General Paediatrics

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NORMAL GROWTH

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Growth phases

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Periods of growth :

Prenatal period :

- Growth before birth/intrauterine period.
  - Fertilized ovum/zygote : First 2 weeks of gestation.
  - Embryo : 2 to 8 weeks of gestation.
  - Fetus : 9 weeks of gestation.

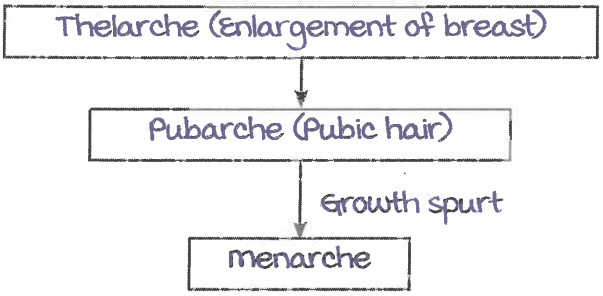
Postnatal period :

- Newborn : First 4 weeks.
  - Early newborn : First week.
  - Late newborn : Next 3 weeks.
- Infancy : First year.
- Toddler : 1 to 3 years.
- Preschool : 3 to 6 years.
- School age : 6 to 12 years.
- Adolescent : 10 to 19 years.
  - Early : 10 to 13 years.
  - Mid : 14 to 16 years.
  - Late : 17 to 19 years.

Pubertal changes :

Puberty occurs earlier in females (8 to 13 years) than males (9 to 14 years).

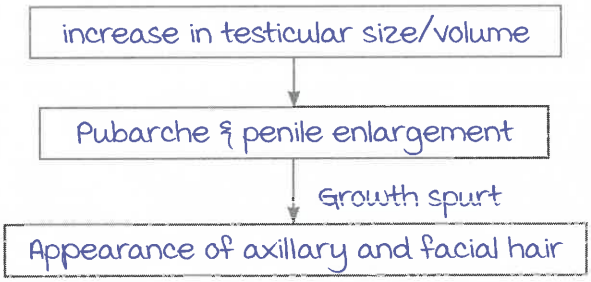
Sequence in females :



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Sequence in males :

Assessment of testicular size is by Praders orchidometer.



Changes during the middle part of puberty in males :

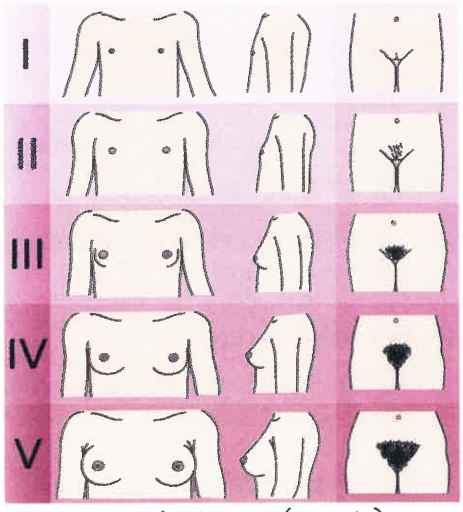
- Spermarche (Production of sperms).
- Voice cracking/deepening seen.

Tanner's SMR (Sexual maturity rating) :

- Done separately in males and females.
  - in males : Testis, penis, pubic hair, and scrotum.
  - In females : Breast and pubic hair appearance.
- Stages I (prepubertal) to stages V (Adult like appearance).

Tanner's staging in females : Breast appearance.

- Stage I : No changes in the breast.
- Stage 2 : Appearance/prominence of breast buds.
- Stage 3 : Generalized swelling of the breasts (Beyond nipple and areola).
- Stage 4 : Nipple + areola forming a second mount over the breast.
- Stage 5 : Mature/adult type appearance, nipple protrudes forward, and areola retracts.



Tanner's staging (Female)

Pubic hair appearance :

- Stage I : No pubic hairs.
- Stage II : Straight, sparse hairs.
- Stage III : increase in number and curling of hairs.
- Stage IV : Dense pubic hair (Curly).
- Stage V : Pubic hairs extends into medial part of thigh region.

Pigmentation starts increasing from stage II to IV.

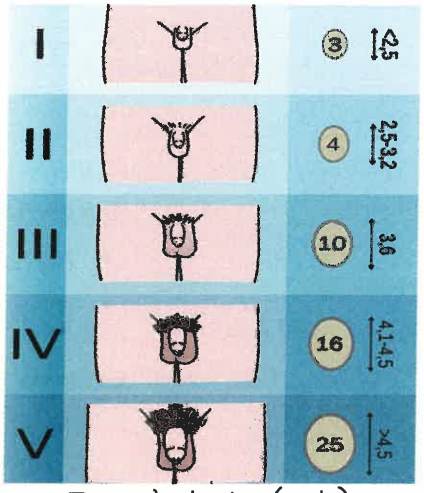
Tanner's staging in males :

- Stage I : Testis size < 2.5 cm and volume < 4 ml.
- Stage II :
  - Testis size ≥ 2.5 cm and volume ≥ 4 ml.
  - Scrotum size increases, skin over scrotum is red in color.
- Stage III : Further increase in volume of testis, penis lengthens, and scrotal skin is dark.
- Stage IV : increase in length & breadth of the penis.
- Stage V : Volume of testis > 20 ml (Adult like appearance).

