

Africa Institute for Project Management Studies



Assignment 4

PGD004 - Post Graduate Diploma in Human Nutrition

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1. Define critical period of growth and development, give an example of why this is important to the development of the fetus.

Critical periods/sensitive periods is a time period in development in which a child is especially vulnerable to environmental stimuli.

In pregnancy, each part of the baby's body forms at a specific time. During these times, the body can be very sensitive to damage caused by medications, alcohol or other harmful exposures. We call this specific time the "critical period of development" for that body part.

The **embryonic period** of development spans from week 3 through week 8 of pregnancy. The embryonic period is termed the **critical period of development**, because during this time *all* of the baby's organs begin to develop and function at a basic level. The developing baby undergoes very, very rapid cell differentiation during this time.

These weeks are the **CRITICAL** weeks, where the greatest amount of damage is likely to occur. However, it's really important to point out that the remaining weeks of the pregnancy are considered to be the **sensitive periods** of development. For example, the critical period of development for the heart is weeks 3-6, but the heart is still sensitive to teratogens throughout pregnancy.

Other example of the critical period for the development of a human child's binocular vision is thought to be between three and eight months, with sensitivity to damage extending up to at least three years of age. Further critical periods have been identified for the development of hearing and the vestibular system.

After 12 weeks of development the embryo acquires a "human appearance" and from that moment already called a fetus

Fetal development period lasts from 12th week until birth

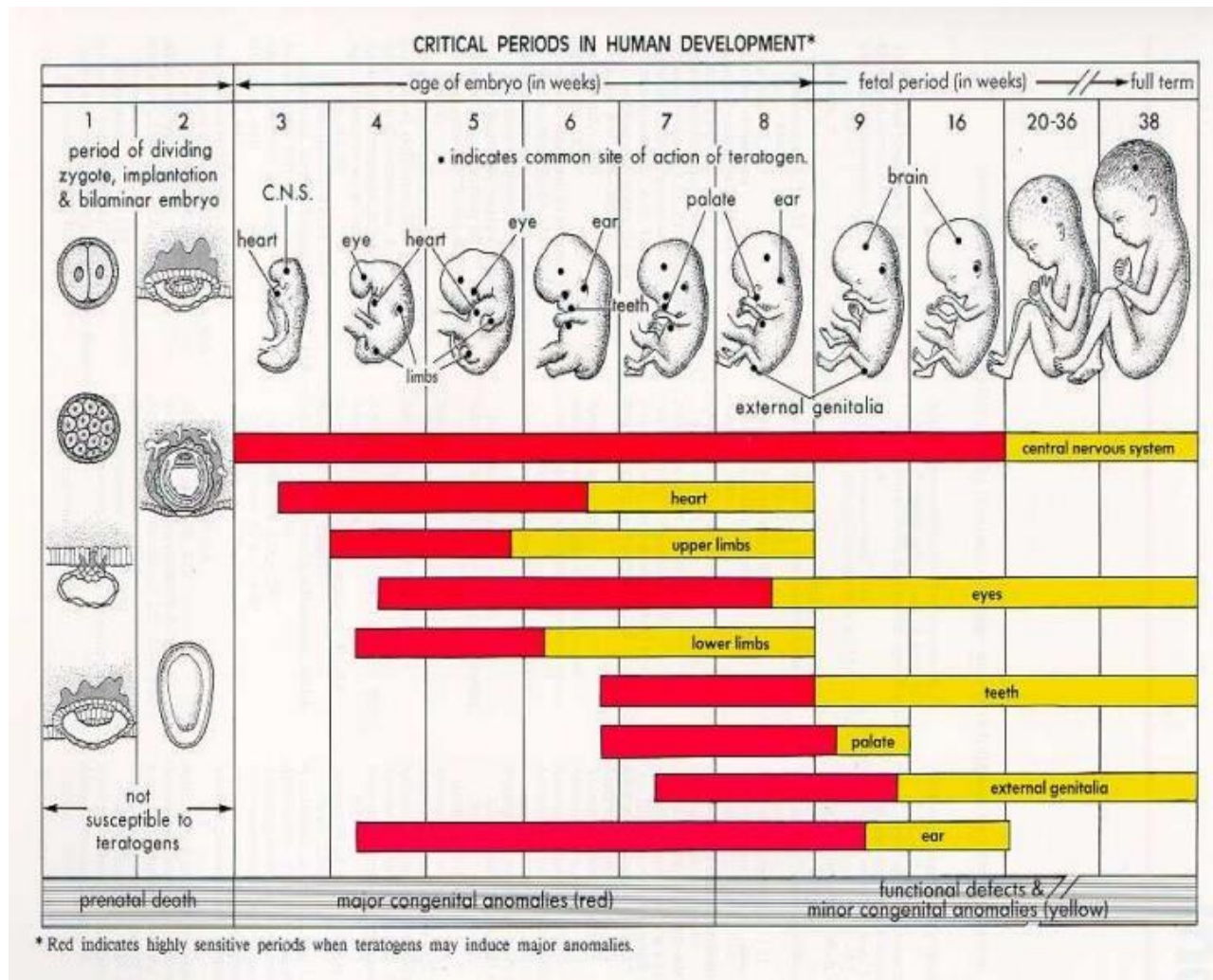
The third critical period is childbirth. This event in the life birthing child is fraught with injuries, especially of the brain that can lead to cerebral palsy. This disease usually manifests itself in early childhood and is characterized by movement disorders.

