest suspicion of infection, treat with 3rd generation cephalosporins and or **gentamycin** for 7 – 10days

Treatment of relapsing disease

- If infrequent relapse (< 2 relapses in 6 months or < 3 relapses in one year),
  - p**rednisolone** 60mg/m2 (maximum 80mg) daily until urinary protein turns negative or trace for 3 consecutive days followed by alternate day therapy with 40mg/m2 (maximum 60mg) for 28 days or 14 doses.
- If frequent relapse (2 or more relapses in the initial 6 months or more than 3 relapses in any 12 months),
  - **prednisolone** 60mg/m2 (maximum 80mg) daily until urinary protein turns negative or trace for 3 consecutive days followed by alternate day therapy with 0.1-0.5mg/kg for 6 months and then taper.

- If the child relapses while on alternate day prednisolone,

- add levamisole 2.5mg/kg on alternate days for 6-12 months, then taper prednisolone and continue levamisole for 2-3 years.

- If the child develops steroid toxicity, refer to a tertiary center.
- ACE inhibitors:
- Steroid resistant NS: option of referral

Reference

- Mola K, Shimelis D. Pattern and outcome of renal diseases in hospitalized children in Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia. Ethiopian Medical Journal. 2016 Jun 9;54(3).
- Handbook for the management of common renal disorders in Ethiopia, 2009
- Pediatric nephrology, 7th ed, 2016

Acute kidney injury

Brief description

- Acute impairment of renal function.

Causes

- Compromised renal perfusion e.g., dehydration, heart failure, shock (acute)
- Obstructed urinary flow
- Damage to renal tissue by infectious and inflammatory diseases (e.g., glomerulonephritis), intoxications, nephrotoxic drugs

Clinical features

- Oliguria (urine flow <1 ml/kg/hour)
- Generalized oedema
- Hypertension, heart failure, dyspnoea
- Nausea and vomiting, anorexia
- Lethargy, convulsions

Differential diagnosis

- Other renal disorders
- Biventricular heart failure

Investigations

- Urine analysis: for blood, proteins, leucocytes, casts
- Urea, creatinine and electrolytes

Treatment

Objectives

- Alleviate symptoms

- Avoid life-threatening complications

Non-pharmacologic

- Management of acute kidney condition can be started at hospital level but the patient should be referred at higher level for more appropriate management:
- Treat underlying conditions e.g., dehydration ➔Fluid NS/RL 20ml/kg over 1hours
- Monitor fluid input and output Daily fluid requirements = 10 ml/kg + total of losses through urine, vomitus and diarrhea
- Monitor BP twice daily
- Daily weighing
- Restrict salt intake (<2 g or half teaspoonful daily)
- Restrict potassium intake e.g., oranges, bananas, vegetables, meat, fizzy drinks
- Moderate protein intake
- Ensure adequate calories in diet
- Check urine and electrolytes frequently

Pharmacologic

- Treat any complications (e.g., infections, hypertension, convulsions), adjusting drug dosages according to the clinical response where appropriate
- If oliguria, furosemide IV according to response (high doses may be necessary)
- If no response to above general measures, worsening kidney function or anuria (urine output less than 100 ml/24 hours)
- Refer for specialist management including possible dialysis as soon as possible and before the patient‘s condition becomes critical

Indications for dialysis

- BUN>150MG/DL I rising
- Referactory edema for medical management
- Severe hyperkalemia refractory to medical treatment

Caution

- Do not give any drugs, which may make kidney damage worse e.g. use gentamicin with caution

Reference

- Mola K, Shimelis D. Pattern and outcome of renal diseases in hospitalized children in Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia. Ethiopian Medical Journal. 2016 Jun 9;54(3).
- Gordon DM, Frenning S, Draper HR, Kokeb M. Prevalence and burden of diseases presenting to a general pediatrics ward in Gondar, Ethiopia. Journal of tropical pediatrics. 2013 Oct 1;59(5):350-7.

Chronic kidney disease

Brief description

- Chronic impairment of kidney function

Causes/risk factors

- Diabetes mellitus
- Hypertension/cardiovascular disease
- Kidney stones
- Drugs especially pain killers like ibuprofen and other NSAIDs
- Family history of kidney disease HIV/AIDS
- Congenital malformations
- VUR

Clinical features

- Most patients with CKD have no symptoms until the disease is advanced
- May present with features of predisposing risk factor
- Anaemia, lethargy, easy fatigue, appetite loss, nausea, vomiting, skin itching, bone pains
- May have body swelling
- May have loin pain

Differential diagnosis

- Other causes of chronic anaemia
- Heart failure
- Protein-energy malnutrition
- Chronic liver disease

Investigations

- Creatinine/Urea/electrolytes
- Urine dip stick for protein and blood
- Kidney ultrasound
- How to screen for CKD in patient at risk
- Urine dipsticks (for protein and blood) and blood pressure measurement at least once a year in high-risk patients
- In diabetics, urine micro albumin where possible or a spot urine for protein: creatinine ratio at least once a year
- Patients with detected abnormalities should have a serum creatinine test performed and GFR calculated as suggested above
- Refer the following patients for specialist attention:

- Children
- Persistent proteinuria or haematuria beyond 3 months
- GFR <60 ml/min or creatinine >1.9 mg/dl
- Familial kidney disease, e.g., polycystic kidney disease

Treatment

Objectives

- Alleviate symptoms
- Avoid life-threatening complications

Non-pharmacologic

- Treatment of end stage renal disease is complex and expensive, and available only at national referral hospital.

