HCP CONNECTIONS | Nurses' Edition
For Indian healthcare professionals
An education initiative by Danone Nutricia India

Infant GROWTH & DEVELOPMENT

For Healthcare Professionals Only.

DANONE NUTRICIA

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DEAR READER

As science continuously evolves it is important that the health care professional keeps updated on the latest advancements in the field. Through continuous medical education programs one can

maintain, develop, or increase the knowledge, skills, and professional performance.

We are glad to bring to you educational programs which are designed keeping in mind your educational needs.

In this module you will learn on **Infant Growth and development.**
How do you measure growth on various parameters, what are growth charts and what do these charts tell us about the nutritional status of the infant. You will also learn about growth and development of various organ systems during infancy and the significance of breastfeeding for infants.

Please note that content in this module is for general information and educational purpose only. Thank you for participating in this programme . We hope you will enjoy learning with us.

NUTRICIA RESEARCH | DANONE NUTRICIA RESEARCH

Science is at the heart of our nutrition and health commitment

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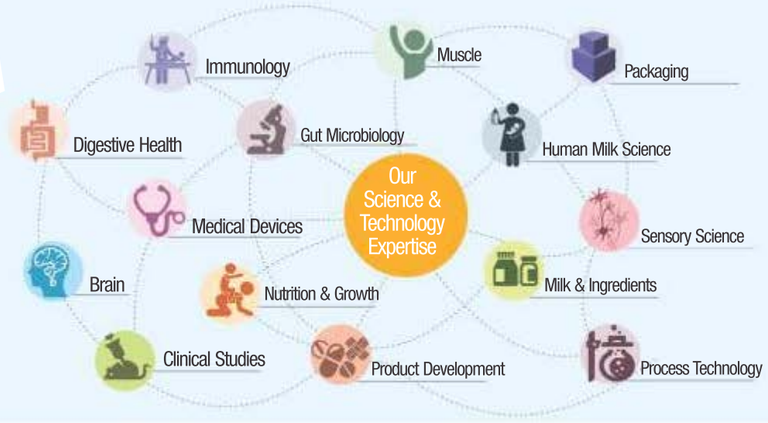
We focus our skills and resources on research and innovation to deliver evidence based specialized nutrition to infants, young children, patients and the elderly.

Our Expertise

Through our multi-disciplinary approach, we bring science, technology and consumer experience to develop the best products.



Our Presence:

The main centre for Nutricia Research is located at Utrecht Science Park, the Netherlands. In addition we have R&D satellites all over the world.

www.nutriciaresearch.com

CONTENT

General characteristics of Infancy:

- Infant's body does not function as if it were a miniature adult, hence it requires special care.
- Infancy is the shortest of all developmental periods but the rate of growth during this period is much more rapid than any other time during childhood.
- Infant's organs are structurally and functionally very immature, which calls for special nutritional requirements and care. Hence small and frequent nutritionally dense feeds are required due to small stomach size of the infant.

What do we mean by Infancy?

Infancy is defined as a period from birth to 12 months of age. Infants can be classified as young infants and older infants

- Young infant is an infant of **0-6** month of age
- Older infant is an infant of **6-12** month of age

A neonate is a baby whose age is 4 weeks or less. A neonate is also called a newborn.

Difference between Growth and Development:

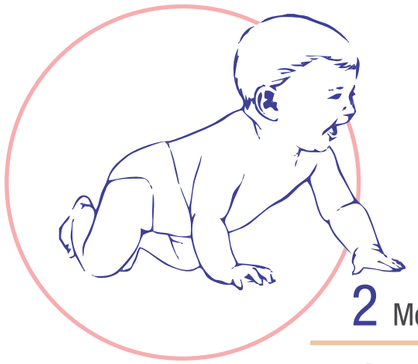
The term **'growth'** and **'development'** during infancy are mostly used together though they have different meanings and these words cannot be exchanged for each other.

