Growth and development

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Objectives:

At the end of this lecture the staff nurse will be able to :

- Define growth and development
- Identify the importance of growth and development
- Mention the principle of growth and development
- List the factor affecting growth and development
- Discuss the importance criteria for assessment of growth.
- Identify the stages of growth and development
- Identify the normal developmental milestones

Definition of Growth

- Growth refers to an increase in physical size of whole body or any of its parts. It results because of cell division and synthesis of proteins. It causes a quantitative change in the child's body. (can be measure in meter , kilo....ect)

Definition of Development

- Development refers to a progressive increase in skill and capacity of function. It causes a qualitative change in the child's functioning.(The measurement not so accurate as growth and can be measured through observation.

Definition of Maturation

- Literally it means ripen, its describe as aging or increase in child's competence and adaptability.
- Its used to describe a qualitative change in structure . (To function at higher level depending on the child heredity).

Importance of studying growth and development for nurses

To expect & help health personnel to observe the child for specific levels of development .

To understand the reason for particular condition and illness, which occur in various age group.

To help for plan total care ,which the physician and other health team members outline for each child

To help health personnel in teaching caregiver how to use the knowledge in achieving their children's optimal G&D

Factors influencing growth and development:

1. Genetic factors as:

- **Genetic disorders/abnormal genes** e.g. Phenylketonuria & thalassemia .
- **Chromosomal disorders : e.g** Down syndrome.
- **Race:** Growth potential varies from race to race.
- **Sex:** e.g. at birth, boys are taller and heavier than girls.

Conti…Factors influencing growth and development:

2.Nutritional factors as

- **Nutritional deficiency** of proteins, calories, minerals, vitamins, and essential amino acids both quantitative and qualitative retard physical growth and development.

- **Malnourished mothers** are known to produce low birth weight babies, especially with **intrauterine growth retardation (IUGR).**

Conti…Factors influencing growth and development:

3. Socioeconomic factors:

- **Poverty** is associated with diminished and affluence with good growth.

4. Environmental and seasonal factors:

- **Physical surroundings** (as sunshine, hygiene, living standards)and **psychological and social factors** (relationship with family members, teachers, friends) affect growth and development.

Conti..Factors influencing growth and development:

5. Chronic Diseases:

- **Chronic diseases** of the heart (Congenital heart, Chronic rheumatic heart), Chest (Tuberculosis, Asthma), Kidneys (Nephrotic syndrome, Nephritis), liver (Cirrhosis), neoplasms, digestive or absorptive disorders, hypothyrodism, etc, impair growth.
- **Adrenocortical** over activity causes excessive height in early childhood.
- **Metabolic disorders** (Glycogen storage disease, renal acidosis) and mental retardation are associated with retarded growth.

Conti…Factors influencing growth and development:

6. Growth potentials:

- The smaller the child at birth, the smaller he is likely to be in subsequent years, the larger the child at birth, the larger he is likely to be in later years. Thus, the growth potential is somewhat indicated by child`s size at birth.

Conti…Factors influencing growth and development:

6. Prenatal and intrauterine factors:

- Maternal infection like rubella, maternal diabetes mellitus, hypothyroidism and antithyroid drugs adversely affect the fetus and thereby the newborn.

Conti…Factors influencing growth and development:

9) Emotional factors:

