PEDIATRICS

RR-8.0

Contents

GENERAL PAEDIATRICS : GROWTH

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Normal Growth

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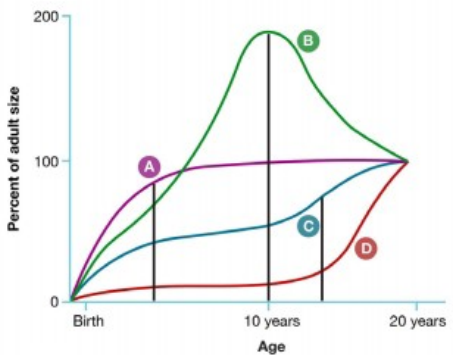
Growth Phases :

	Period of growth		Days of life
Prenatal (Before birth)	Ovum		0 – 14 days of gestation
	Embryo		14 days – 8 weeks of gestation
	Fetus		9 weeks – Birth
Perinatal			22 weeks of gestation – 7 days after birth
Postnatal	Newborn	Early	0 – 7 days after birth
		Late	8 – 28 days after birth
	Infancy		Till 1 yr
	Toddler		1 – 3 yrs
	Preschool		3 – 6 yrs
	School age		6 – 12 yrs
	Adolescence	Early	10 – 13 yrs
		Mid	14 – 16 yrs
		Late	17 – 19 yrs

Growth Patterns :



Scammon growth curve

- A : Brain growth (Max at 2 yrs). Parabolic.
- B : Lymphoid growth (E.g : Tonsils). >100% adult size.
- C : Somatic growth. Growth spurt after 12 yrs.
- D : Gonadal growth

Anthropometry

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Weight :

- Average birth weight : 2.9 Kg.
- Low birth weight (LBW) : < 2.5 Kg.

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Weight loss after birth : D/t loss of excess extracellular fluid.

	Weight loss (In % in 1st week)	Regains weight by
Term	10	10th day
Preterm	15	15th day

Weight gain :

Age	↑ in weight
Till 3 months	30 g/day
Till 1 yr	400 g/month
1 – 7 yrs	2 Kg/yr
>7 yrs	3 Kg/yr

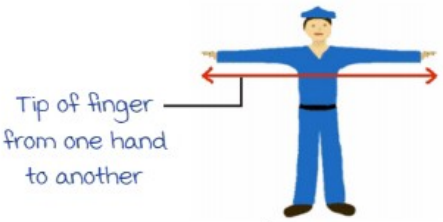
- Doubles : 5 – 6 months
- Triples : 1 year
- Quadruples : 2 years

} After birth.

Height/Length (< 2 years) :

Arm span : Height equivalent in older children.

Comparison	Age
Arm span (< 2.5 cm) < Length	Birth
Arm span = Length	11 yrs
Arm span (> 1 cm) > Length	> 11 yrs



Arm span

Increase in height :

Age	Height
At birth	50 cm
At 1 year	75 cm
At 2 years	87.5 cm (Height = Half of adult height at 18 to 24 months)
> 2 yrs – Till puberty	↑ of 6 cm/yr
Growth spurt at puberty	• Boys : 20 – 30 cm • Girls : 16 – 28 cm
Adult	160 – 170 cm

- Doubles (100 cm) : 4 years.
- Triples (150 cm) : 12 years.

Circumference :

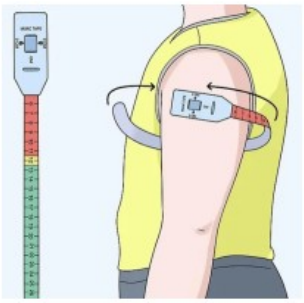
Mid arm circumference (MAC) :

- Nutritional status assessment.
- Age : 1 – 5 years.

Shakir's tape :

- Normal : >12.5 cm
- Malnutrition : 11.5 – 12.5 cm
- Severe malnutrition : <11.5 cm

Shakir's tape



Head circumference :

Brain growth assessment.

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Age	Head circumference & growth rate
At birth	33 – 35 cm (34 cm)
First 3 months	2 cm/month (40 cm)
3 – 6 months	1 cm/month (43 cm)
6 months – 1 yr	0.5 cm/month (46 cm)
1 – 2 yr	2 cm/year (48 cm)
At 12 yrs	Adult value : 52 cm

WHO Growth Chart, Dentition & Puberty

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WHO Growth Chart :

