

VOLUME 1



PrepLadder



PEDIATRICS

NEET SS

VERSION 4.0

PREFACE

Dear Dreamer,

Pat your back and reward yourself, today you've taken an important step towards reaching your dream. Mark Twain said, "the secret of getting ahead is getting started". You have started in the right direction.

The next few months until your targeted exam or exams are crucial. Every moment counts and each step you take now, will help you reach your goal, your dream.

PrepLadder is your partner in this journey. We are in this together. So, don't worry, do not stress. Just focus on your preparation and stay positive. Set daily targets, achievable and realistic ones. If you pass the target, celebrate. However, if you miss a daily target, forgive yourself, move on and do better the next day.

Always remember that you are special and unique. Do not compare your preparation, your speed, your abilities with others. Believe us, it doesn't help.

Practice a lot. Solve the QBank. Take Grand Tests. Review your performance. But don't let ranks and results drag you down. Rather use them as a guiding light to know your strengths and weaknesses, to increase your speed and accuracy, and to get yourself ready for the exam day.

If you have a doubt or a question, ask us. We are here.

Lastly and most importantly, take care of yourself. You and your health are precious. So, keep up with exercise, eat healthy, get enough sleep and care for yourself.

We're behind you, cheering you on to the finish line. You might be feeling stressed, overwhelmed, and so tired, but you're nearly there. Give it everything you've got, and know that whatever happens next, you've got what it takes for the life you want. You are a Champion.

Own Your Dream
Team PrepLadder



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GROWTH AND DEVELOPMENT

1 GROWTH AND ANTHROPOMETRY-I



Growth Vs Development

00:00:55

Growth

- Refers to an increase in the size or number of cells or tissue or even organ systems.
- It is measured **quantitatively**.

Development

- Refers to the maturation of function.
- It is measured **qualitatively**.

Terminologies Used in Childhood

00:02:57

- Ovum: Till **2 weeks** after fertilization.
- Zygote: From the **15th day till 8 weak gestations**
- Fetus: For the **9th-week gestation** till the birth of a child.
- Perinatal period: **22nd week** of gestation till the **7th day** of postnatal life.
- Neonate (Newborn): A child up to **1st 4 weeks** of postnatal life.
 - The early neonatal period is 0-7 days.
 - The late neonatal period is 8- 28 days.
- Infants: Up to **1 year** of age.
- Toddler: A child **> 1-3 years**.
- Pre-school age child **>3-6 years**.
- School-age child **> 6 -12 years**.
- Adolescence: **10 - 19 years** of age, according to WHO, UNICEF and ICMR publications.
 - The early adolescence period is 10 -13 years.
 - Mid adolescence period is 14 - 16 years.
 - The late adolescence period is 17 -19 years.

Growth Patterns in Humans

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- Human growth occurs through **Cephalocaudal**.
- **Distal to proximal**

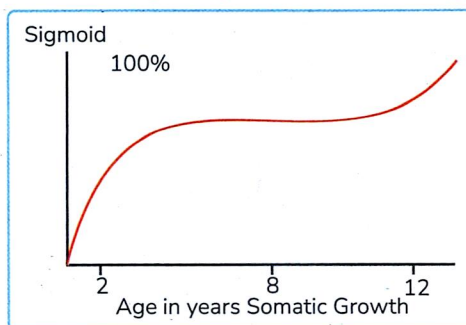
Growth Curve

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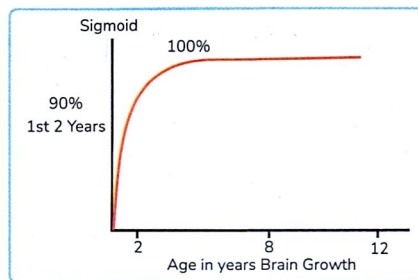
- The growth curve is called **Scammon's**.

A. Somatic Growth

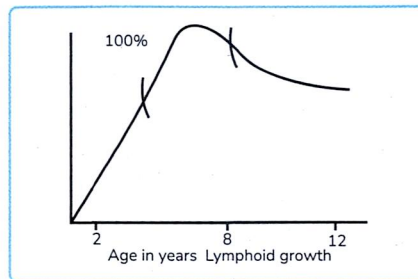
- Refers to the general body growth pattern.
- Somatic growth shows a curve pattern known as a **sigmoid pattern**, i.e., an “S” shape curve.