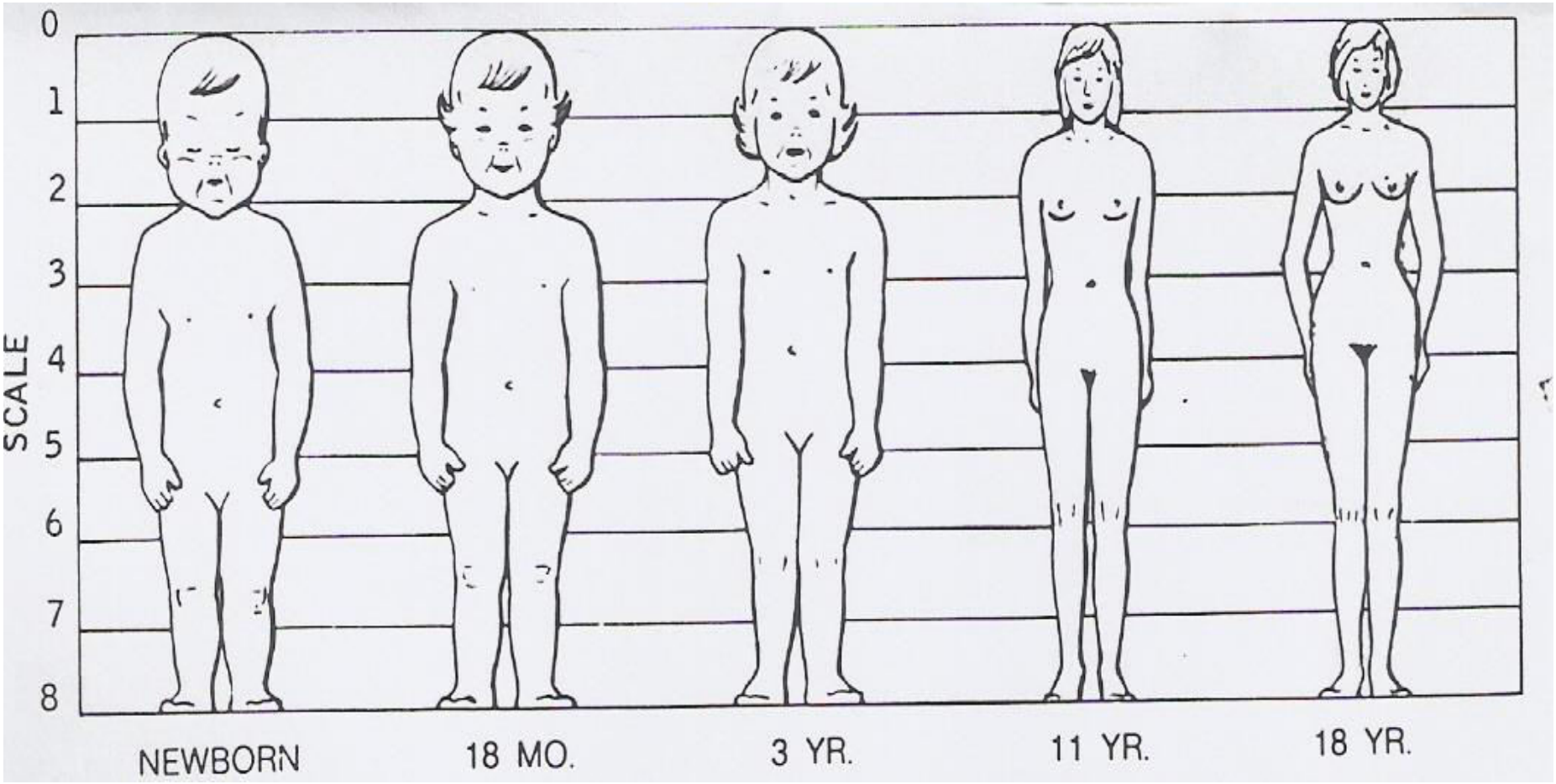
- Emotional traumas from unstable family, insecurity, loss of parent and inadequate schooling, …etc.

Conti…Factors influencing growth and development:

9) Hormonal factors:

- **Growth hormone:** its role in postnatal growth is significant.
- **Thyroxin deficiency:** may cause fetal goiter and hypothyroidism with retardation of the skeletal growth of the fetus.
- **Insulin:** Diabetic mothers cause increase in fetal blood sugar that leads to increase formation of islets of langerhans and elevation of insulin production. This results in stimulation of fetal growth.