Goals

- Establish diagnosis and treat reversible diseases
- Identify co-morbid conditions and manage further complications of CKD
- Slow progression of CKD by optimizing treatment
- Plan renal replacement therapy well before end stage kidney disease is reached

Treatment to preserve kidney function in patients with CKD

- Lifestyle modifications: Weight loss, stop smoking, exercise, healthy balanced diet, lipid control, salt restriction
- Blood pressure control:
  - Target 130/80 mmHg (lower in children).
  - Use ACE inhibitors as first line antihypertensive for diabetics and patients with proteinuria, plus low salt diet
- In diabetics:
  - BP control is paramount:
  - Optimal blood sugar control (HbA1C <7%)
- Proteinuria:
  - Reduce using ACE inhibitors and/or ARBs; target < 1 g/day
- Avoid nephrotoxic medicines, e.g., NSAIDs, celecoxib's, aminoglycosides, contrast agents

Prevention of complications

- Anemia: due to multiple causes.
  - Consider iron and folic supplements. Target Hb 11-12 gr/dL
- Bone mineral disease:
  - Consider adding calcium lactate or other calcium/vitamin D supplements

Treatment of symptoms

- If fluid retention/oliguria, furosemide tablet according to response (high doses may be

necessary)
- Dialysis for end stage cases

Caution
- Start ACE inhibitors at low doses and monitor renal function carefully. DO NOT use in advanced chronic disease

Prevention
- Screening of high-risk patients
- Optimal treatment of risk factors
- Treatments to slow progression in initial phases
- Avoidance of nephrotoxic drugs

Reference

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CHAPTER 7
Anemia in children

Brief description

- Anemia is defined as reduction in red blood cell (RBC) mass, which will be measured in the laboratory, by reduction in hemoglobin concentration or hematocrit or RBC count. WHO criteria for anemia.
- For children 6mo-59months <11g/dl, 5yrs-12yrs <11.5g/dl, 12-15yrs <12g/dl, after 15 yrs. adult cut off points are used.
- Anemia is not a single disease entity; it is rather a manifestation of several pathologies.
- The causes of anemia can be divided in to two broad categories
  - Anemia due to increased RBC loss or destruction- Hemorrhage or hemolysis
  - Anemia due to defective or decreased RBC production - Examples – Iron deficiency anemia, B12 or folate deficiency, anemia of chronic disease/chronic renal failure/hypothyroidism, Aplastic anemia, Bone marrow infiltration, Chemotherapy induced anemia.
- Anemia is often a symptom of a disease rather than a disease itself.

Clinical features

Endophthalmitis

Brief description:

- Intraocular infection, can be acute(symptomatic), subacute and chronic (asymptomatic)
- It can be postoperative (most common), posttraumatic and rarely endogenous
- Prognosis depends on the etiology, duration and organism, usually poor in posttraumatic

Clinical features:

Symptoms

- Pain, red eye, photophobia, decreased vision

Signs

- Decreased visual acuity, poor red reflex
- Lid edema, Conjunctival injections and chemosis, proptosis
- Corneal edema, anterior chamber cell and flare, hypopyon, Keratic precipitates

Investigations and diagnosis

- B scan if fundus is not visualized

Treatment

Goal of treatment

- Treat the infection
- Prevent sight- and/or life-threatening complications

Non-pharmacological treatment

- Daily follow up in acute phase, then according to the treatment response

Pharmacological treatment

- Intravitreal antibiotics
- Broad spectrum fortified topical antibiotic (fortified antibiotic possible, see annex about antibiotic fortification)
- Topical steroids
- Systemic intravenous antibiotics for marked inflammation, severe cases

Referral. Early referral to eye care center is recommended for all cases of suspected Endophthalmitis

CHAPTER 8
Conjunctivitis

Allergic Conjunctivitis

Brief description:

- Atopy is a genetically determined predisposition to hypersensitivity reactions upon exposure to specific environmental antigens
- It is Type I, mediated by degranulation of mast cells in response to action of IgE
- There is evidence of an element of Type IV hypersensitivity in at least in some forms
- There are various forms of allergic conjunctivitis

Acute Allergic Conjunctivitis Brief description:

- A common condition, an acute reaction to an environmental allergen (usually pollen)
- It is typically seen in younger children after playing outside in spring or summer

Clinical features:

Symptoms

- Conjunctival swelling, acute itching, watering

Signs

- Chemosis is the hallmark (frequently dramatic and worrying to the child and parents)

Investigation and diagnosis: Clinical

Treatment

Goal of treatment

- To relieve the symptom

Non-pharmacological treatment

- Cold compress (e.g. washing with refrigerated water, putting a clean refrigerated towel or

ice pack)

Pharmacological treatment

- Dexamethasone 0.1% BID to QID

Hay Fever and Perennial Allergic

Conjunctivitis Brief description:

- Common subacute conditions, distinguished from each other
- Often other atopic conditions, such as allergic rhinitis and asthma

Hay fever	**Seasonal**	**Perennial**
Prevalence	• More common	• Less common
Allergens	• Tree & grass pollens	• Mites, dander, fungus
Exacerbation season	• Spring and summer	• Autumn
Severity	• Mild to severe	• Usually, mild

Clinical features:

Symptoms

- Intense itching is a hallmark symptom, attacks are usually short lived and episodic
- Eyelid swelling, mucoid eye discharge, associated with sneezing and nasal discharge

Signs

- Conjunctival hyperemia and chemosis, relatively mild papillary reaction, lid edema

Investigations and diagnosis

- Conjunctival scraping to look characteristics of eosinophils or their granules

Treatment

Goal of treatment

- Avoid exposure to allergen
- Alleviate the symptoms

Non-pharmacological treatment

- Identify and avoid the allergens
- Cold compresses

Pharmacological treatment (see under Atopic keratoconjunctivitis)

Topical

- Artificial tears for mild symptomatic
- Antihistamines for symptomatic exacerbation
- Mast cell stabilizer for long term use

- Combination

Systemic

- Oral antihistamines may be indicated for severe symptoms

Vernal Keratoconjunctivitis (VKC)

