

Growth and development of children

Objectives:

By the end of this lecture, the student will be able to:

- Identify the importance of growth and development.
- Define growth and development.
- Mention the principles of growth and development.
- List factors affecting growth and development.
- Mention types of growth and development.
- Identify the stages of development.

Growth:

Growth refers to an increase in physical size of the whole body or any of its parts.

It is simply a quantitative change in the child's body.

It can be measured in Kg, pounds, meters, inches,....etc

Development:

- Development refers to a progressive increase in skill and capacity of function.
- It is a qualitative change in the child's functioning.
- It can be measured through observation.

Maturation:

- Increase in child's competence and adaptability.
- It is describing the qualitative change in a structure.
- The level of maturation depends on child's heredity.

Importance of growth and development:

- Knowing what to expect of a particular child at any given age.
- Gaining better understanding of the reasons behind illnesses.
- Helping in formulating the plan of care.
- Helping in parents' education in order to achieve optimal growth & development at each stage.

Principles of growth and development:

- Continuous process
- Predictable Sequence

- Don't progress at the same rate (↑ periods of GR in early childhood and adolescents & ↓ periods of GR in middle childhood)
- Not all body parts grow in the same rate at the same time.
- Each child grows in his/her own unique way.
- Each stage of G&D is affected by the preceding types of development.
- G & D proceed in regular related directions :
 - - Cephalo-caudal(head down to toes)
 - - Proximodistal (center of the body to the peripheral)
 - - General to specific

Growth patterns:

The child's pattern of growth is in a head-to-toe direction, or cephalocaudal, and in an inward to outward pattern called proximodistal.

Factors affecting growth and development:

- Hereditary
- Environmental factors

Pre-natal environment

1-Factors related to mothers during pregnancy:

- Nutritional deficiencies
- Diabetic mother
- Exposure to radiation
- Infection with German measles
- Smoking
- Use of drugs

2-Factors related to fetus

- Mal-position in uterus
- Faulty placental implantation

Post-Natal Environment

I - External environment:

- socio-economic status of the family
- child's nutrition
- climate and season

- child's ordinal position in the family
- Number of siblings in the family
- Family structure (single parent or extended family ...)

Internal environment:

- Child's intelligence
- Hormonal influences
- Emotions

Types of growth and development:

Types of growth:

- Physical growth (Ht, Wt, head & chest circumference)
- Physiological growth (vital signs ...)

Types of development:

- Motor development
- Cognitive development
- Emotional development
- Social development

Stages of growth and development

- Prenatal
 - Embryonic (conception- 8 w)
 - Fetal stage (8-40 or 42 w)
- **Infancy**
 - Neonate
 - Birth to end of 1 month
 - Infancy
 - 1 month to end of 1 year
- **Early Childhood**
 - Toddler
 - 1-3 years
 - Preschool
 - 3-6 years

- **Middle Childhood**

- School age
- 6 to 12 years
- Late Childhood
- Adolescent
- 13 years to approximately 18 years

1-New born stage:

Newborn stage is the first 4 weeks or first month of life. It is a transitional period from intrauterine life to extra uterine environment.

Normal new born infant:

Physical growth

- Weight = 2.700 – 4 kg
- Wt loss 5% -10% by 3-4 days after birth
- Wt gain by 10th days of life
- Gain ¾ kg by the end of the 1st month

Weight:

They loose 5 % to 10 % of weight by 3-4 days after birth as result of :

- Withdrawal of hormones from mother.
- Loss of excessive extra cellular fluid.
- Passage of meconium (feces) and urine.
- Limited food intake.