Scale Showing Changes in body proportion from birth to physical maturity

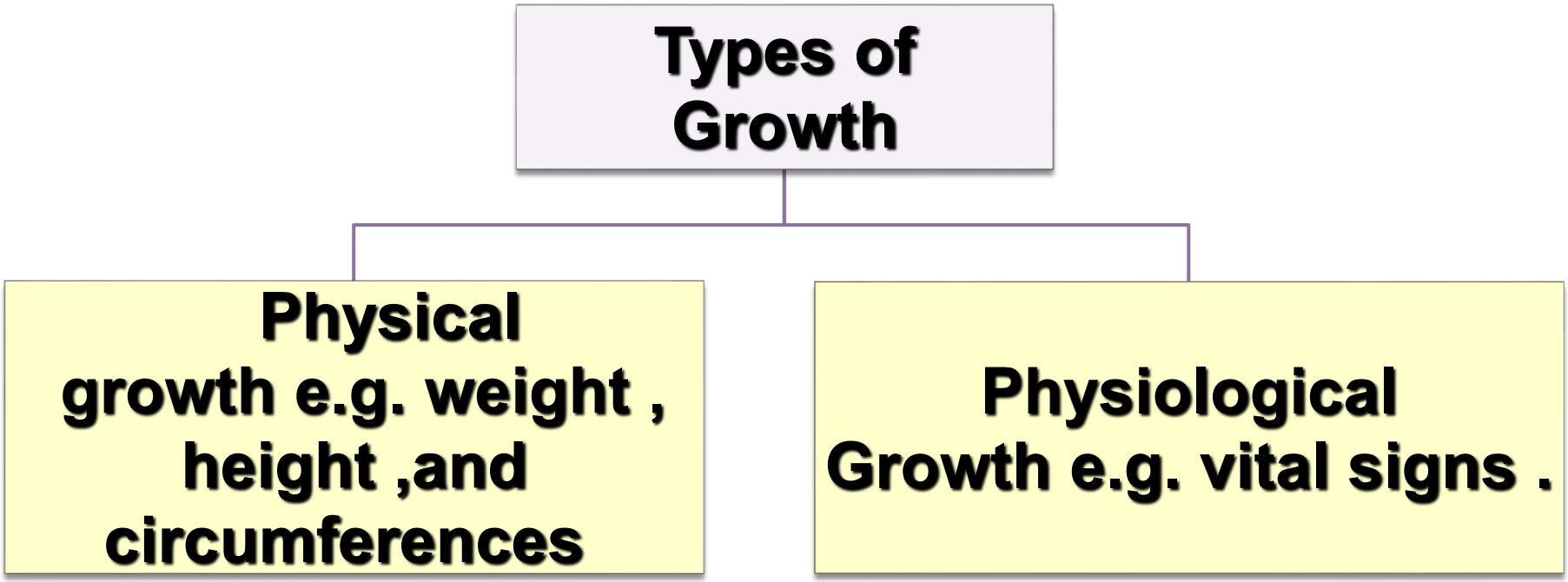


Growth spurts:

Acceleration of growth is characteristic of three periods:

- First year
- Six to eight years
- Adolescence

Types of Growth



Methods of growth monitoring

- Weight.
- Height (length).
- Head circumference.
- Chest circumference.
- Mid upper arm circumference.
- Skin fold thickness.
- Weight for age.
- Height for age.
- Weight for height.

Important criteria for assessment of growth:

Weight:

- On an average, ideal birth weight is from 2700gm to 4000gm. The newborn loses up to 10% of his weight during the first week. As result of:
- withdrawal of hormones from mothers
- passage of meconium and urine
- limited food intake
- loss of extra cellular fluids

Conti...Important criteria for assessment of growth:

- Birth to 4 months ⟶ 3/4 kg/ month
- 5 to 8 months ⟶ 1/2 kg/ month
- 9 to 12 months ⟶ 1/4 kg/ month
- Weight (kg) at 3 to 12 months = $\frac{\text{age (months) +9}}{2}$

Conti...Important criteria for assessment of growth:

- Weight (kg) at1 to 6 years = age (years) ×2+8
- Weight (kg) at 7 to 12 years = $\frac{\text{age (years)} \times 7-5}{2}$
- In adolescent stage Males will gain 7 to 30 kg, while female will gain 7 to 25 kg.

Conti...Important criteria for assessment of growth

Length/Height

- The ideal length of a full-term infant at birth is 50 cm.
- Length increases about 3 cm / month during the first 3 months of age
- It increases 2 cm/ month at age of 4-6 months
- At 7 to 12 months it increases 1 1/2 cm/month.

Conti...Important criteria for assessment of growth

- In toddler stage:
  - It increases about 10 to 12.5 cm/ year.
  - Formula to calculate normal height of children over 1 year of age(Kg):

    =Age in years x 5 + 80

Conti…Important criteria for assessment of growth

- In preschool stage (3-6y): *Doubles* birth length by 4-5 years of age.
- Formula to calculate normal height is the same as toddler

Conti…Important criteria for assessment of growth

- In school stage:
  - Gains about 5 cm/ year.
  - Body proportion during this period: Both boys and girls are long-legged.
  - Formula is the same as toddlers and preschoolers.