Brief description:

- Recurrent bilateral disorder, IgE- and cell-mediated immune mechanisms play roles
- Primarily affects boys and onset is generally from about the age of 5 years onwards
- Frequently but not invariably have personal or family history of atopy
- Often occurs on a seasonal basis, with a peak incidence over late spring and summer, although there may be mild perennial symptoms
- There is remission by the late teens in 95% of cases, although many of the remainder develop atopic keratoconjunctivitis

Clinical features:

Symptoms

- Intense itching, lacrimation, photophobia
- Foreign body sensation, burning and thick mucoid discharge
- Increased blinking is common

Signs

- Conjunctival hyperemia and diffuse velvety papillary hypertrophy on superior tarsal plate in palpebral form, micro to giant papilla (–cobble stone‖ appearance)
- Different forms of keratoplasty are more frequent in palpebral disease
- Horner -Trantas dot in limbal form (also may find in atopic keratoconjunctivitis)
- Pseudogerontoxon i.e. perilimbal band of superficial scarring can develop in recurrent limbal disease, resembling arcus senilis

Investigations and diagnosis: Clinical

Treatment

Goal of treatment

- Relieve symptomatic surface disease
- Prevent complications

Non-pharmacological treatment

- Climatotherapy such as the use of air-conditioning or relocation to cooler environment
- Ice packs and frequent face washing with cold water gives temporary relief
- Avoid eye rubbing, which is partly responsible cause for corneal ectasia

Pharmacological treatment

- Mild: Topical antihistamine +/- NSAIDS
- Moderate: topical mast cell stabilizer +/- NSAIDS
- Severe: Steroid +/- topical antihistamine +/- NSAIDs +/- mast cell stabilizer
- NB. Corticosteroids should be reserved for exacerbations with moderate to severe discomfort and/or decreased visual acuity and should be discontinued between attacks. The patient and family must be thoroughly informed about the potential risk of chronic steroid therapy

Referral: In severe and complicated cases refer to an ophthalmologist

Atopic Keratoconjunctivitis (AKC)

Brief description:

- A rare bilateral disease that typically develops in adulthood (peak incidence 30 to 50 years) following a long history of atopic dermatitis (eczema)
- Asthma is also extremely common in these patients. About 5% have suffered from childhood VKC
- Eosinophils tend to be less common in conjunctival scrapings than with VKC
- Associated chronic staphylococcal blepharitis and madarosis are common

Clinical features:

Symptoms

- Similar to those of VKC, but are frequently more severe and unremitting
- Discharge is generally more watery

Signs

- Eyelid erythema, dryness, scaling and thickening
- There may be keratinization of the lid margin.
- Hertoghe sign: absence of the lateral portion of the eyebrows
- Dennie–Morgan folds: lid skin folds caused by persistent rubbing

Investigations & diagnosis: Clinical

Treatment

Goal of treatment

- To alleviate the symptoms
- Treat associated blepharitis

Non-pharmacological treatment

- Allergen avoidance
- Cold compress
- Lid hygiene for associated blepharitis

Pharmacological treatment

Topical:

- Vasoconstrictor: Tetrahydrozoline 0.05% or Oxymetazoline 0.025% or 0.05%, 1 drop TID to QID, not more than one week (due to rebound conjunctivitis)
- Vasoconstrictors- antihistamine combination: Naphazoline + Antazoline 0.025%+0.5% or Naphazoline + Phenylephrine 0.25% + 0.3%, 1 drop TID to QID
- Antihistamine: Levocabastine 0.05% or Olopatadine 0.1%, 1 drop TID to QID
- Mast cell stabilizer: Cromolyn Sodium 4% or Lodoxamide 0.1%, 1 drop TID to QID
- NSAIDs: Diclofenac 0.1% or Flurbiprofen 0.03% or Ketorolac 0.5% or Suprofen 0.5%, 1 drop TID to QID
- Artificial tears, 1 drop 3 to 5 times per day
- Steroid: Dexamethasone 0.1% or Prednisolone 0.25%, and 1% or Fluoromethalone 0.1%, 0.25%, every 2 to 4 hours per day depending on the severity and tapered every 5 to 7 days down to 1 drop every other day
- Steroid – antibiotics combination: Dexamethasone + Chloramphenicol 0.1% + 0.5% or Dexamethasone + Tobramycin 0.1% + 0.3%, 1 drop every 2 to 4-hour, taper as steroid

NB. Treatment should be based on the severity of patient symptoms, and consists of one or more the above medications. Mast cell stabilizer not effective against acute attack, due to slow onset of effect

Systemic: oral antihistamine may provide symptomatic relief in some patients

Bacterial Conjunctivitis

Acute Bacterial Conjunctivitis in Children and Adult

Brief description:

- A common and usually self-limiting condition caused by direct contact with infected secretions, about 60% resolve within 5 days without treatment.
- In children, the possibility of progression to systemic involvement should always be borne in mind
- The most common isolates are Streptococcus pneumoniae, Staphylococcus aureus, Haemophilus influenzae and Moraxella catarrhalis
- Other rare isolates are Neisseria gonorrhea (sexually active individuals) & Neisseria meningitides (in children)

Clinical features:

Symptoms

- Acute onset of redness, grittiness, burning and discharge
- Involvement is usually bilateral although one eye may become affected 1–2 days before the other
- On waking, the eyelids are frequently stuck together and may be difficult to open

Signs

- Visual acuity is not usually affected
- Generalized conjunctival hyperemia and chemosis
- Muco-purulent eye discharge, gumming of eye lashes
- Palpable LNs in severe gonococcal & meningococcal infections

Investigations and diagnosis:

- Conjunctival swab & scrapings for Gram's stain & culture and sensitivity for severe cases