Note :

Pubic hair changes are similar to females.

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Tanner's staging (male)

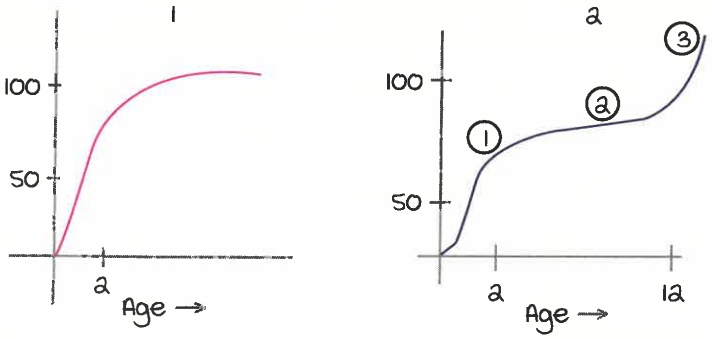
Growth spurts & patterns

00:15:10

Rules :

- Growth is in cephalocaudal progression.
- Growth occurs from the distal to proximal direction.
- Not all tissues in the body grow at the same rate.

Growth spurts :



Graph 1 : Till 2 years there is steep increase followed by minimal growth (Parabola). Depicts growth of brain.

Graph 2 : Depicts somatic growth.

- Sigmoid curve.
- Phases : Rapid growth (1 & 3) : Growth spurts.
- Phase 3 : Pubertal growth spurt.

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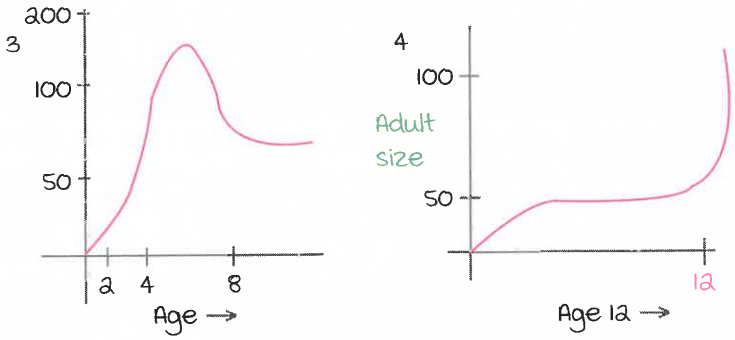
Pubertal growth spurts :

- Occur early in females.
- Increase in height :
  - 16 to 28 cm in females.
  - 20 to 30 cm in males.

Growth spurts :

- Female : Tanner's stage 3.
- Males : Tanner's stage 4.

Growth patterns :



Graph 1 :

- Peak (4–8 years) is 2 times of adult size.
- Comes back to normal size after 8 years.
- Eg : Lymphoid tissues like LN, tonsils, and adenoids.
- Between 4 to 8 years : Physiological lymphoid hyperplasia.

Graph 2 :

- Increase in size after 10 to 12 years.
- Stage of gonadal growth.

Assessment of growth

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Anthropometry : measurement of growth parameters.

Weight :

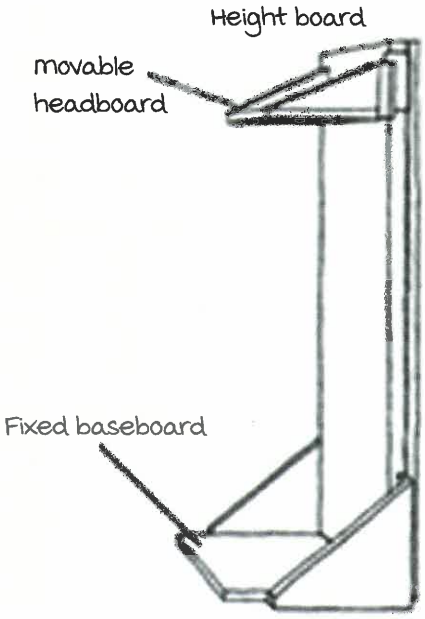
- Average birth weight in india : 2.9 kg.
- LBW is defined as weight < 2.5 kg.
- Physiological weight loss : During 1st week
  - 10% of weight loss in term babies.
  - Preterm babies : up to 15% of weight loss.

- Regaining of birth weight : 10 (Term) to 14 days (Preterm).
- Best way of assessment : Growth charts.
- Birth weight doubles by 5 to 6 months.
- Birth weight triples by 1 year.
- Birth weight quadruples by 2 years.

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Height/length :

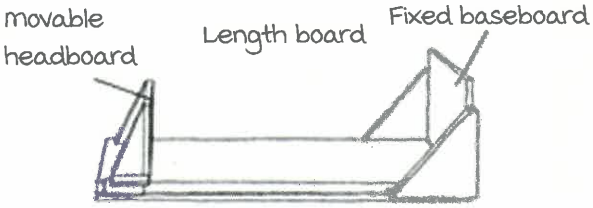
- Length : measured in supine posture (up to 2 years).
- measured by stadiometer (Height) or infantometer (Length).