Conti…Important criteria for assessment of growth

- In Adolescence
  - Birth length triples by about age of 13.
  - Males will gain 10 to 30 cm in height.
  - Females will gain less height than males as they gain 5 to 20 cm.
  - Growth in height ceases at 16 or 17 years in females and 18 to 20 in males.

Conti...Important criteria for assessment of growth

Mid parental height (MPH) is a good predictor for adult height, is calculated by the following formula:

- **MPH in boys = $\frac{(\text{Father's height} + \text{mother's height}) + 13}{2}$**
- **MPH in girls = $\frac{(\text{Father's height} + \text{mother's height}) - 13}{2}$**

Conti…Important criteria for assessment of growth

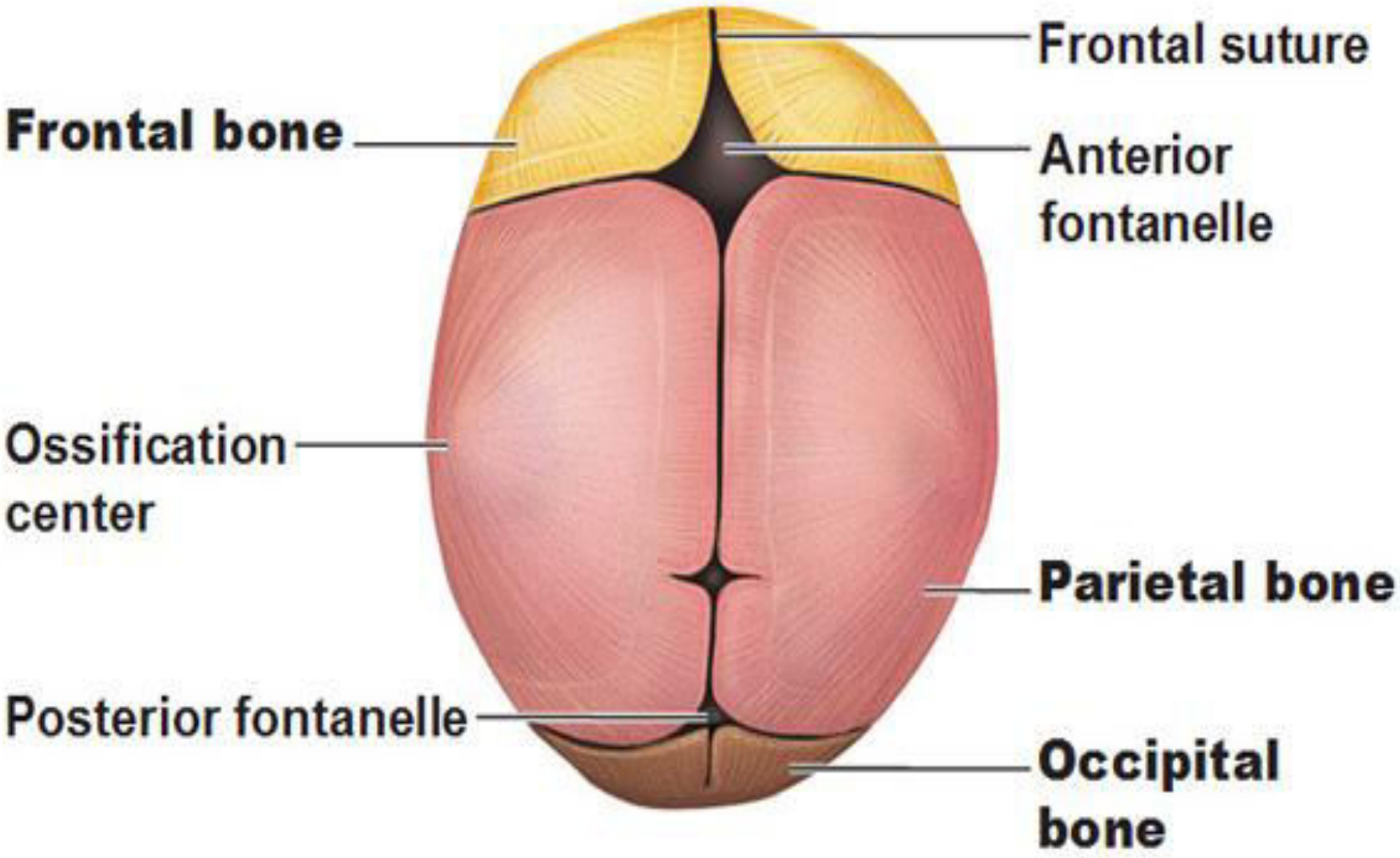
Head circumference

- Head circumference which represents the growth of the brain, measures 34-35 cm at birth.
- It increases about *2 cm / month* during the first 3 months, then *½ cm / month* during the second 9 months of age.
- From 1 year to adult head increases *10 cm* only