Treatment

Goal of treatment

- Treat the infection
- Prevent re-infection, transmission and complications

Non-pharmacological treatment

- Frequent cleaning of the eyelids and warm compression

Pharmacological treatment

Topical antibiotics

- Chloramphenicol, 0.5 % solution 1 drop every 4 to 6 hours or 1% ointment single strip apply BID to QID for 10 to 15 days OR
- Tetracycline 1% ointment, single strip apply BID to QID for one to two weeks OR
- Ciprofloxacin 0.3 % solution, 1 drop every 4 to 6 hours per day for one to two weeks OR
- Tobramycin 0.3% eye drop, 1 drop every 4 to 6 hours per day for one to two weeks

Systemic antibiotics are required in cases of

- Gonococcal infections, ceftriaxone or quinolones
- H. influenzae in children, amoxicillin/clavulanate
- Meningococcal infections in children
- NB. Frequent topical instillation of antibiotic eye drops or ointments is useful (it speeds recovery, re-infection and transmission). Quinolones (such as ciprofloxacin eye drop should be reserved for refractory (resistant) cases to initial therapy.

Referral: In severe and complicated cases refer to an ophthalmologist

Neonatal Conjunctivitis (Ophthalmia Neonatorum)

Brief description:

- Conjunctival inflammation developing within the first month of life
- It is identified as a specific entity distinct from conjunctivitis in older infants because of its potentially serious nature (both ocular and systemic complications)
- Common etiologies C. Trachomatis and N Gonorrhea; other HSV 2, staphylococcus, chemical conjunctivitis (prophylaxis eye drops, silver nitrate) and congenital NLDO

- Gonococcal conjunctivitis is a serious infection and, if untreated, it progresses to corneal ulceration/perforation and endophthalmitis, leading to blindness.

Clinical features:

Symptoms

- Rapid progressive copious purulent conjunctival discharge

Timing of onset

- Chemical irritation: first few days
- Gonococcal: first week
- Staphylococci and other bacteria: end of the first week
  - Herpes simplex virus (HSV): 1–2 weeks
  - Chlamydia: 1–3 weeks

Signs

- Marked conjunctival hyperemia and chemosis

Investigations and diagnosis:

- Gram's stain and culture from discharge in moderate to severe cases

Treatment

Goal of treatment

- Treat the infection
- Prevent corneal perforation and blindness

Non-pharmacological treatment

- Saline irrigation to remove excessive discharge

Pharmacological treatment

Mild conjunctivitis – Topical antibiotics

- Tetracycline 1% ointment, single strip apply BID to TID for 2 weeks OR
- Erythromycin 1% ointment, single strip apply BID to TID for 2 weeks OR
- Chloramphenicol, 0.5% eye drop 1 to 2 drops TID to QID or 1% ointment single strip apply BID to TID OR
- Gentamicin 0.3% solution, 1 to 2 drops 4-6 times daily for 10 to 15 days

NB. For chemical conjunctivitis, avoid the offending agent and use artificial tears if needed

Moderate to Severe – systemic antibiotics

Chlamydial infection

- Erythromycin po for 2 weeks

Gonococcal infection

- Ceftriaxone, 50 mg/kg to a maximum of 125 mg as a single IM injection OR
- Cefotaxime, 25mg/kg IV OR IM every BID to TID for 7 days OR
- Penicillin G Sodium Crystalline, 50,000 IU/kg QID for 10 days
- N.B. Most gonococcal strains are now resistant to penicillin.

Prophylaxis of Gonococcal conjunctivitis

- Clean the newborn's eye with 0.9 % saline or clean water using sterile gauze
- Apply single strip of ointment into each eye any of the above antibiotic eye ointments

Referral: In severe and complicated cases refer to an ophthalmologist

Blepharitis

Brief description:

- Blepharitis is a general term for inflammation of the eyelid margins
- It is one of the most common causes of external ocular irritation
- It is usually chronic and bilateral
- If it is associated with conjunctivitis, it is termed Blepharoconjunctivitis
- There are three types of blepharitis: Seborrhoeic, Staphylococcal and demodectic
- Patients should be advised that a permanent cure is unlikely, but control of symptoms is usually possible

Staphylococcal (Ulcerative) Blepharitis

Brief description:

- The most common causes of blepharitis, usually caused by staphylococcus aureus
- It is more common in younger individuals

Clinical feature:

Symptoms

- Irritation and burning to peak in the morning and improve as the day progresses
- In the presence of a risk for resistant infections: carbapenems, piperacillin- tazobactam or cefepime or ceftazidim

CHAPTER 9
INTESTINAL HELMINTHIC INFESTATIONS

BRIEF DESCRIPTION

- These are infestation caused by intestinal worms (nematodes and cestodes), which are commonly associated with poor personal and environmental hygiene.
- Although they may not be fatal, they contribute to malnutrition and diminished work capacity.

CLINICAL FEATURES

- Include abdominal cramps, nausea, bloating, anorexia
- Anemia
- Perianal itching
- Passage of adult worms

INVESTIGATIONS

- Mainly by direct stool microscopy:A single stool microscopy may not be diagnostic.A repeated stool microscopy may be needed.