Major morphologic abnormalities occur during weeks 3 to 7. However, physiologic defects and minor morphologic abnormalities do occur from week 8 to term

1. Weeks 1 and 2: period of dividing zygote, implantation, and bilaminar embryo

1. THE EMBRYO IS NOT NORMALLY SUSCEPTIBLE to teratogens during this period
1. A substance will damage either all or most of the cells at this time, resulting in prenatal death, or the embryo will survive with few defects, if any
2. Week 3
 1. THIS IS A HIGHLY SENSITIVE PERIOD for the developing heart and central nervous system
1. Highly sensitive for the heart from the middle of week 3 to week 6
2. Highly sensitive period for the central nervous system from the beginning of week 3 through early in week 6
3. Week 4
 1. DURING THIS PERIOD, the eyes, ears, arms, and legs begin to develop
1. Sensitive period for the eyes is the middle of week 4 to the middle of week 8
2. Sensitive period for the ears is the middle of week 4 to the middle of week 9
3. Sensitive period for the arms is the middle of week 4 to the end of week 7
4. Sensitive period for the legs is the middle of week 4 to the end of week 7
4. Week 6
 1. THE TEETH are most sensitive between the end of week 6 until the end of week 8
 2. THE PALATE is most sensitive between the end of week 6 until early in week 9
5. Week 7
 1. THE EXTERNAL GENITALIA are most sensitive from the middle of week 7 until the end of week 9
6. Periods of lesser sensitivity to teratogens
 1. THE CENTRAL NERVOUS SYSTEM: from early in week 6 to term
 2. THE HEART: from late in week 6 to the end of week 8
 3. THE ARMS: during week 8
 4. THE EYES: middle of week 8 to term
 5. THE LEGS: during week 8
 6. THE TEETH: during weeks 9 and 10
 7. THE PALATE: during week 9
 8. THE EXTERNAL GENITALIA: late in week 9 to term

9. THE EAR: middle of week 9 to the end of week 16



2. What is meant by growth and development and what are the factors affecting normal growth and development of infants and toddlers?

Growth is an increase in the size of the body as a whole or the size attained by specific parts of the body. It is a fundamental characteristic of all living organisms. Growth is a form of motion.

The term development is frequently used along with growth and even considered synonymous by some

Growth refers to physical characteristics such as height, weight, size, etc., while developments refers to qualitative changes to growth in a series of orderly and meaningful changes which lead to maturity. Growth and development contribute to each other and are inseparable and occur simultaneously. For example, most babies by the time they grow to be 8 months old, can sit up and this is a milestone they reach as part of their development.

According to Watson and Lowery “growth means an increase in the physical size of the whole or any of its parts.” It can be measured in terms of centimeters and kilograms or metabolic balance I. e. retention of hydrogen and calcium in the body. Juan Comas defines it “as the objective manifestation of hypertrophy and hyperplasia of the organism constituent tissues and is determined by post-natal body size.” This increase in body size is, as is especially evident in the muscular hypertrophy that occurs with regular resistance exercise.