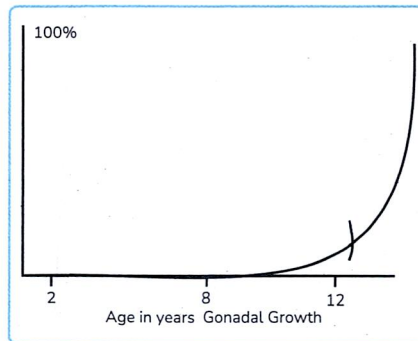
B. Brain Growth



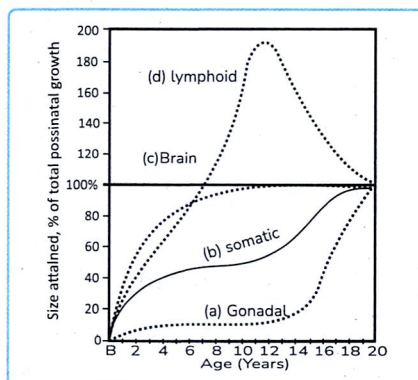
C. Lymphoid Growth



D. Gonadal Growth (Reproductive Tissue Growth)



The following image is the combined graph of all four growth curves.



Facts and One-Liners to Remember

- Maximal lymphoid growth occurs: Between **4-8 years** of age
- Hormones important in fetal growth:
 - Insulin
 - Thyroxine
 - Glucocorticoids
- GH has little to no role in fetal growth.
- Thyroxine secretion into the fetus begins at **12 weeks of gestation**.

- Anthropometry measures height, weight, length, and related body circumferences.

Weight Gain Patterns

First 3 months of normal growth pattern

- In the first 7 days of life, a weight loss is up to **10% of birth weight**.
- From the 7 - the 10th day, birth weight is regained. **Normal**
- > 10th day, true or visible weight (i.e., **25 - 40 g/day till 3 months of age**) gain can occur. } **Normal**

Scenarios

Scenarios in the first 3 months of life are:

- Any weight loss in a unit in the **1st 7 days** up to 10% is **normal**.
- Any weight loss of > **10%** in the first week is always **abnormal** (Due to dehydration due to less feeding of a child).
- Any abnormal weight gain in **1st week of life** is **abnormal**.
 - Fluid retention in the child due to congestive cardiac failure (CCF)
 - The most common cause of CCF is Patent Ductus arteriosus
- Beyond 3 months: **Weech's Formulas**
 1. The child aged 3-12 months.
 - The expected weight in kg is given by: $\frac{\text{Age (in months)} + 9}{2}$
 2. The child's age is 1-6 years old
 - Expected weight = $[(\text{Age in years}) \times 2] + 8$
 3. The child is 7-12 years old
 - Expected weight: $\frac{[(\text{Age in years}) \times 7] - 5}{2}$

Ready-reckoners for Weight

Birth weight of child	x
At 5 month	2x
At 1 year	3x
At 2 year	4x
At 3 year	5x
At 5 year	6x
At 7 year	7x
At 10 year	10x

MCQ

Example of Questions

Q. Calculate % gain in weight at the end of 1st year of life.

- 50%
- 100%
- 200%**
- 300%

Explanation

- Birth weight = x
- At 5 months = 2x
- At 1 year = 3x
- So, gain in weight = $3x - x = 2x$
= 200 %

Height / Length Gain Pattern

00:28:07

- At birth normal length = 50 cm
- At 1 year = 75 cm
- At 2 years = 85-90 cm
- 4 years = 100 cm

The expected height formula is given by

- Exp. ht (in cm) for age 2-12 yr = $[Age \text{ (in yr)} \times 6] + 77$

Height Velocity Patterns

- 0-6 months: 16 cm in 6 months
- 6-12 months: 9 cm in 6 months
- 1-2 years: 12 cm/year
- 2-5 years: 6 cm/year
- 5-10 years: 5-6 cm/year

