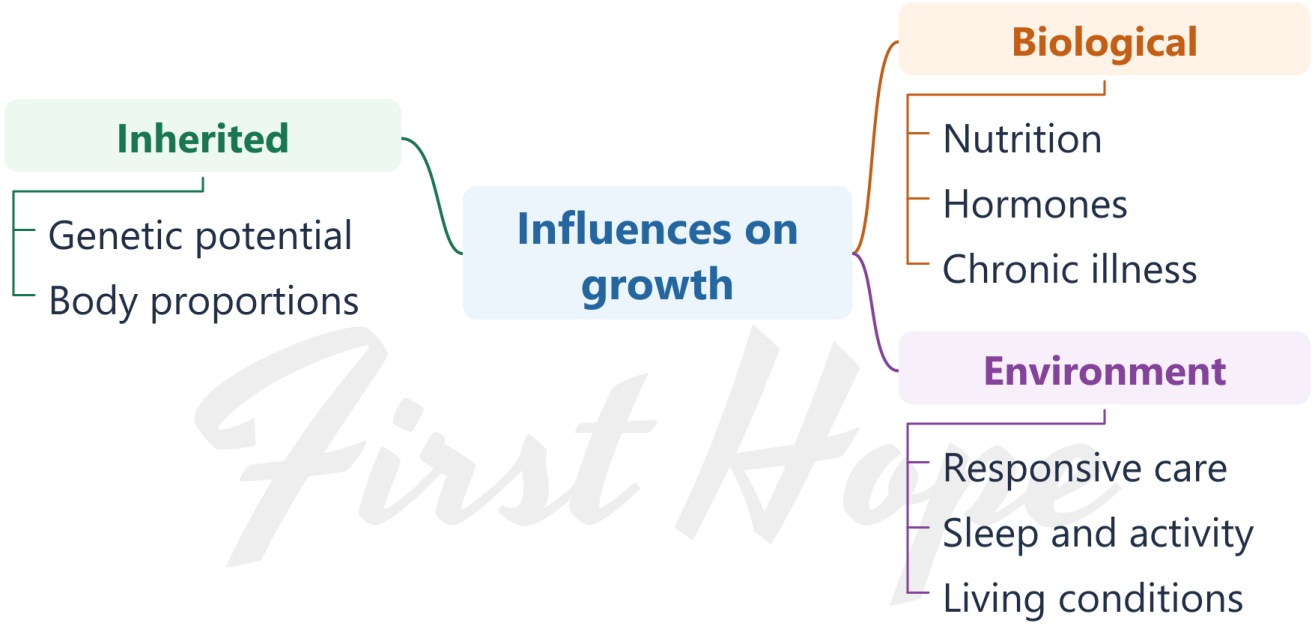
Pediatrics - Topic 1 - Normal Growth and Development

Understanding Growth and Development

- **Growth** is an increase in body size, such as weight, length or head circumference.
- **Development** is the acquisition and refinement of skills in movement, communication, learning and social interaction.
- A child may grow normally but have a language delay, so both processes must be assessed separately.

Factors That Shape Growth



Genetic, Nutritional and Hormonal Influences

- Genetic potential influences final height, body proportions and the timing of puberty.
- Adequate nutrition supplies the energy, protein and micronutrients needed to build new tissue.
- Poor intake, malabsorption and repeated infection may reduce weight gain before they affect height.
- Growth hormone, thyroid hormone and sex steroids support growth at different ages.

Maternal, Medical and Social Conditions

- Placental function and maternal health influence fetal growth, while chronic disease may impair growth after birth.
- Secure relationships, sleep, physical activity and access to health care support healthy growth.
- Poverty, food insecurity and psychosocial stress can affect growth without being the fault of the child or caregiver.

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Normal Growth Patterns

Principles and Patterns of Growth

- Growth and development usually progress from the head toward the feet and from central control toward finer movements of the hands and fingers.
- Different tissues grow at different rates, so a single curve cannot describe the whole body.

A. General or somatic growth

- Most body tissues show rapid infant growth, slower childhood growth and a pubertal acceleration.

B. Neural growth

- The brain and head grow especially rapidly in early childhood.

C. Lymphoid growth

- Lymphoid tissue enlarges during childhood and later decreases toward adult proportions.

D. Genital growth

- Reproductive organs show their major acceleration at puberty.

Classical Growth Patterns at a Glance

Classical growth pattern	Main feature
General or somatic growth	Most body tissues show rapid infant growth, slower childhood growth and a pubertal acceleration.
Neural growth	The brain and head grow especially rapidly in early childhood.
Lymphoid growth	Lymphoid tissue enlarges during childhood and later decreases toward adult proportions.
Genital growth	Reproductive organs show their major acceleration at puberty.