Development refers to the increase of functional capacity in perfect form resulting from production of specialized tissues from unspecialized ones. The term development has been variously defined by scientists. Comas (1960) regards development as a quality peculiar to living matter that carries it through the process of progressive evolution to a state of perfect function. Hurlock (1941) considers development as changes in its progressive series which are orderly and coherent and which lead to maturity. It is, in fact, the consequence of cellular differentiation that the character and its specificity results into perfect function

Watson and Lowery (1960) have tried to distinguish between the two processes. They say that growth may mean increase in physical size of the whole or any of its part which may be measured. On the other hand, development indicates an increase in skill and complexity of function. In any case the processes of development and growth are not the same but are interrelated and interdependent.

The factors affecting the normal growth and development of a toddler are;

Toddlers makes great strides in development during their early years, and many factors contribute to normal growth and reaching milestones. Luckily, most growth and development occurs without much effort and shouldn't cause concern.

However, if the toddler is struggling to stay on the growth curve or isn't reaching his developmental markers on time, doctor can be consulted. The cause could be an underlying problem that needs attention.

How children grow and develop depend on both internal and external environmental factors, some, we have no control over and most of them we do as follows;

1. Nutrition

Toddlers are notoriously picky eaters, and many generations of mothers have woken up in a cold sweat worried that their child isn't eating enough to achieve good nutrition. Adequate vitamin and mineral intake contributes to the toddler's overall good health, but foods that contain a good dose of nutrients also contain calories, which are important for growth and development. Toddler might

opt for the rice cake, but make sure the toddler is getting a well-rounded mix of foods from each food group.

Nutrition is a critical factor in growth as everything the body needs to build and repair itself comes from the food we eat. **Nutrition plays a crucial role in your baby's development**

At the crux of it, nutrition is still incredibly important for parents to focus on when having their child's development in mind.

Physical and biological development are influenced by nutrition, which can positively (or negatively) impact an infant's or child's ability to learn. Good nutrition is always stressed by nutritionists, experts, doctors and other parents. These are some nutrients and how they can aid your child's mental and physical development.

Nutrient	Role in supporting mental development
DHA	Supports visual and cognitive development
Choline	Supports memory development
Lutein	Supports visual development and may support brain development. It also contains an antioxidant that filters harmful blue light
Phospholipids (including sphingomyelin)	Fundamental component of cell membranes, especially in nerve cells; sphingomyelin is a building block of myelin, a fatty membrane formation around neuronal axons that supports the efficient transportation of information throughout the brain
Iron	Supports mental (cognitive) and motor development
Vitamin B12	Key to supporting growth and maintenance of nerve tissue
Folate	Supports neurologic development
Vitamin A	Essential for low-light and color vision

Nutrient	Role in supporting physical growth and development
Proteins	<ul style="list-style-type: none">• High quality protein alpha-lactalbumin supports growth and developmental processes as well as digestive health• May facilitate the absorption of essential minerals and provides essential amino acids to support growth and development
Carbohydrates	An essential source of energy for growing infants and children

Fats	Main source of energy for infants; necessary for absorption of fat-soluble vitamins; essential for normal growth and maturation of many organ systems
Oligo fructose	Supports digestive health as a source of prebiotic fiber
Calcium	Essential for bone mineralization and growth
Iodine	Necessary for the production of hormones that play a role in growth and development; especially important for brain development
Nucleotides	Important for normal development, maturation, and repair of the digestive system and other rapidly growing tissues
Selenium	Plays a role in both the immune and endocrine systems. It is also an antioxidant.
Vitamin E	Antioxidant that helps support immune system function
Vitamin C	Important for immune system function and helps with iron absorption
Zinc	Critical for normal physical growth, neurologic development, and immune system function

2. Stimulation

Toddlers need to play; it's vital to their learning and development. Playing can be very educational, even if the toddler doesn't realize it. But having just one or two toys probably isn't going cut it. Yes, this gives the license to hit the toy store, but keep in mind that children will play with anything. The more variety the toddler has, the more active his brain can be during playtime. So it is good to have fancy toys at the store, if possible, but don't underestimate the learning potential of an empty box or old pots and pans. Children who lack early stimulation may struggle at some point down the road with complex problem solving, according to The Permanente Medical Group.