Growth is an important feature which distinguishes a child from an adult. It starts from the conception and continues till the child grows into an adult. Growth refers to the multiplication of cells (Hyperplasia) and net increase in size of the tissue (Hypertrophy). Hence we can refer to growth as an increase in physical size. It is characterized by height and weight gain.

Development is related to maturation of functions and acquisition of various skills for optimal functioning of an individual.

For example: turning over, sitting, pointing to objects, etc.

Growth and development are closely related to each other and go hand-in-hand; For example, Muscle and skeletal growth is required to learn the skill of sitting. Hence, factors which affect growth, affect development as well.



What are Developmental Milestones?

Developmental milestones are a set of functional skills or age specific tasks that most children can do at a certain age range.

For example, A baby at

- 2 Months — Makes smoother movements with arms and legs
- At 4 Months — Can hold a toy and shake it
- At 6 Months — begins to sit without support
- At 9 Months — can stand with the help of support
- At 12 Months — can walk with support

GROWTH MEASUREMENT

It is important to measure the growth of the infant to understand, Whether the infant is growing at a normal rate and Whether they are getting adequate nutrition or not. It is measured on various parameters *like: weight, length and head circumference*

WEIGHT

We measure weight, because it is a good indicator of nutritional status of the baby. An infant beam balance or a digital scale is used for weighing infants. An infection can lead to drop in weight while adequate nutrition leads to weight gain

The average birth weight of an infant is about **3 kg.** During first few days after birth, infant loses extracellular fluid about **10%** of the body weight. Most infants regain their birth weight by the age of **10 days**. An infant usually doubles his birth weight by the age of **6 months** and triples by the age of **1 year**

LENGHT

Since infant cannot stand, we record his length instead of height. Length board or infantometers or measuring tapes are used to record the length. Measuring length of the infant helps to identify growth abnormalities such as short stature or stunting.

HEAD CIRCUMFERENCE

Head growth is rapid during the first part of infancy. It reflects the brain growth during this period. The head circumference is measured by encircling the head with an unstretchable measuring tape, or a piece of string in the absence of a tape measure

GROWTH MONITORING AND STANDARDS

Growth monitoring is the process of maintaining regular close observations of a child's growth. Based on the need of the situation, growth is monitored by measuring growth parameter daily, weekly, monthly, bimonthly. These observations of the infant are plotted on the growth charts.

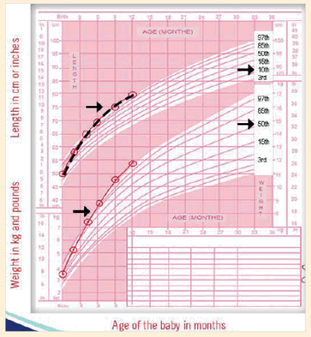
Typically WHO growth charts are used. These Growth standards represent the norms of the growth. Growth standards are specifications for babies' growth for various parameters like weight, length and head circumference. There are different charts for boys and girls.

These charts were developed using data collected in the WHO Multicenter Growth Reference Study. They collected information from approximately 8500 children from selected countries. This information was used to develop the growth charts.

The horizontal line or X axis shows age of the baby in months, and the vertical line or y axis shows the weight in kg and pounds and length in cm or inches. The red curves on the white area of the chart are percentile lines

If a baby is on the curve for 50th percentile for weight on the growth chart, it means that half of the healthy babies of the same age are heavier and half are lighter; if a baby is on the curve for 10th percentile for height, then 90% of babies of the same age are taller and 10% are shorter. Healthy babies, just like adults, can come in all shapes and sizes i.e. a baby is on the 10th percentile curve can be just as healthy and normal as a baby on the 97th percentile curve. It is important to observe the consistency in the growth pattern.

For example, the dotted line on the chart shows normal growth pattern of the baby.



Hence growth charts can be referred to as a visual display of the child's growth over a period of time

Static Growth Curve

Good Growth Curve

Downward Growth Curve

GROWTH CURVE

By looking at the direction of the child's growth curve, one can understand whether the child is gaining weight appropriately or not. The direction of the growth curve indicates how the child is growing

An upward growth curve indicates **good growth** and **adequate nourishment.**

A horizontal or flat or static growth curve means that the child is not growing. It indicates that infant is not getting adequate nutrition or is suffering from infectious diseases. If left untreated, it can result in to downward growth curve where baby starts losing weight.