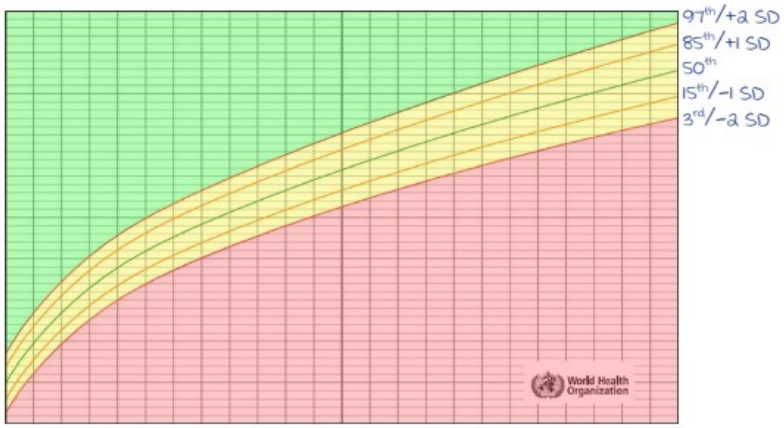
Colours :

- Pink : Girls.
- Blue : Boys.

: Tall stature (>97th centile/>+2 SD).

: Normal height.

: Short stature (<3rd centile/<-2 SD).



Height for age : Growth chart

Dentition :

	1° dentition (Temporary)	2° dentition (Permanent)
Total no. of teeth	20	32
1st tooth to erupt	Lower central incisor	1st molar
Time of eruption	6 months	6 yrs

Mixed dentition :

- Both temporary & permanent teeth.
- Age : 6 – 12 yrs.

Supernumerary teeth :

- Additional teeth.
- m/c : In b/w 2 central incisors.

Delayed dentition : Non-appearance of teeth by 13 months.

Cause :

- Idiopathic (m/c).
- Malnutrition.
- Genetic syndromes (Down, Turner).
- Hormonal deficiency (GH, thyroid).

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Puberty Changes :

Females (8 – 13 years) :

Thelarche : Breast enlargement
↓
Pubarche : Pubic hair appearance
↓
Growth spurt
↓
Menarche.

Males (9 – 14 years) :

Testicular enlargement
↓
Penile enlargement
↓
Pubarche
↓
Growth spurt
↓
Axillary & facial hair.

Sexual maturity rating (SMR) : Tanner's staging.

Stage 1 : Prepubertal.

Stage 3 : Growth spurt in girls.

Stage 4 : Growth spurt in boys.

Stage 5 : Adult-like.

Short Stature

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Height/age : < 3rd percentile or < -2 SD.

Causes :

- Normal variants (m/c than pathological causes).
  - Constitutional delay : m/c cause of short stature & delayed puberty.
  - Familial short stature.

Mid parental height : Child's genetic potential.

$$\frac{\text{Father's height} + \text{mother's height}}{2} \pm 6.5$$

- For boys : + 6.5
- For girls : – 6.5

Constitutional delay vs familial short stature :

	Constitutional delay	Familial short stature
Adult height	Normal	Short
Puberty	Delayed	Normal for age
Bone age		
Parent's height	Normal	Short

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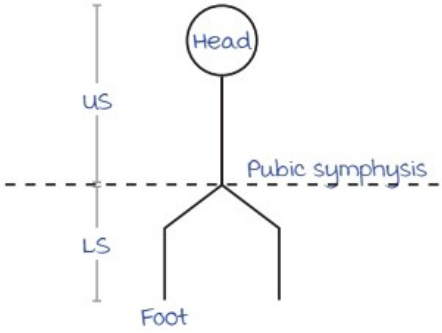
US:LS Ratio :

Age	US : LS
At birth	1.7 : 1
3 yrs	1.3 : 1
10 yrs	1 : 1
>10 yrs	0.9 : 1



US : Upper segment
LS : Lower segment

Approach to short stature :

US : LS ratio is normal for age : Proportionate short stature	US : LS ratio is abnormal for age : Disproportionate short stature	
	Short trunk (US)	Short limbs (LS)
• Normal variants • Chronic malnutrition (Stunting) • GH deficiency	• Spondylo-epiphyseal dysplasia • Hemivertebrae • Mucopolysaccharidosis (MPS) • Pott's disease : TB spine	• Achondroplasia • Rickets • Congenital hypothyroidism

Anomalies of Head Size & Growth

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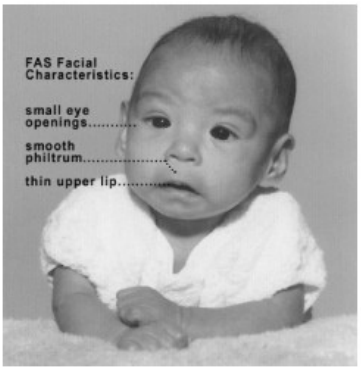
MICROCEPHALY

Causes :

1°/genetic microcephaly	2° microcephaly
• Developmental anomalies • Genetic defects (Trisomies)	• Prenatal : Maternal TORCH infections, teratogenicity • Perinatal : Birth asphyxia • Postnatal : Infections, trauma