- These classical Scammon patterns explain broad tissue behaviour; clinical decisions still use validated measurements and growth charts.

Weight and Length

- Growth is rapid in infancy, steadier during childhood and faster again during the pubertal growth spurt.
- A term infant commonly doubles birth weight by about 5 months and triples it by about 1 year.
  - These are rough teaching guides rather than diagnostic limits for an individual child.

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- Length increases by about 25 cm in the first year, while school-age height commonly increases by about 5–6 cm each year before puberty.
- Puberty occurs at different ages, so apparent differences between classmates may reflect different stages of maturation.

Approximate Infant and Preschool Growth

- Birth weight commonly increases about fourfold by 2 years, but serial charting is more useful than a multiplication rule.
- An average term infant is about 50 cm long at birth and about 75 cm at 1 year.
- Head circumference is approximately 35 cm at term and 46 cm at 1 year; sex-specific charts are required for interpretation.

Head Growth and Body Proportions

- Head circumference increases rapidly during infancy because the brain is growing quickly.
- A rapidly crossing head-circumference curve needs assessment, even if the measurement remains within the printed chart range.
- The upper-to-lower body segment ratio falls with age as the legs become relatively longer.
- Disproportionate short stature suggests a skeletal or genetic disorder rather than simple familial short stature.

Measuring and Charting Growth

Choose the Correct Measurement and Chart

Selecting the Chart and Growth Index

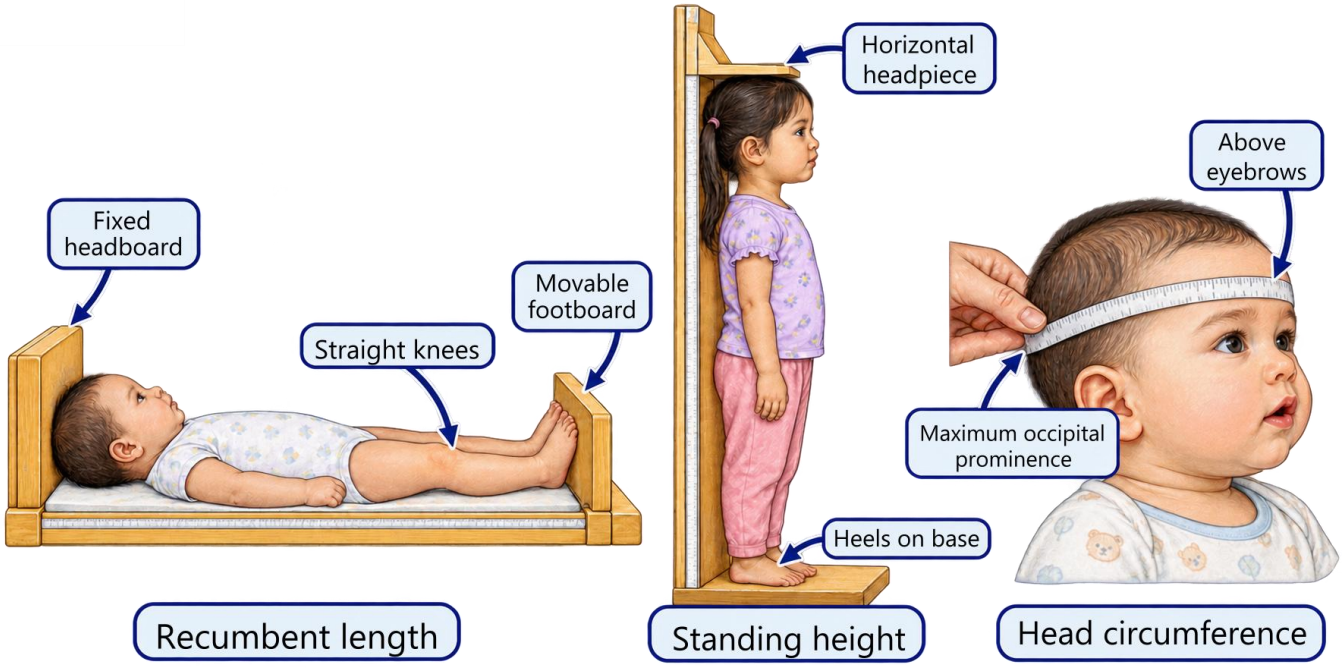
- Use **WHO growth standards from birth to 5 years** and the revised **IAP height, weight and BMI charts for 5–18-year-old Indian children**.
- Choose the correct sex-specific chart and plot the child's exact age on the horizontal axis.
- Use weight-for-age, length or height-for-age, and weight-for-length or BMI-for-age for the question being assessed.
    - Weight-for-age alone cannot distinguish a short child from a thin child.