3. Sleep

Nap time is a magical time for mothers. Let chores be done, reading a magazine even if it is last month's -- or take nap. Sleeping both during naps and at night, is vital to a toddler's growth and development. When he sleeps, his brain gets a chance to rest and process all the knowledge that has been crammed in there during the day. According to The National Sleep Foundation, toddlers generally need 12 to 14 hours of sleep in every 24-hour period. If he only sleeps 10 hours at night, his nap should be at least two hours. Toddlers are masters of resisting sleep, but stick to adequate sleep contributes to proper height and weight development, according to Gerber.

4. Love and Attention

Showing the toddler love and attention assures him that he's safe, which provides an environment conducive to reaching his full potential. Play with the child, but allow him time to play alone, too.

Create a routine so he knows that he will be eating and sleeping at approximately the same time each day. This consistency comforts him and lets him focus on his own play and learning. Knowing he can trust the parents is also vital for the toddler's development. The World Health Organization says that parental love and attention are the most important aspect of a toddler's development.

Parents who want to focus on giving their children the best learning environment possible should surround their kids with:

- Language (hearing, talking, singing, and being read to)
- Play areas and toys
- A healthy family socioeconomic status
- Positive child-care and parenting behavior

Families have the most profound impact in nurturing a child and determine the ways in which they develop psychologically and socially. Whether they are raised by their parents, grandparents or foster care, they need basic love, care and courtesy to develop as healthily functional individuals. The most positive growth is seen when families invest time, energy and love in the development of the child such as reading to them, playing with them and having deep meaningful conversations. Families that abuse or neglect children would detract them from a positive development.

5. Heredity

Heredity is the transmission of physical characters from parents to children through their genes. It influences all aspects of physical appearance such as height, weight, body structure, and the color of the eye, the texture of the hair and even intelligence and aptitudes.

6. Environment

Environment plays a critical role in the development of children and it represents the sum total of physical and psychological stimulations the child receives. Some of the environmental factors influencing early childhood development involve the physical surroundings, geographical conditions, social environment and relationships with family and peers.

7. Sex

The sex of the child is another major determinant among the factors affecting physical growth and development of a child. Boys and girls grow in different ways, especially nearing puberty. Boys tend to be taller and physically stronger than girls, however, girls have faster growth during adolescence and excel boys who mature over a longer period of time. The physical structure of their bodies also has differences which make boys more athletic and suited for physical rigors. Their temperaments also vary making them show interest in different things.

8. Exercise and Health

The word exercise here does not mean physical exercise as a discipline or the child deliberately engaging in physical activities knowing it would help them grow. Exercise here refers to the normal play time and sports activities which help the body to increase muscular strength and put on bone mass. Good exercise help children grow well and reach milestones on time or sooner. Exercise also keeps them healthy and fights off diseases by strengthening the immune system. Outdoor play exposes them to microbes that help them build resistance and prevent allergies.

9. Hormones

Hormones belong to the endocrine system and influence the various functions of our bodies. They are produced by different glands that are situated in specific parts of the body to secrete hormones that control body functions. Their timely functioning is critical for normal physical growth and development in children. Imbalances in the functioning of hormone-secreting glands can result in growth defects, obesity, behavioral problems and other diseases. It is just as important during puberty when the gonads produce sex hormones which control the development of the sex organs and the appearance of secondary sexual characteristics in boys and girls.

10. Geographical Influences

Where one lives also has a great influence on how the children turn out to be. The schools they attend, neighborhood, opportunities offered by the community and their peer circles are some of the social factors affecting child development. Living in an enriching community that has parks, libraries and community centers for group activities and sports all play a role in how much the child is involved with the community. Uninteresting communities can push some children to not go outside often but play video games at home instead. What part of the world you live in has cultural factors that shape the child's thoughts, attitudes, and behaviors. Even the weather of a place influences children in the form of bodily rhythms, allergies and other health conditions.