Height:

- Boys average Ht = 50 cm
- Girls average Ht = 49 cm
- Normal range for both (47.5- 53.75 cm)

Head circumference

33-35 cm

Head is ¼ total body length

Skull has 2 fontanels (anterior & posterior)

Anterior fontanel:

- Diamond in shape

- The junction of the sagittal, coronal and frontal sutures forms it
- Between 2 frontal & 2 parietal bones
- 3-4 cm in length and 2-3 cm width
- It closes at 12-18 months of age

Posterior fontanel:

- Triangular
- Located between occipital & 2 parietal bones
- Closes by the end of the 1st month of age

Chest circumference:

It is 30.5 to 33cm (usually 2–3cm less than head circumference).

Physiological growth:

- Vital signs
- **Temperature (36.3 to 37.2°C).**
- **Pulse (120 to 160 b/min).**
- **Respiration (35 to 50C/min) .**

Senses:-

- Touch
- Vision
- Hearing
- Taste
- Smell

Touch:

- It is the most highly developed sense.
- It is mostly at lips, tongue, ears, and forehead.
- The newborn is usually comfortable with touch.

Vision:

- Pupils react to light
- Bright lights appear to be unpleasant to newborn infant.
- Follow objects in line of vision

Hearing:

- The newborn infant usually makes some response to sound from birth.
- Ordinary sounds are heard well before 10 days of life.
- The newborn infant responds to sounds with either cry or eye movement, cessation of activity and / or startle reaction.

Taste:

Well developed as bitter and sour fluids are resisted while sweet fluids are accepted.

Smell:

Only evidence in newborn infant's search for the nipple, as he smell breast milk.

Gross motor development:

Motor development:

The newborn's movement are random, diffuse and uncoordinated. Reflexes carry out bodily functions and responses to external stimuli.

Fine motor development:

- Holds hand in fist
- When crying, he draws arms and legs to body

Reflexes:

- Swallowing
- Gagging
- Sucking
- Grasp
- Tonic-neck

Cognitive development:

The cognitive development of newborn infant is difficult to understand or observe it.

Emotional development:

The newborn infant expresses his emotion just through cry for hunger, pain or discomfort sensation

Infancy:

Definition of normal infant:- It is the period which starts at the end of the first month up to the end of the first year of age. Infant's growth and development during this period are rapid.

Physical growth of normal infant:

Weight : the infant gains :

- Birth to 4 months → $\frac{3}{4}$ kg /month

- 5 to 8 months → $\frac{1}{2}$ kg / month

- 9 to 12 months → $\frac{1}{4}$ kg /month

The infant will double his birth wt by 4-5 months and triple it by 10-12 months of age

Calculating infant weight:

Infants from 3 to 12 months

Weight = Age in months + 9

2

Wt of 7 months old infant = $7 + \frac{9}{2} = 16 = 8$ kg

2 2

Height:

- Length increases about 3 cm /month during the 1st 3 months of age,
- then it increases 2 cm /month at age of 4-6 months,
- Then, at 7 – 12 months, it increases 1 $\frac{1}{2}$ cm per month

Head circumference:

- It increases about 2 cm /month during the 1st 3 months,
- Then, $\frac{1}{2}$ cm/month during the 2nd 9 months of age.
- Posterior fontanel closes by 6-8 w of age.
- Anterior fontanel closes by 12-18 months of age.

Chest circumference:

By the end of the 1st year, it will be equal to head circumference.

Physiological growth of infants:-

Pulse 110-150 b/min

Resp 35 ± 10 c/min

Breath through nose.

Blood pressure $80/50 \pm 20/10$ mmHg

Dentition:

Eruption of teeth starts by 5–6 months of age. It is called "Milky teeth" or "Deciduous teeth" or "Temporary teeth".

Average age of tooth eruption:

<ul style="list-style-type: none">• Lower central incisors• Upper central incisors• Upper lateral incisors• Lower lateral incisors• Lower first molars• Upper first molars• Lower cuspids• Upper cuspids	<ul style="list-style-type: none">• Erupt at 6 months• Erupt at 7.5 months• Erupt at 9 months• Erupt at 11 months• Erupt at 12 months• Erupt at 14 months• Erupt at 16 months• Erupt at 18 months
Lower 2nd molars	Erupt at 20months

Motor development:

- **At 2 months**
 - Hold head erects in mid-position.
 - Turn from side back.
- **At 3 months**, the infant can
 - Hold head erects and steady.
 - Open or close hand loosely.
 - Hold object put in hand

At 4month the infant can:

- Sit with adequate support.
- Roll over from front to back.
- Hold head erect and steady while in sitting position.
- Bring hands together in midline and plays with fingers.
- Grasp objects with both hands.