Hence, we need to monitor infant growth since it helps

01 In early detection of abnormal growth and development, &

02 In providing an opportunity for giving health education & advice to mothers for the prevention of malnutrition.

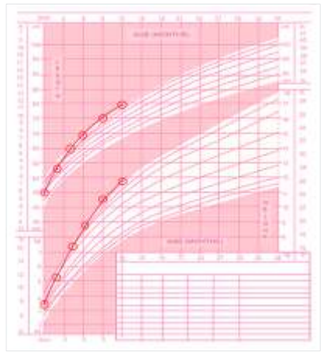
GROWTH PATTERNS

Now that we have seen how growth is monitored, we can see various patterns of growth.

NORMAL GROWTH

Normal growth can be defined as an average of reading obtained in a group of healthy individuals

Normal growth is present when sequential growth measurements consistently lie within the **5th** to **95th** percentiles on the growth chart. Generally it is observed that most of the children maintain their growth within the permissible range on growth chart



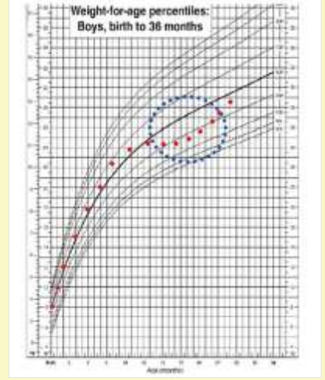
CATCH UP GROWTH

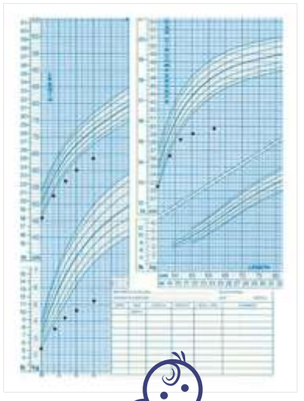
Catch up growth is defined as an acceleration of the growth rate following a period of growth restriction. Growth restriction can occur due to birth defects, acute malnutrition, pre or post natal infection or illness.

If you observe the red dots on the growth chart displayed, you can observe the acceleration of the growth after the **"growth restriction".**

Catch up growth is important to increase the survival chances of the child.

Good nutritional care is required to achieve this desired catch up growth in infants with growth failure.





GROWTH FAILURE

Growth failure is a term used to describe a growth rate that is below the appropriate growth velocity (speed) for age

Observe the growth chart displayed on the side. If you follow the black dots, you can see how the growth rate of the baby is way below the desired growth speed for the age from the birth. You can observe the growth failure in length, weight and head circumference.

Causes for growth failure include poor nourishment due to difficulty in breastfeeding or inappropriate weaning, or refusal to eat

An external nutritional support like nutritional supplements may help to correct the situation.

STUNTING

It is another form of growth failure. A child who is stunted or chronically malnourished often appears to be normally proportionate but is actually shorter than normal for his/her age.

Stunting is caused by poor nutrition, poor feeding practices, poor food quality as well as frequent infections

As stunting is not reversible after **2 years** of age, hence it is important to provide adequate **nutritional support during pregnancy and infancy.**

GROWTH & DEVELOPMENT OF ORGAN SYTEMS

BRAIN

The brain grows more rapidly during the first year than any other period in people's lives, with a "growth spurt" from the 3rd trimester of pregnancy through until two years of age

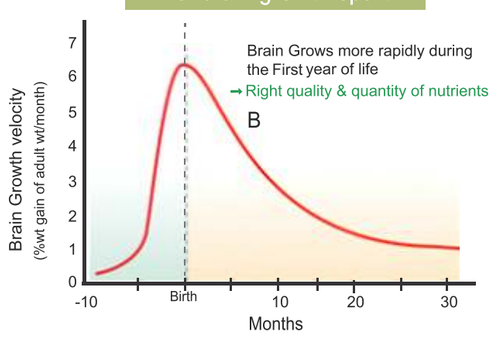
The below graph shows brain growth per month in relation to adult weight. For example, just after birth, the brain grows at a rate of six and a half per cent of its adult weight per month. That means, given an average adult brain weight of almost one and a half kilos, the brain grows at approximately **90 grams per month**. After about two years of age, the rate of brain growth slows to approximately one per cent or 15 grams per month.