11. Socio-Economic Status

The socio-economic status of a family determines the quality of the opportunity a child gets. Studying in better schools that are more expensive definitely has benefits in the long run. Well-off families can also offer richer learning resources for their children and afford special aid when they need. Children from poorer families may not have access to educational resources and good nutrition to reach their full potential. They may also have over working parents who cannot invest enough quality time in their development.

12. Learning and Reinforcement

Learning involves much more than schooling, it is building the child up mentally, intellectually, emotionally and socially so they operate as healthy functional individuals in the society. This is where the development of the mind takes place and the child can be mature. Reinforcement is a component of learning where an activity or exercise is repeated and refined to solidify the lessons learned. An example is playing a musical instrument; they get better at playing it as they practice playing the instrument. Therefore, any lesson that is taught has to be repeated until the right results are obtained.

13. Pollution

According to studies, air pollution not only affects the respiratory organs but also have harmful effects on human growth. Indoor pollution or the pollution from housing conditions can result in ill health which can negatively impact human growth and development. For example, lead exposure from deteriorated lead-based paint in older housing can be very harmful. Lead is very harmful for children as it simply gets immersed into the growing bodies of children and obstructs with the normal development of brain and other organs and systems.

14. Race

Racial factors also influence height, weight, color, features, and body constitution of a human being. The body growth and development differences show a relationship with varied cultural groups. For example a child of black race will be black, their height, their hair and eye color, facial structure are all governed by the same race.

3. A. What are the three classifications of under nutrition in preschool children and how is this determined?

A child with malnutrition can be classified as;

1. **Severe complicated malnutrition:** A child with visible severe wasting or edema of both feet or in the case of a child aged 6 to 59 months, MUAC<110 mm, AND poor appetite or pneumonia or persistent diarrhoea or dysentery – classify as having severe complicated malnutrition.
2. **Severe uncomplicated malnutrition:** A child with visible severe wasting or edema of both feet or in the case of a child aged 6 to 59 months, MUAC<110 mm, but some appetite and no pneumonia, no persistent diarrhoea or no dysentery – classify as having severe uncomplicated malnutrition.

3. **Moderate malnutrition:** A child with none of the above but weight for age is less than minus 2SD of the mean – classify as moderate malnutrition or low weight for age.

Measuring malnutrition

- a. All children between six months and five years of age should be screened for malnutrition at the clinic for under-fives.
- b. Weight for height measurements are the best indicators of acute malnutrition in emergency situations.
- c. Height for age is an indicator of chronic malnutrition.
- d. Weight for age is an indicator of both long-term malnutrition and current malnutrition.
- e. MUAC (mid upper arm circumference) is used for quick screening and rapid nutritional assessments.
- f. Edema – only bilateral swelling of feet and legs indicates nutritional edema.

NUTRITIONAL GRADING / CLASSIFICATIONS Preschool Children:

- i. **GOMEZ CLASSIFICATION WEIGHT FOR AGE** (% of NCHS Standards) NUTRITIONAL GRADE ≥ 90 Normal 75 – 89.9 Grade I (Mild Undernutrition) 60 – 74.9 Grade II (Moderate Undernutrition) < 60 Grade III (Severe Undernutrition)

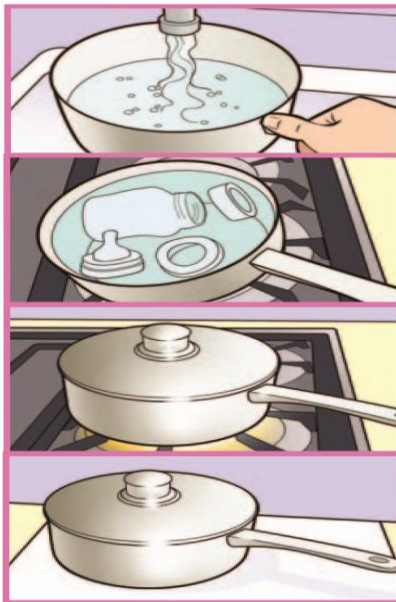
GOMEZ CLASSIFICATION Gomez ET. al. (J Trop Ped 1956) Based on Prognosis of children admitted to Hospitals in Mexico - Significantly higher incidence of mortality among children with $< 60\%$ of standard wt for age - Significantly higher morbidity among children with 60-75% of standard weight for age