At 5 months, the infant can:

- Balance head well when sitting.
- Site with slight support.
- Pull feet up to mouth when supine.

- Grasp objects with whole hand (Rt. or Lt.).
- Hold one object while looking at another

At 6 months:

- Sit alone briefly.
- Turn completely over (abdomen to abdomen).
- Lift chest and upper abdomen when prone.
- Hold own bottle.

At 7 months:

- Sit alone.
- Hold cup.
- Imitate simple acts of others.

At 8 months:

- Sit alone steadily.
- Drink from cup with assistance.
- Eat finger food that can be held in one hand.

At 9 months:

- Rise to sitting position alone.
- Crawl (i.e., pull body while in prone position).
- Hold one bottle with good hand-mouth coordination

At 10 months:

- Creep well (use hands and legs).
- Walk but with help.
- Bring the hands together.

At 11 months , the infant can:

- Walk holding on furniture.
- Stand erect with minimal support

At 12 months:

- Stand-alone for variable length of time.
- Sit down from standing position alone.

- Walk in few steps with help or alone (hands held at shoulder height for balance).
- Pick up small bits of food and transfers them to his mouth

Ambulation(motor growth):

- 9 month old: crawl
- 10 month old: creep
- 1 year: stand independently from a crawl & creep position

13 month old: walk and toddle quickly

Emotional development:

- His emotions are instable, where it is rapidly changes from crying to laughter.
- His affection for or love family members appears.
 - **By 10 months**, he expresses several beginning recognizable emotions, such as anger, sadness, pleasure, jealousy, anxiety and affection.
 - **By 12 months** of age, these emotions are clearly distinguishable.

Social development:

- He learns that crying brings attention.
- The infant smiles in response to smile of others.
- The infant shows fear of stranger (stranger anxiety).
- He responds socially to his name.
- According to **Erikson, the infant develops sense of trust**. Through the infant's interaction with caregiver (mainly the mother), especially during feeding, he learns to trust others through the relief of basic needs.

Speech milestones:

- 1-2 months: coos
- 2-6 months: laughs and squeals
- 8-9 months babbles: mama/dada as sounds
- 10-12 months: "mama/dada specific"
- 18-20 months: 20 to 30 words – 50% understood by strangers
- 22-24 months: two word sentences, >50 words, 75% understood by strangers
- 30-36 months: almost all speech understood by strangers

Hearing:

- BAER hearing test done at birth
- Ability to hear correlates with ability enunciate words properly

- Always ask about history of otitis media – ear aiding devices.
- Early referral to MD to assess for possible fluid in ears (effusion)
- Repeat hearing screening test
- Speech therapist as needed

Red Flags in infant development:

- Unable to sit alone by age 9 months
- Unable to transfer objects from hand to hand by age 1 year
- Abnormal pincer grip or grasp by age 15 months
- Unable to walk alone by 18 months
- Failure to speak recognizable words by 2 years.

Normal toddler:

Toddler stage is between 1 to 3 years of age. During this period, growth slows considerably.

Weight:

The toddler's average weight gain is 1.8 to 2.7 kg/year.

Formula to calculate normal weight of children over 1 year of age is

Age in years X 2+8 = kg.

e.g., The weight of a child aging 4 years

$$= 4 \times 2 + 8 = 16 \text{ kg}$$

Height:

- During 1–2 years, the child's height increases by 1cm/month.
- The toddler's height increases about 10 to 12.5cm/year.