Head Growth and Corrected Age

- Use head-circumference charts in infancy and early childhood when monitoring brain and skull growth.
- For a child born preterm, use corrected age for developmental and early growth interpretation according to the follow-up programme, commonly through 2 years.
    - Corrected age equals chronological age minus the number of weeks the child was born before 40 weeks.

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Anthropometric Measurement Methods



Accurate positioning makes length, height and head circumference measurements reproducible

A. Measure Weight

- Check that the scale is level, calibrated and set to zero before weighing the child.
- Weigh an infant without clothes or in a clean dry diaper whose weight is allowed for.
- Weigh an older child in light clothes without shoes and record the measurement in kilograms.
- Repeat an unexpected measurement before interpreting it as disease.

B. Measure Length or Height

- Measure recumbent length with an infantometer in children younger than 2 years or those unable to stand reliably.
- One person holds the head against the fixed board while another gently straightens the knees and brings the footboard against the soles.
- Measure standing height with a stadiometer from about 2 years, with shoes removed and the head in a horizontal eye–ear plane.
- Bring the headpiece down firmly onto the crown without compressing the child into a bent posture.
- Recumbent length is slightly greater than standing height, so record the method and use the matching chart.

C. Measure Head Circumference and Mid Upper Arm Circumference

i. Head Circumference

- Place a nonstretch tape just above the eyebrows and around the most prominent occipital point to obtain the maximum head circumference.

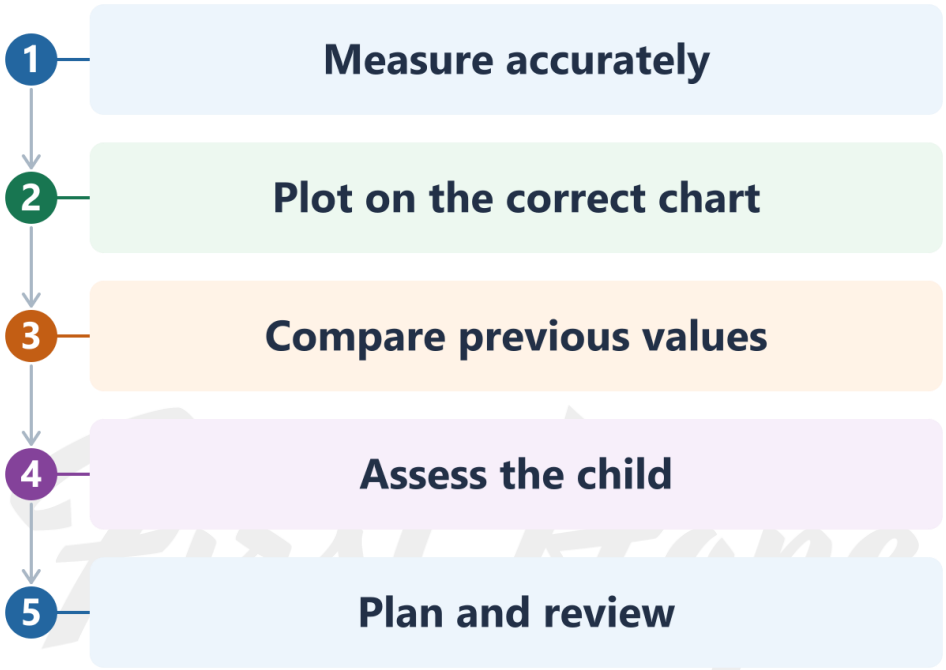
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- Repeat the measurement and record the largest reliable circumference to the nearest appropriate scale division.

ii. Mid Upper Arm Circumference

- For mid upper arm circumference, find the midpoint between the acromion and olecranon with the elbow bent.
- Then allow the arm to hang and fit the tape snugly without compressing the soft tissues.

Interpret the Whole Growth Pattern



Percentiles and Z Scores

- A percentile compares a child's measurement with the reference population of the same age and sex.
- A z score expresses how far the measurement lies from the reference median in standard-deviation units.
- A height-for-age below −2 z scores indicates short stature or stunting, depending on the clinical context.
- For children younger than 5 years, a weight-for-length or height below −2 z scores indicates wasting and below −3 indicates severe wasting.
- Edema can conceal loss of body tissue by increasing measured weight.

Serial Measurements

- A child's growth velocity and change in trajectory are often more useful than one isolated percentile.
- Confirm equipment, age, plotting and measurement technique before investigating an apparent change.

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