- ii. **IAP CLASSIFICATION (Indian Academy of Pediatrics) WEIGHT FOR AGE** (% of Harvard Standard) NUTRITIONAL GRADE ≥ 80 Normal 70 – 89.9 Grade I (Mild Undernutrition) 60 – 69.9 Grade II (Moderate Undernutrition) 50 – 59.9 Grade III (Severe Undernutrition) < 50 Grade IV (Severe Undernutrition)
- iii. **STANDARD NORMAL DISTRIBUTION** -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 34% 14% 2% SD Score ($\pm 2SD = 96\%$) Normal “Measuring Changes in Nutritional Status” (WHO, Geneva 1983).
- iv. **STANDARD DEVIATION (SD) CLASSIFICATION CUT-OFF LEVEL NUTRITIONAL GRADE WEIGHT FOR AGE HEIGHT FOR AGE WEIGHT FOR HEIGHT** \geq Median – 2 SD Normal Median – 3 SD to Median – 2 SD Moderate Underweight Moderate Stunting Moderate Wasting $<$ Median – 3 SD Severe Underweight Severe Stunting Severe Wasting

- v. **Nutritional gradation based on BMI (adult) Body Mass Index (BMI)** = Weight in kg/ height in meter square
 Nutritional gradation based on BMI (adult) Classification Cut-off points (BMI = kg/m²)
 CED grade III (Severe thinness) <16.00
 CED grade II (Moderate thinness) 16.00-16.99
 CED grade I (Mild thinness) 17.00-18.49
 Normal 18.50-24.99
 Overweight 25.00-29.99
 Obese ≥

Sterilizing

Cleaned equipment can be sterilized using a commercial sterilizer (follow manufacturer's instructions), or a pan and boiling water:



Step 1

Fill a large pan with water.

Step 2

Place the cleaned feeding and preparation equipment into the water. Make sure that the equipment is completely covered with water and that no air bubbles are trapped.

Step 3

Cover the pan with a lid and bring to a rolling boil, making sure the pan does not boil dry.

Step 4

Keep the pan covered until the feeding equipment is needed.

30.00

b. What precautions should one take when preparing infant formula?

Cleaning, sterilizing & storage

How to prepare a bottle feed



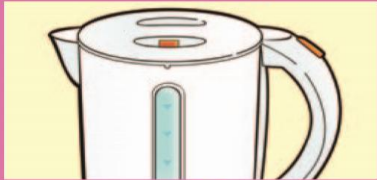
Step 1

Clean and disinfect a surface on which to prepare the feed.



Step 2

Wash your hands with soap and water, and dry with a clean or disposable cloth.



Step 3

Boil some safe water. If using an automatic kettle, wait until the kettle switches off. If using a pan to boil water, make sure the water comes to a rolling boil.



Step 4

Read the instructions on the formula's packaging to find out how much water and how much powder you need. Adding more or less formula than instructed could make infants ill.









Step 5

Taking care to avoid scalds, pour the correct amount of boiled water into a cleaned and sterilized feeding bottle. The water should be no cooler than 70°C, so do not leave it for more than 30 minutes after boiling.



Step 6

Add the exact amount of formula to the water in the bottle.

	<p>Step 7</p> <p>Mix thoroughly by gently shaking or swirling the bottle.</p>
	<p>Step 8</p> <p>Immediately cool to feeding temperature by holding the bottle under cold running tap water, or by placing in a container of cold or iced water. So that you do not contaminate the feed, make sure that the level of the cooling water is below the lid of the bottle.</p>
	<p>Step 9</p> <p>Dry the outside of the bottle with a clean or disposable cloth.</p>
	<p>Step 10</p> <p>Check the temperature of the feed by dripping a little onto the inside of your wrist. It should feel lukewarm, not hot. If it still feels hot, cool some more before feeding.</p>
	<p>Step 11</p> <p>Feed infant.</p>
	<p>Step 12</p> <p>Throw away any feed that has not been consumed within two hours.</p>

Warning: Never use a microwave to prepare or warm-up feeds. Microwaves heat unevenly and may cause 'hot spots' that could scald the infant's mouth.