Stadiometer



Move quickly and surely to measure length accurately before the baby becomes agitated.



Infantometer

- Normal length at birth : Approximately 50 cm.
- In the first year : increase of 25 cm hence, at 1 year : 75 cm.
- In the second year : increase of 10 to 15 cm hence, at 2 years : 85 to 90 cm.
- There is a steady increase of 6 cm/year till 12 years.
- After 12 years (Pubertal growth spurts) :
  - Females : 8cm/year.
  - Males : 10 cm/year.
- Height doubles by 4 years.
- Height triples by 12 years.
- Half of adult's height in a normal child (80–85 cm) : Around 2 years (18 to 24 months).

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Body proportions and circumferences

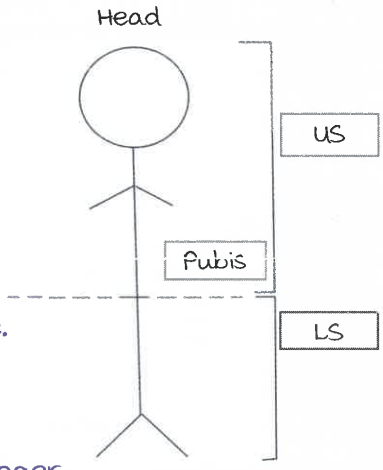
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Body proportions :

Upper Segment (US) : Lower Segment (LS) ratio.

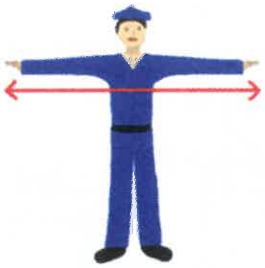
- At birth it is 1.7 : 1
- At 3 years it is 1.3 : 1
- At 7 to 10 years it is 1 : 1.
- After >10 years it is 0.9 : 1.

Significance : Useful in the evaluation of short stature.



Arm span :

- Measured from tip of one finger to tip of other finger.
- Used in tall children.
- At birth : Height > Arm span (Difference is 2.5 cm).
- At 11 years : Height = Arm span.
- >11 years : Arm span > Height (Difference is 1 to 2 cm).



Arm span

Circumferences :

Head circumference (HC) :

- Also called as occipitofrontal circumference.
- It indicates brain growth.
- At birth : Approximately 34 cm (33-35 cm).
- First 3 months after birth : increase of 2 cm/month.
  At 3 months : 40 cm.
- Next 3 months : Increase in 1 cm/month.
  At 6 months : 43 cm.
- Next 6 months : Increase in 0.5 cm/month.
  At 12 months : 46 cm.
- Next 1 year : Increase in 2 cm.
  At 2 years : 48 cm.
- At around 12 years : 52 cm.

Chest circumference (CC) :

- Measured at the level of nipples midway between inspiration & expiration.
- Birth : HC > CC (3cm).
- 1 year : HC = CC.
- > 1 year : CC > HC.



Chest circumference

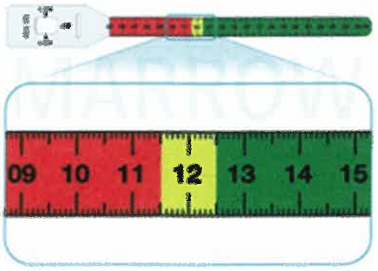
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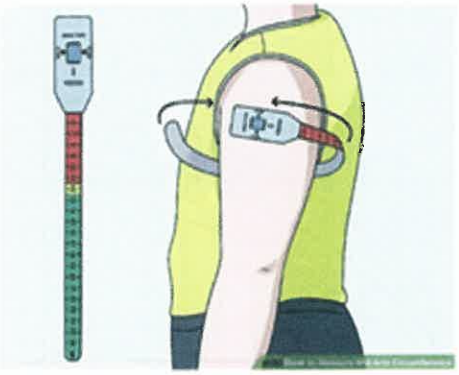
Mid arm circumference :

- Measured in children < 5 years.
- Useful for community assessment of growth (Can be done by health workers).

Shakir's tape :

- MUAC measured at midpoint of arm : Midpoint between 2 bony prominences.
- Green : Nutrition is normal.
- Yellow : Malnutrition.
- Red : Severe malnutrition (≤ 11.5 cm).





Mid upper arm circumference (MUAC) tape

Skin fold thickness measurement :

- Thickness of subcutaneous fat is measured.
- Indicator of nutritional status in children.
- Instrument : Harpenden's caliper.
  - ≥ 10 mm : Normal.
  - < 6 mm : Severe malnutrition.
- Charts for skin fold thickness : interpreted as percentile value.
  - < 5th percentile : Low value (Malnutrition).



Harpenden's caliper

Growth charts

00:46:06

In India :

- Between 0 to 5 years : Only WHO charts are used.
- 5 to 19 years : WHO or IAP charts can be used.

WHO growth chart :

- Most preferred and used commonly.
- Considered as international comparison tools.