TREATMENT

OBJECTIVES

- Reduce symptoms
- Break the cycle of transmission

Pharmacologic (See table below)

Table 8.55: Treatment of common intestinal helminthic parasitic infestations

Name of infestation Etiology Mode of transmission	Treatment	Remark
Ascariasis ***Ascaris lambricoids*** Ingestion of the larvae of the parasite together with food	**First line-options** **Albendazole,** 400mg P.O. as a single dose, for children: 1 – 2 years, 200mg as a single dose. **Mebendazole,** 100mg P.O.BID for 3 days or 500mg, once **Alternative (pregnant women)** **Pyrantel pamoate**, 700mg P.O. as a single dose	Presence of migrating larvae in the lungs can provoke pneumonia

Enterobiasis ***Enterobius Vermicularis*** Ingestion of the eggs of the parasite together with food	**First line-options** **Mebendazole,** 100mg P.O. BID for 3 days, repeat in two weeks OR **Albendazole,** 400mg P.O. as a single dose, repeat in two weeks, Alternative **Piperazine,** 4g in a single dose. • Simultaneous treatment of the entire household is warranted due to high transmission possibilities	Common in Children and auto infection may occur
Hookworm infestation *Necator americanus or Ancylostoma duodenale* Penetration of the larvae of the parasite through skin	**First line-options** **Albendazole,** 400mg P.O. as a single dose (**preferred**) OR **Mebendazole,** 100mg P.O. BID for 3 days or 500mg stat **Alternatives:** **Pyrantel pamoate**, 700mg P.O. as a single dose	

Strongyloidiasis ***Strongloidexs stercolaries*** Penetration of the larvae of the parasite through skin	**First line** **Ivermectin,** 200mcg/kg daily for 2 days. For disseminated strongyloidiasis, treatment with ivermectin should be extended for at least 5–7 days or until the parasites are eradicated. **Alternatives-**options **Albendazol**e 400mg P.O.BID for three consecutive days (less effective than ivermctin). OR **Thiabendazole,** 1500mg, P.O. BID, for children: 25mg/kg p.o. for three consecutive days (comparable efficacy to ivermectin).	Larvae migrate to the lungs where they cause tissue destruction and bleeding. Treat concomitant anemia if any
Trichuriasis ***T.tricura***	**First line-options** **Mebendazole**, 500mg P.O., single dose **(preferred over Albendazole)** OR **Albendazole,** 400mg, P.O. for three days oxantel pamoate 15 to 30 mg/kg (if available) plus albendazole 400 mg on consecutive days is superior than other therapies	Heavy infestation leads to bloody diarrhea, bleeding & weakness

Taeniasis ***T.saginata*** ***T.solium***	**First line-Intestinal infestation** **Praziquantel** P.O. 600mg or 10mg/Kg, single dose **Alternative** **Niclosamide,** 2g in a single dose P.O. **Treatment of neurocysticercosis** **Albendazole** P.O. 15mg/kg per day for 8- 28 days **or** **Praziquantel** 50–100mg/kg daily in three divided doses for 15–30 days**.** Longer courses are often needed in patients with multiple subarachnoid cysticerci **PLUS** -High-dose glucocorticoids -Anti epileptics (if there is seizure)	*T. solium* (pork tapeworm) may cause fatal cys-Ticercosis
Hym enolepis nana	**First line** **Praziquantel**, 25mg/kg or 1800mg P.O. single dose, followed by repeat dose 10 days later **Alternatives** **Niclosamide,** 2g P.O. on the first day followed by 1g QD for 6 days	

CHAPTER 10: ASTHMA IN CHILDREN

Bronchial asthma

Brief description

- Bronchial asthma is a disease characterized by recurrent, reversible airway obstruction, airway inflammation and increased airway responsiveness to a variety of stimuli (hyper-reactive airway).
- Symptoms are usually triggered or aggravated by viral infection of the respiratory tract or inhaled allergens.

Causes

- Not known but associated with allergies, inherited and environmental factors

Clinical feature

- Cough - usually dry, may be intermittent, persistent, or acute, especially at night
- No fever (if fever present, refer to pneumonia)
- Difficulty in breathing (usually recurrent attacks) with chest tightness, with or without use of accessory muscles -reported by older children.
- Patients may not appear very distressed despite a severe attack
- Wheezing, rhonchi: recurrent wheezing (mostly expiratory) which is severe at night
- Severe forms: failure to complete sentences, darkening of lips, oral mucosa and extremities (cyanosis)

Finding on examination

- Tachypnea, hyper-inflation of the chest, lower chest wall in drawing
- Prolonged expiration with audible wheeze
- Reduced air intake when obstruction is severe absence of fever
- Good response to treatment with a bronchodilator.

Danger signs during acute attacks:

- Paradoxical breathing
- Profound diaphoresis
- Cyanosis
- Silent chest on auscultation

- Drowsiness or confusion
- Agitation
- Exhaustion
- Arrhythmia

Differential diagnosis

- Heart failure
- Other causes of chronic cough
- Bronchiolitis
- Bronchiectasis

Investigations

- Diagnosis of childhood asthma is generally made on clinical grounds and investigations are not needed unless complication or concurrent chest infection is suspected.

Specialized investigations

- Peak flow rate: the peak flow rate increases to about 200 ml following administration of a bronchodilator
- Sputum: for eosinophilia

If evidence of bacterial infection

- Chest X-ray: if complications like pneumothorax, atelectasis or concurrent pneumonia is suspected, CBC

Asthma, acute exacerbation

Mild or moderate

- Talks in phrases, prefers sitting to lying, Not agitated
- Respiratory rate increased; Accessory muscles not used
- Pulse rate (beats per minute)
- Child >5 years: <125bpm
- Child <5 years: 140bpm
- Oxygen saturation in air > 92%
- PEF >50% predicted or best

Severe

- Talks in words or Cannot complete sentences in one breath or, too breathless to talk or feed
- Sits hunched forward, Agitated, Drowsy, Confused
- Respiratory rate > 30/min
- Use of accessory muscles for breathing (young children)
- Respiratory rate
  - Child > 5 years: > 30

- Child < 5 years: >40
- Pulse (beats/minute)
  - Child > 5 years: > 125 bpm
  - Child <5 years: > 140 bpm
- PEF < 50% predicted or best Life threatening
- SpO2 < 92%

Life threatening/impending RF

- Silent chest, feeble respiratory effort, cyanosis
- Hypotension, bradycardia or exhaustion, agitation
- Reduced level of consciousness
- Peak flow < 33% of predicted or best
- Arterial oxygen saturation < 92%