The Following are the steps to ensure proper nutrition and to avoid food-related illness.

1. Check the expiration date

Look for an expiration or "use by" date on the formula container. If the expiration date has passed, you can't be sure of the formula's quality. Don't buy or use outdated infant formula.

2. Wash your hands

Before preparing formula, wash your hands thoroughly with soap and water. Dry your hands well.

3. Prepare your bottle

Sterilize bottles, nipples, caps and rings before using them for the first time. You can boil the bottle and accessories in water for five minutes, use a microwave steam sterilizer bag or use a stand-alone electric steam sterilizer.

After the first use, there's no need to sterilize your bottle and accessories. Wash these items with soap and water and allow them to air-dry. Bottle and nipple brushes can help you clean nooks and crannies. You can also use a dishwasher.

4. Add water to liquid-concentrate or powdered formula

If you're using liquid-concentrate or powdered formula, you'll need to add water. Follow the manufacturer's instructions for how much water to use.

5. Measure the formula

For ready-to-use formula:

- Shake the formula well.
- Pour enough formula for one feeding into a clean bottle.
- Use only formula — don't add water or any other liquid.
- Attach the nipple and cap.

For liquid-concentrate formula:

- Shake the concentrated liquid before mixing it with water.
- Pour the amount of formula for one serving into the bottle, which already contains the appropriate amount of water.
- Attach the nipple and cap and shake well.

For powdered formula:

- Determine the amount of formula you want to prepare, following instructions on the package.
- Use a measuring cup to measure the amount of water needed and add the water to the bottle.
- Use the scoop that came with the formula container. Fill the scoop with powdered formula. Add the number of scoops needed.
- Pour the scoop or scoops into the bottle.
- Attach the nipple and cap and shake well.

6. Warm the formula, if needed

It's fine to give your baby room temperature or even cold formula. If your baby prefers warm formula place a filled bottle in a bowl of warm water and let it stand for a few minutes — or warm the bottle under running water. The formula should feel lukewarm — not hot.

Don't warm bottles in the microwave. The formula might heat unevenly, creating hot spots that could burn your baby's mouth.

Discard remaining formula at the end of each feeding if it has been more than an hour from the start of a feeding. Resist the urge to refrigerate a bottle once you have fed your baby from it, since bacteria from your baby's mouth can still multiply in the refrigerator.

7. Store formula safely

If you're using ready-to-use formula, cover and refrigerate any unused formula from a freshly opened container. Discard any leftover formula that's been in the refrigerator more than 48 hours.

If you prepare and fill several bottles of liquid-concentrate or powdered formula at once:

- Label each bottle with the date that the formula was prepared.
- Refrigerate the extra bottles until you need them.
- Discard any prepared formula that's been in the refrigerator more than 24 hours.

4. What are the key causes/determinants of malnutrition in children?

Causes of Malnutrition

The causes of malnutrition are multispectral related primarily to Food, health and caring practices. It has been divided into basic, underlying and immediate causes.

- a. These three causes are interrelated to each other for the development of undernutrition in children under five years of age, globally.
- b. A poor dietary intake and disease (immediate causes), poor household food security, caring practices, health system and environmental sanitation (underlying causes),
- c. economic factors political factors and availability of resource (basic causes) are responsible for the malnutrition in children under five years of age globally

The following are the key Causes of malnutrition in children

- a. Diseases such as malaria, TB, diarrhoea, pneumonia, measles
- b. Poor breast-feeding habits

- c. Failure to introduce solid foods at six months of age (weaning period)
- d. Eating food that is unsuitable for a child
- e. Lack of food owing to famine, war or economic reasons
- f. Poor health and nutritional status of the mother

5. What are some of the risks associated with introducing complementary foods too early?

There are good reasons why we say wait until the 6-month age to begin giving your baby solid food:

- Solid foods aren't as nutritious as breast milk or formula. Solid food can be lower in good nutrition and higher in calories, which can cause obesity.
- Solid foods are harder to swallow. A baby may not be developed enough to swallow solid food properly before the age of 6 months.
- Solid food may increase the risk of health problems. Solid food given too early may cause allergies and eczema, and researchers say there may be a link to chronic diseases like diabetes and celiac disease.

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