Formula to calculate normal height:

Age in years X 5 + 80 = cm.

e.g., the length of 2 years old child

$$= 2 \times 5 + 80 = 90 \text{ cm}$$

Head and chest circumference:

- The head increases 10 cm only from the age of 1 year to adult age.
- During toddler years, chest circumference continues to increase in size and exceeds head circumference.

Teething:

- By 2 years of age, the toddler has 16 temporary teeth.
- By the age of 30 months (2.5 years), the toddler has 20 teeth

Physiological growth:

Pulse: 80–130 beats/min (average 110/min).

Respiration: 20–30C/min.

Bowel and bladder control:

Daytime control of bladder and bowel control by 24–30 months

Fine motor- Toddler

- 1 year old: transfer objects from hand to hand
- 2 year old: can hold a crayon and color vertical strokes
 - Turn the page of a book
 - Build a tower of six blocks
- 3 year old: copy a circle and a cross – build using small blocks

Gross-motor of toddler:

At 15 months:

- **Walk alone.**
- Creep upstairs.
- Assume standing position without falling.
- Hold a cup with all fingers grasped around it.

At 18 months:

- **Hold cup with both hands.**

Transfer objects hand-to hand at will

At 24 months:

- Go up and down stairs alone with two feet on each step.
- **Hold a cup with one hand.**
- Remove most of own clothes.
- Drink well from a small glass held in one hand.

At 30 months: the toddler can:

- Jump with both feet.
- Jump from chair or step.

- Walk up and downstairs, one foot on a step.
- Drink without assistance.

Emotional development:

- Stranger anxiety – should dissipate by age 2 ½ to 3 years
- Temper tantrums: occur weekly in 50 to 80% of children – peak incidence 18 months – most disappear by age 3
- Sibling rivalry: aggressive behavior towards new infant: peak between 1 to 2 years but may be prolonged indefinitely
- Thumb sucking

Cognitive development:

- Up to 2 years, **the toddler uses his senses and motor development to differentiate self from objects.**
- The toddler from 2 to 3 years will be in the **pre-conceptual phase of cognitive development** (2-4 years), where he is still egocentric and can not take the point of view of other people.

Social development:

- The toddler is very social being but still egocentric.
- He imitates parents.
- Notice sex differences and know own sex.
- According to **Erikson**,
- The development of autonomy during this period is centered around toddlers increasing abilities to control their bodies, themselves and their environment i.e., "I can do it myself".

Preschool age:

Definition:-

It is the stage where child is 3 to 6 years of age. The growth during this period is relatively **slow**.

Fine motor-older toddler

- 3 year old: copy a circle and a cross – build using small blocks
- 4 year old: use scissors, color within the borders
- 5 year old: write some letters and draw a person with body parts

Fine motor and cognitive abilities

pre-school:

- Buttoning clothing
- Holding a pencil
- Building with small blocks

- Using scissors
- Playing a board game
- Have child draw picture of himself

Cognitive development: :

Preschooler up to 4 years of age is in the **pre-conceptual phase**. He begins to be able to give reasons for his belief and actions, but not true cause-effect relationship.

Preschooler:

- Fears the **dark**
- Tends to be **impatient and selfish**
- Expresses **aggression** through physical and verbal behaviours.
- Shows signs of **jealousy of siblings.**

Social development in preschoolers:

- Egocentric
- Tolerates short separation
- Less dependant on parents
- May have dreams & night-mares
- Attachment to opposite sex parent
- More cooperative in play

According to **Erikson theory:**

- The preschooler is in the stage where he **develops a sense of initiative**, Where he wants to learn what to do for himself, learn about the world And other people.

Red flags in preschoolers:

- Inability to perform self-care tasks, hand washing simple dressing, daytime toileting
- Lack of socialization
- Unable to play with other children
- Unable to follow directions during exam

Normal school age:

- ☐ School-age period is between the age of 6 to 12 years. The child's growth and development is **characterized by gradual growth.**