Treatment

Objective

- Relieve symptoms
- Prevent respiratory failure

General principles of management

- Inhalation route is always preferred as it delivers the medicines directly to the airways; the dose required is smaller, the side-effects are reduced
- E.g., nebulizer solutions for acute severe asthma are given over 5-10 minutes, usually driven by oxygen in hospital
- In children having acute attacks, use spacers to administer inhaler puffs
- Oral route may be used if inhalation is not possible but systemic side-effects occur more frequently, onset of action is slower and dose required is higher
- Parenteral route is used only in very severe cases when nebulization is not adequate

Acute asthmatic attack in children

Mild to moderate

Non-pharmacologic

- Treat as an out-patient
- Reassure patient; place him in a. sitting position

Pharmacologic

- Give salbutamol Inhaler 6 puffs for children < 6 years, 12puffs for those >6 years.
  - Spacer can be prepared from locally available materials like plastic water bottles (volume 100-600ml
  - After giving salbutamol with rapid succession, one should wait until the patient breaths 3-5 times before putting off the spacer.
  - Or 5 mg (2.5 mg in children) nebulization

- Repeat every 20-30 min if necessary
- Steroid is only for moderate attacks.
  - Prednisolone 50 mg (1 mg/kg for children)
  - IV hydrocortisone 4-5mg/kg Q6hrs
- Monitor response for 30-60 min.
  - If not improving or relapse in 3-4 hour -Refer to higher level
- If improving, send home with
  - 2-6 puff salbutamol Q4-6 hours as needed
  - Prednisolone 1 mg/kg once a day for 3 days for children
  - Instruct the patients on self-treatment and when to come back
  - Review in 48 hours
  - Do not give routine antibiotics unless there are clear signs of bacterial infection

Severe asthma

Non-pharmacologic

- Admit, Positioning: upright or leaning position in older children.
- Oxygen: administer oxygen via mask or nasal prongs/cannula. Continue oxygen therapy until the signs of hypoxia are no longer present or maintain the SpO2>94%
- Treatment of comorbid conditions: rhinitis, sinusitis or pneumonia as appropriate.
- Nutrition: Increase feeding and fluid intake as appropriate.

Pharmacologic

First-line

Management of Severe acute asthma

- Put on intranasal oxygen 2-4 liters/minute
- Start salbutamol 6 puff for children <6 years, 12 puffs for children >6 years every 20 minutes
- Hydrocortisone 4-5mg/kg/dose every 6 hours. Start steroid together with salbutamol.
- Epinephrine challenge:
  - Can be considered if the patient has silent chest or any other sign of impending respiratory failure, and when salbutamol puff or nebulized is not available.
  - Dose: epinephrine 1 in 1000 preparation 0.01ml/kg (maximum 0.3ml (if diluted to 1/10,000 (by adding 1 ampoule of epinephrine to 9ml of normal saline), the dose is 0.1ml/kg (max 3ml).
  - Can be repeated once if no improvement after 15 minutes.
- If the above measures fail, magnesium sulphate 50% solution at a dose of 0.1ml/kg/ dose can be given. Dilute to 20% to give IM and to 10% solution to give IV (give over 20 minutes).
- Aminophylline is reserved for case unresponsive for the above measures.
  - Dose: loading dose 5-6mg/kg, the maintenance dose of 3-5mg/kg/dose IV every 6 hours.

- Administration: diluted in D5W to be given over 1 hour.
- Discontinue or omit subsequent doses if the child develops vomiting, tachycardia >180beats per minute, or convulsion

Follow-up

- Review within 24 hours
- Monitor symptoms and peak flow
- Arrange self-management plan

Asthma, long-term management

General principles of management

- Follow a stepped approach
- Before initiating a new drug, check that diagnosis is correct, compliance and inhaler technique are correct and eliminate trigger factors for acute exacerbations
- Start at the step most appropriate to initial severity
- Rescue course
- Beclomethasone inhaler is preferred than systemic steroid in current guideline
- Mouth gargling after use to decrease risk of oral thrush Or Give a 3-5 days –rescue course‖ of prednisolone at any step and at any time as required to control acute exacerbations of asthma at a dose of prednisone: Child < 1 year: 1-2 mg/kg daily; 1-5 years: up to 20 mg daily; 5-15 years: Up to 40 mg daily; adult: 40-60 mg daily for up to 3-5 days.
- Stepping down
- Review treatment every 3-6 months
- If control is achieved, stepwise reduction may be possible
- If treatment started recently at Step 4 (or contained corticosteroid tablets, see below), reduction may take place after a short interval; in other patients 1-3 months or longer of stability may be needed before stepwise reduction can be done

Treatment

STEP 1: Intermittent asthma

- Intermittent symptoms (< once/week)
- Night time symptoms < twice/month
- Normal physical activity

Occasional relief bronchodilator

- Inhaled short-acting beta2 agonist e.g., salbutamol inhaler 2 puffs
- **Dosage form:** Metered Dose Inhaler or MDI 100mcg/puff
- Move to Step 2 if use of salbutamol needed more than twice a week or if there are night-time symptoms at least once a week

STEP 2: Mild persistent asthma

- Symptoms > once/week, but < once/day
- Night time symptoms > twice/month
- Symptoms may affect activity

Regular inhaled preventer therapy

- Salbutamol inhaler 1-2 puffs prn
- PLUS, regular standard-dose inhaled corticosteroid, e.g., beclomethasone: 40-80mcg every 12 hours)
- Assess after 1 month and adjust the dose prn
- Higher dose may be needed initially to gain control
- Doubling of the regular dose may be useful to cover exacerbations