Anterior fontanel and Posterior fontanel

Comparison	Anterior fontanel	Posterior fontanel
Shape	diamond	Triangular
Size	2 – 3 cm	Smaller than anterior
Time of close	12 - 18 month	1.5 - 3 month
Location	At the juncture of the two parietal and fontanel	Between occipital and parietal bones

Fontanelles



Conti...Important criteria for assessment of growth

Head/Chest circumference ratio

- At birth, head circumference is *larger* than chest circumference by *about 2.5 cm.*
- by 6 to 12 months both are equal. After the first year chest circumference tends to be *larger* by 2.5 cm.

Conti...Important criteria for assessment of growth

Skin-fold thickness:

- using Holtain skin fold caliper. It was measured to the nearest millimeter.

Triceps

Subscapular

Flank

Quadriceps (thigh)

Conti...Important criteria for assessment of growth

Body mass index (BMI)

- It is given by the following formula:

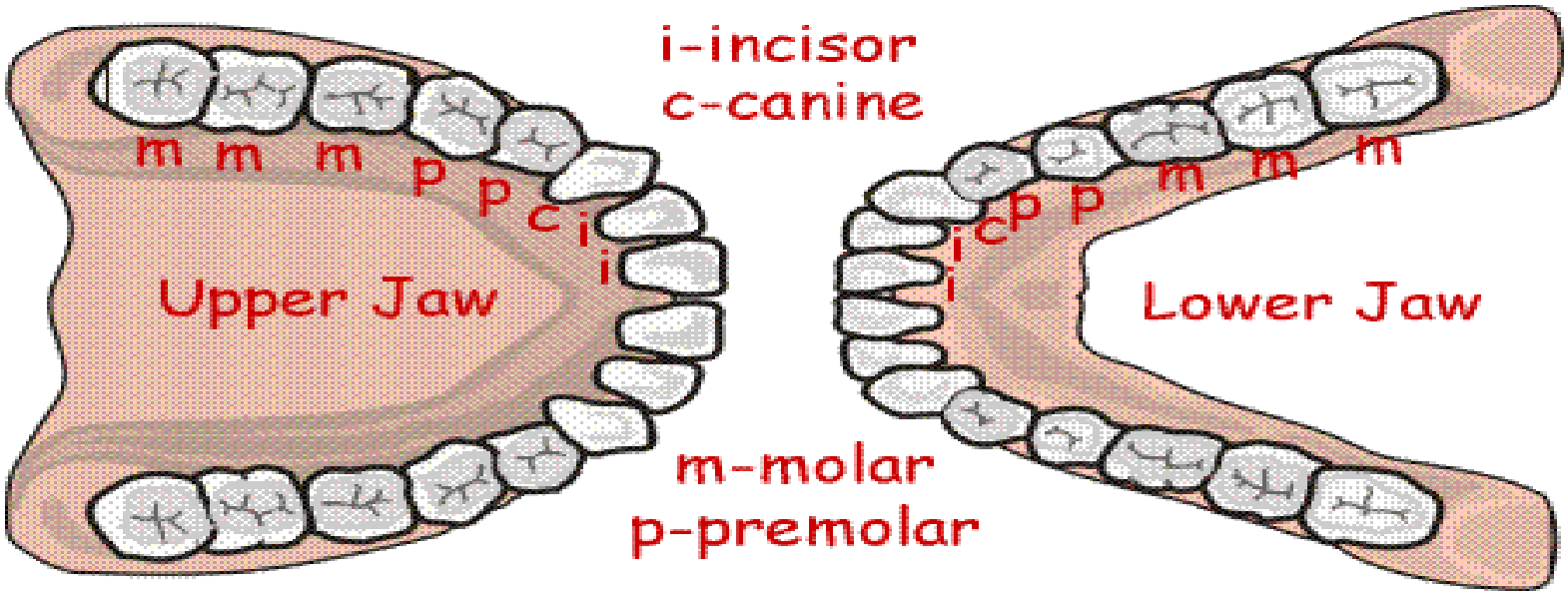
$$BMI = \frac{\text{Weight (kg)}}{(\text{Height (m)})^2}$$

- BMI remains constant (*15-25 kg/m ^{2}*) up to the age of 5 years.
- BMI > 25 kg/m ^{2} point to overweight.
- BMI >30 kg/m ^{2} establishes existence of obesity.
- BMI < 15 kg/m ^{2} point to malnutrition.