Because the brain grows so fast during the first year of life, right quality and quantity of nutrients should be given to support this.

Certain nutrients like amino acids, essential fatty acids (like DHA and Aracadonic acid), vitamins (like B complex) and minerals (such iron, zinc , copper and iodine) are required for brain development.

Malnutrition is one of the leading causes of stunted brain growth. It leads to less & small brain cells, smaller head circumference and lower IQ.

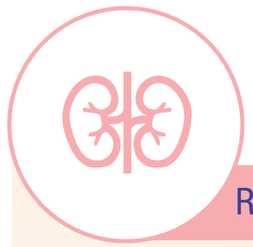
The 'brain growth spurt'



GASTROINTESTINAL SYSTEM

Newborns have immature digestive systems and it develops and matures during the first year. Most of the infants have poor digestive process till about three months of age as there is low secretion of digestive enzymes

An infant's stomach capacity is between 10-20 ml which increases to 200 ml by one year of age. Hence, infant requires small and frequent feeds to satiate themselves adequately and to prevent reflux of stomach contents.

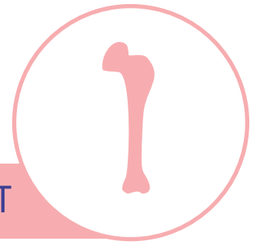


RENAL SYSTEM

Kidneys of infants are immature till the sixth month of age. Young infants can't dilute or concentrate their urine in the kidneys as well as older children. This means they are susceptible to fluid overload or overload from solutes in the diet

Kidney excretes various solutes like sodium, potassium, chloride and phosphorus and end-products of protein metabolism – mainly urea

Cow's milk has high amount of proteins and electrolytes which increases stress on kidneys and causes dehydration



BONE DEVELOPMENT

There is rapid bone growth in infancy. The skeletal mass doubles during 1st year of life and there is an increase in bone size

Nutrients like calcium, phosphorus, magnesium, Vitamin D and proteins are required for to build bones

IMMUNE SYSTEM

Infants are born with immature immune system

First milk of mother, **colostrum** is the richest source of immuno-nutrients (like Vitamin A, proteins) and antibodies which helps in protection of the babies against infections

Nutrients present in Breast milk help in building strong immune system. Hence breastfeeding is very crucial

To summarize this module: we have leant that Infancy is a period of rapid growth and development. Infant's need proper nutrition to achieve the milestones. Also since the organ system is structurally and functionally immature babies need nutrients in easily digestible format.

Breast milk provides nutrients and immunity to the baby. It is the first best suitable nutritional choice. Hence Breast milk is considered as gold standard for infant feeding.

As a practice:

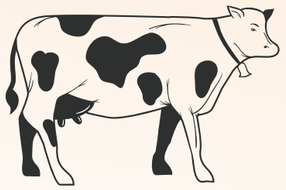
1. Infants should be exclusively breastfeed from birth till **six months.**

2. Breastfeeding should be initiated with **1 hour** of birth and infants should be fed colostrum.

3. After completion of six months of age, with introduction of optimal complementary feeding, breastfeeding should be continued for a **minimum of two years** and beyond depending on the choice of the mother and the baby.

Breast milk is every infant's right!

Cow's milk should not be given to infant's below **1 year** of age.



Q1 Define Growth and Development?

Q2 Name the parameters on which growth is measured

Q3 Cow's milk can be given to infant of 3 months old?

○ True | ○ False

Q4 List down the appropriate infant feeding pratices

Q5 Weight of an infant _____ by **6 months** and _____ by the end of **1 year.**

NOTE

Thank you