STEP 3: Moderate persistent asthma

- Daily symptoms
- Symptoms affect activity
- Night time symptoms > once/week

Daily use of salbutamol

- Children below 5 years: refer to specialist
- Regular high-dose inhaled corticosteroids
- Salbutamol inhaler 1-2 puffs prn up to 2-3 hourly Usually 4-12 hourly
- PLUS, beclomethasone inhaler in child 5-12 years: 100-400 micrograms every 12 hours)

STEP 4: Severe persistent asthma

- Daily symptoms
- Frequent night time symptoms

Daily use of salbutamol

- Refer to specialist clinic especially children <12 years
- Salbutamol (as in Step 3) plus
- Regular high-dose beclomethasone (as in Step 3) Plus regular prednisolone 10-20 mg daily after
- Breakfast

Note

- If inhaler not available, consider salbutamol tablets/syrup
  - Child < 2 years: 100 micrograms/kg per dose
  - Child 2-5 years: 1-2 mg per dose

Caution

- Do not give medicines such as morphine, propranolol, or other B-blockers to patients

with asthma as they worsen respiratory problems

- Do not give sedatives to children with asthma, even if they are restless

Prevention

- Avoid precipitating factors e.g.
  - Known allergens such as dust, pollens, animal skins
  - Exposure to cold air
  - Exercise can precipitate asthma in children, advise them to keep an inhaler handy during sports and play
  - Effectively treat respiratory infections

Reference

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- Jain A, Bhat HV, Acharya D. Prevalence of bronchial asthma in rural Indian children: A cross sectional study from South India. The Indian Journal of Pediatrics. 2010 Jan 1;77(1):31-5.

Bronchiolitis

Brief description

- Acute inflammatory obstructive disease of small airways (bronchioles) common in children less than 2 years.

Causes

- Mainly viral (often respiratory syncytial virus, RSV)

Clinical features

- First 24-72 hours: rhinopharyngitis with dry cough
- Later tachypnoea, difficulty in breathing, wheezing (poorly responsive to bronchodilators)
- Cough (profuse, frothy, obstructive secretions)
- Mucoid nasal discharge
- Moderate or no fever
- Criteria for severity: child < 3 months, worsening of general condition, pallor, cyanosis, respiratory distress, anxiety, respiratory rate >60/minute, difficulty feeding, SpO2 < 92%

Differential diagnosis

- Asthma
- Pneumonia, whooping cough

- Foreign body inhalation

- Heart failure

Investigations

- Mainly Clinical diagnosis
- X-ray: Chest (to exclude pneumonia)

Treatment

Objectives

- Alleviate symptoms
- Avoid life-threatening complications

Non-pharmacologic

- Mild-moderate bronchiolitis (Wheezing, 50-60 breaths/minute, no cyanosis, able to drink/feed)
    - Treat the symptoms (possibly as an out-patient)
    - Nasal irrigation with normal saline
    - Small, frequent feeds
    - Increased fluids and nutrition

Severe bronchiolitis (Wheezing, fast breathing > 60 breaths/min, cyanosis)

- Admit and give supportive treatment as above
- Give humidified nasal-oxygen (1-2 liters/min)
- Give basic total fluid requirement of 150 ml/kg in 24 hours plus extra to cover increased losses due to illness

Pharmacologic

- Treat fever (paracetamol)
- Salbutamol inhaler 100 micrograms/puff: 2 puffs with spacer, every 30 minutes or nebulization salbutamol 2.5 mg in 4 ml normal saline.
- If symptoms improve, continue salbutamol every 6 hours
- If symptoms non-responsive, stop the salbutamol
- Nebulize Adrenaline 1:1000, 1 ml diluted in 2-4 ml normal saline every 2-4 hours
- Give as much oral fluids as the child will take: e.g. ORS. Use NGT or IV line if child cannot take orally
- Antibiotics for suspected superimposed infection

Reference

- Meissner HC. Viral bronchiolitis in children. New England Journal of Medicine. 2016 Jan 7;374(1):62-72.
- Spurling GK, Doust J, Del Mar CB, Eriksson L. Antibiotics for bronchiolitis in children. Cochrane Database of systematic reviews. 2011(6).

Croup (Acute Laryngo-Tracheo-Bronchitis)

Brief description

- Infectious croup is a syndrome caused by upper airway obstruction due to infection of the larynx and trachea.
- The term croup has been used to describe a variety of upper respiratory conditions in children, including laryngitis, laryngotracheitis, laryngotracheobronchitis, bacterial tracheitis, or spasmodic croup.
- Infants and young children develop more severe disease because of their narrow upper airway.

Clinical features

- Inspiratory stridor, hoarseness of voice, brassy (barking) cough, apnea
- Symptoms and signs of upper respiratory tract infection
- May have fever, but no sign of toxicity

Danger signs

- Severe stridor on inspiration and expiration
- None or markedly reduced air entry
- Change in sensorium (lethargic or unconscious)
- Duskiness or cyanosis

Table 16. 13. Modified Westley Clinical Scoring System for Croup

	0	1	2	3	4	5
Inspiratory Stridor	Not present	When agitated/active	At rest			
Intercostal recession		Mild	Moderate	Severe		
Air entry	Normal	Mild decreased	Severely decreased			
Cyanosis	None				With agitation/activity	At rest

Level of consciousness	Normal					Altered
Total possible Score = 0 – 17. *4= Mild Croup; 4 – 6= Moderate Croup; >6= Severe Croup*						

Investigations

- The diagnosis of croup is generally clinical and investigations are seldom required.
- Neck X-ray: Sub-glottic narrowing of the trachea (—pencil end‖) appearance.

- Chest X-ray: If complications or comorbid chest infections are suspected.

Treatment

Objectives

- Prevent respiratory failure
- Relieve symptoms

Non-pharmacologic

- Children with croup need minimal handling. This includes limiting examination, nursing with parents.
- Supplemental oxygen is not usually required. If needed, consider severe airways obstruction.
- Do not forcibly change a child's posture - they will adopt the posture that minimizes airways obstruction.
- Iv access should be deferred.
- Avoid distressing the child further.