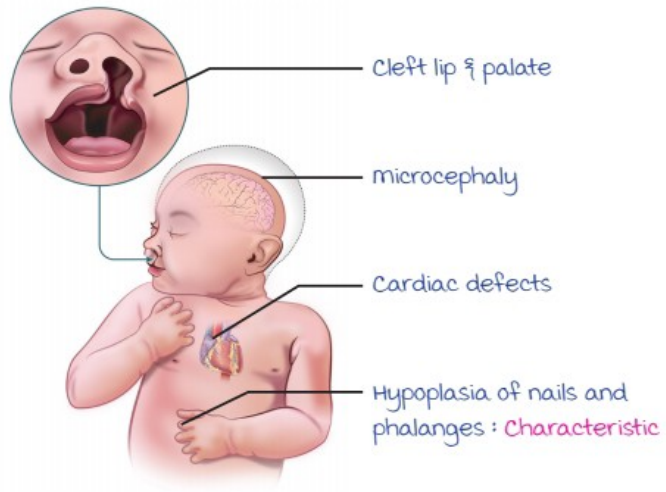
Fetal Alcohol Syndrome :

VSD : m/c heart disorder.



Fetal Hydantoin Syndrome :

VSD : m/c heart disorder.



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Rett's Syndrome :

- X-linked dominant disorder.
- Defect : MECP2 defect.
- Clinical features :
  - Microcephaly
  - Developmental regression
  - Stereotypes : Hand wringing movements
  - Speech defects, ataxia

} Symptoms appear after 1 yr (Normal at birth).

MACROCEPHALY

Causes :

- Hydrocephalus : ↑CSF.
- MPS
- Leukodystrophies :
  - Alexander disease
  - Canavan disease

} Megalencephaly.

- Thalassemia
- Osteogenesis imperfecta

} ↑Bony component.

Congenital Hydrocephalus :

Normal CSF :

- Adults : 150 mL.
- Infants : 50 mL.

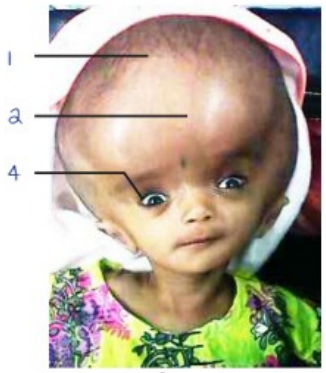
Etiopathogenesis :

Anomalies → Obstruction in CSF pathway.

Aqueductal stenosis (m/c) : Narrowing b/w 3rd & 4th ventricle.

Clinical features :

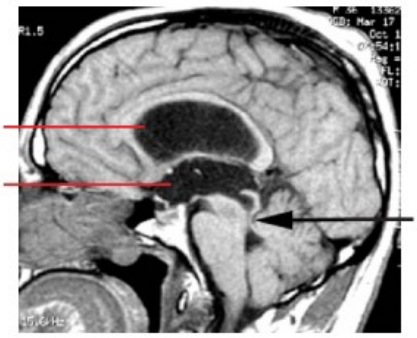
1. Macrocephaly :
   >2 cm/month ↑in head circumference.
2. Bulging fontanelle.
3. Congested/prominent scalp veins.
4. Sunset appearance : Visible upper sclera (D/t downward rotation of eyeball).
5. Cracked pot resonance : D/t ↑pressure.



Features of macrocephaly

Investigation :

- Postnatal MRI :



- Intranatal USG :
  - Anomalies detected at 2nd trimester.
  - Fetal ventriculomegaly (m/c cause : Aqueductal stenosis).

Management :

- Ventriculo-peritoneal shunt (m/c) : CSF shunting.
- Endoscopic 3rd ventriculostomy.

Disorders of Puberty

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Abnormal onset of 2° sexual characteristics :

	Males	Females
Delayed puberty	> 14 yrs	> 13 yrs
Precocious puberty	< 9.5 yrs	< 8 yrs

Delayed Puberty :

Cause :

Constitutional delay (m/c).

Central causes	Peripheral causes
• CNS abnormalities (Pituitary/hypothalamus) : Tumours, trauma, infiltration in pituitary. • Syndromes : Kallman syndrome (Anosmia).	• Genetics (Gonadal defects) : – Turner : Streak ovaries. – Klinefelter, Noonan } Cryptorchidism.

Precocious Puberty :

Central causes (Pituitary, hypothalamus) : Gonadotropin dependent (↑ LH, FSH)	Peripheral causes : Gonadotropin independent
• Tumours : – Hypothalamic hamartoma (m/c overall & m/c in boys). – Glioma. • Idiopathic (m/c in girls).	• Functional testicular tumors (↑testosterone) : Seminoma, germinoma. • Autonomously functioning ovarian cyst : McCune Albright syndrome. – Precocious puberty (D/t ↑estrogen). – Polyostotic fibrous dysplasia. – Cafe-au-lait macules.