Conti...Important criteria for assessment of growth (Teething):

- By 2 years primary dentition of 16 teeth and 20 teeth by 30 months
- *Quick formula for teeth calculation:*

Child's age in months – 6

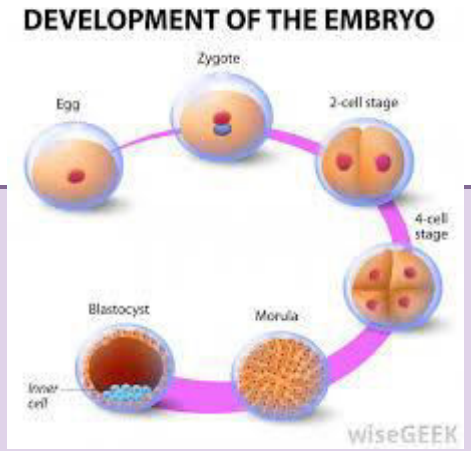


Teething Conti…

1- lower central incisors	At 6 months
2-upper central incisors	At 7.5 months
3-upper lateral incisors	At 9 months
4- lower lateral incisors	At 11 months
5-lower first molars	At 12 months
6-upper first molars	At 14 months
7-lower cuspids	At 16 months
8-upper cuspids	At 18 months
9-lower second molars	At 20 months
10-upper second molars	At 24 months

Stages of Growth &Development

Prenatal period: It is the period from conception to birth



Embryonic stage: From <u>conception to 8 weeks</u>.

Fetal stage: From <u>8 weeks to birth</u> (40 – 42 weeks of gestation).

Conti…Stages of Development

Infancy period: It is the period from birth to 12 months

Neonatal stage (newborn age): From birth to 4 weeks (28 days)

Infancy stage: From 1 – 12 months of age.

Conti...Stages of Development

Early childhood: It is the period from 1 to 6 years of age.

Toddler: From 1 – 3 years of age.

Pre-school: From 3 – 6 years of age.

Conti...Stages of Development

Middle childhood: It is the period from 6 to 12 years of age.

For some classification it is from 6 to 10/11 years. This stage is referred to as school age and latency period.

Conti…Stages of Development

Late childhood (Adolescence stage): It is the period from 10 – 18 years of age or (20 – 21 years)

Prepubertal period:
Age from 10 – 13 years

Adolescence period: Age from 13 to approximately 18 years. (20 or 21)years for some countries).

Types of development

- Motor development:
- Gross motor.
- Fine motor.
- Cognitive development
- Emotional development
- Social development

NORMAL DEVELOPMENTAL MILESTONES

Gross motor	
Head/neck holding	3 months
Sitting (with support)	5 months
Sitting (without support)	7-8 months
Standing (with support)	9 months
Walking with support	10 months
Crawling/creeping	11 months
Standing (without support)	12 months
Walking (without support)	13 months
Running	18 months
Climbing upstairs	24 months
Riding cycle	36 months

Fine motor

Grasping a rattle (when placed in hand)	4 months
Reaching out for a bright object (intentional reaching)	5 months
and grasps it with both hands (bidextrous grasp)	
Holding an object with crude grasp from palm (palmar grasp)	7 months
Holding a small object between index finger and thumb (pincer grasp)	9 months

Personal/social

Social smile	4-8 weeks
Recognition of mother	3 months
Smilig at mirror image	6 months
Waving "bye-bye"	9 months
Playing a simple ball game	1 year
Knowing gender	3 years

Language	
Turning head to sound (rattle, ball)	1 month
Cooing	3 months
Monosyllables (ma, pa, ba)	6 months
Bisyllables (mama, papa, baba)	9 months
Two words with meaning	1 year
Simple sentence	2 years
Telling a story	3 years
Account of recent events	4 years

THANK YOU