Pharmacologic

Mild to Moderate Croup

- **Prednisolone** 1mg/kg, AND prescribe a second dose for the next evening. OR
- A single dose of **Oral Dexamethasone** 0.15mg/kg if available.
- Observe for half an hour post steroid administration.
- Discharge once stridor-free at rest.

Severe Croup

- **Dexamethasone**, 0.6mg/kg IM, single dose (for severe cases).

Additional

- **L-epinephrine (nebulized),** 0.5ml/kg of 1:1000 (1mg/ml) in 3ml NS (maximum dose is 2.5ml for age ≤4years old, 5ml for age >4years old).
- **Racemic epinephrine:** 0.05ml/kg diluted in 3ml total volume normal saline

- Hospitalize the child if more than one nebulization is required

Reference:

- Bjornson C, Russell KF, Vandermeer B, Durec T, Klassen TP, Johnson DW. Nebulized epinephrine for croup in children. Cochrane database of systematic reviews. 2011(2).
- Westley CR, Cotton EK, Brooks JG; Nebulized racemic epinephrine by IPPB for the treatment of croup: a double-blind study; Am J Dis Child. 1978 May; 132(5):484-7.

Epiglottitis

Acute Epiglottitis

Brief description

- Epiglottitis is an acute inflammation of the epiglottis.
- It is rare diseases of young children since routine childhood immunization with Hib vaccine was introduced.
- Airway obstruction is always severe, and intubation or tracheostomy is often needed.

Cause

- Bacterial infection, commonly Haemophiles influenzae type b

Clinical features

- Rapid onset of high fever
- Typical: ―tripod or sniffing‖ position, preferring to sit, leaning forward with an open mouth, appears anxious
  - Sore throat, difficulty swallowing, drooling, respiratory distress
  - Stridor and may be cough
  - Appears critically ill (weak, grunting, crying, drowsy, does smile, anxious gaze, pallor, cyanosis)
  - Asphyxia leading to quick death

Differential diagnosis

- Laryngeal cause of stridor e.g., laryngotracheobronchitis

Treatment

Objectives

- Alleviate symptoms
- Avoid life-threatening complications

Non-pharmacologic

- Admit and treat as an emergency – intubation or tracheostomy may often be needed
- Insert IV line and provide IV hydration

Pharmacologic

- Ceftriaxone 50 mg/kg once daily for 7-10 days

Prevention

- Hib vaccine is part of the pentavalent DPT/HepB/Hib vaccine used in routine immunization of children

Reference

- Adair JC, RING WH. Management of epiglottitis in children. Anesthesia & Analgesia. 1975 Sep 1;54(5):622-5.
- World Health Organization, World Health Organization. Department of Child, Adolescent Health, UNICEF.

PROTOCOL UTILIZATION MONITORING TOOL

Objective:
To monitor adherence to the Standard Treatment Guidelines (STG) within the Peddiatric OPD, ensuring appropriate use and timely review of clinical protocols.

1. Protocol Awareness			
Are healthcare providers familiar with the protocol?			
Was a briefing on the top 10 diseases conducted?			
2. Protocol Utilization			
Are diagnoses in alignment with protocol guidelines?			
Are treatments initiated based on protocol recommendations?			
3. Documentation			
Are treatment plans documented as per protocol?			
Are follow-up plans in line with protocol timelines?			
4. Outcomes and Feedback			
Has there been an improvement in patient outcomes?			
Are there any challenges in implementing the protocol?			
5. Protocol Compliance			
Are deviations from the protocol documented with justification?			
Are treatment adjustments aligned with updates in patient condition?			
6. Education and Training			
Are new staff members oriented to the protocol?			
Are continuous training sessions provided to reinforce protocol application?			

7. Resource Availability			
Are all necessary medications available as per the protocol?			
Are equipment and diagnostic tools required by the protocol readily accessible?			
8. Quality Improvement Measures			
Are challenges in protocol implementation reviewed regularly?			
Is there a system in place to update the protocol based on hospital or national guideline changes?			
9. Patient Education and Adherence			
Are patients informed about their condition and treatment according to the protocol?			
Is patient adherence to treatment and follow-up monitored and supported?			
10. Review and Reporting			
Are monitoring reports submitted to department heads or quality committees?			
Are audit results and findings discussed in department meetings for continuous improvement?			

Implementation and Review Process

To ensure the effective application of this protocol, a structured implementation plan will be followed:

1. Training and Orientation: All clinical staff within the pediatric Department will be oriented on the new protocol, with regular refresher training provided to keep them updated on any changes or enhancements.

2. Resource Allocation: Regular assessments of resource availability (e.g., medications, diagnostic tools) will be conducted to ensure that all items required by the protocol are accessible. Any gaps identified will be reported to the procurement department to facilitate timely acquisition.

3. Quarterly Monitoring and Feedback Sessions: Utilization of the monitoring tool will be reviewed quarterly. Findings will be shared with relevant teams, and challenges or deviations will be addressed in feedback sessions. This continuous loop

will support a culture of accountability and improvement.

4. Quality Improvement Reporting: Results from the monitoring tool will be documented and submitted to the hospital's quality committee. Trends in compliance, identified issues, and success stories will be highlighted in these reports to guide decision-making at the hospital level.

This systematic approach will ensure adherence to the STG protocols and will enable Deder General Hospital to maintain high standards in patient care, fostering both consistency and quality in the management of the most prevalent health conditions in the pediatrics Department.

DEDER GENERAL HOSPITAL

PEDIADTRICS OUTPATIENT DEPARTMENT (PEDI OPD)

Standard Treatment Guidelines (STG) Protocol

"Adapted from National STG 2021 4th Edition"