Target Height According to Parental Height

- Target height in males = $\frac{\text{Height of father (cm)} + \text{Height of mother (cm)}}{2} + 6.5$
- Target height in females = $\frac{\text{Height of father (cm)} + \text{Height of mother (cm)}}{2} - 6.5$

Upper Segment: Lower Segment Ratio

00:30:55

- **Upper Segment**
 - It is also called Sitting height
 - At birth **Upper segment: Lower segment ratio** is 1.7: 1 - 1.9: 1
 - At 3 years = 1.3: 1
 - At 6-7 years = 1.1: 1
 - At 8-10 years = 1: 1
 - 10 years = Adult ratio 0.9: 1 (**1: 1.1**)

Head Circumference (HC)

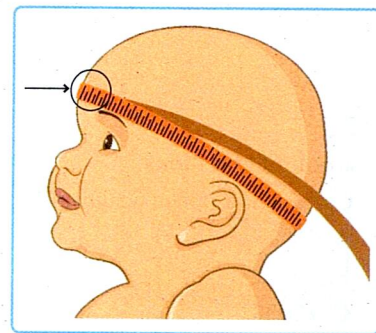
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Normal HC/OFC

- The normal value in a term neonate at birth is **33-35 cm**.
- Dine's Formula for HC = $\left(\frac{\text{Length}}{2} + 9.5\right) \pm 2.5$
- Range of HC = 44.5 ± 2.5

Gain pattern of HC/OFC

- 1-3 months: 2 cm/month
- 4-6 months: 1 cm/month
- 7-12 months: 0.5 cm/month
- 1-3 years: 0.2 cm/month
- 3-5 years: 1 cm/year



Q. Calculate the expected HC at 6 months in a normal child.?

- The normal value at birth is 33-35 cm.
- For 1-2 months, the gain pattern is 2 cm/month.
- So, for 3 months, $2 \times 3 = 6$ cm

- For 4-6 months, the gain pattern is 6 cm/month.
- The total gain at the end of 6 months will be 9 cm/month.
- Expected head circumference at 6 months of age = 42-44 cm

Relation of Chest Circumference to HC

- In a normal child at birth $HC > CC$ by 3 cm.
- At 9-12 months: $HC = CC$
- At > 12 months: $CC > HC$

MCQ Points

- In a child aged 15 months: $HC > CC$
 - Rule out protein energy manipulation (PEM, i.e., the chest is very small)
 - Also rule out macrocephaly (head is too big).
- In a day 1 child: $HC > CC$ by 6 cm,
 - Rule out Hydrocephalus (head is too big)
 - Rule out Asymmetrical IUGR (Chest is shrunken).



Other Anthropometric Measurements

00:00:20

Stem Stature Index (SSI)

- The upper segment refers to the **height from the top of the head to the midpoint of the pubic symphysis**.
 - It is also called **sitting height or crown-rump length**.

$$SSI = \frac{\text{Sitting Height (Crown-rump length)}}{\text{Total Height}} \times 100$$

- As age advances, **the upper segment to lower segment ratio tends to fall, so the SSI index also falls**.
- SSI value

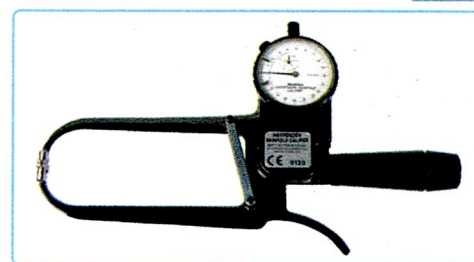
At birth	70
At 6 months	66
At 1 year	64
At 2 years	61
At 3 years	58
At 5 years	55
At puberty	52

- The SSI is around 50 or just **below 50 in the case of adult**.

Triceps Skin Fold Thickness

00:02:19

- It is a technique to measure **subcutaneous fat** in the case of children.
- Two methods are used to measure triceps skin fold thickness
 - Herpendan's caliper**: It is used in most medical colleges.
 - It checks for **skin fold thickness**; if it is **< 10 mm**, it indicates **undernutrition in children**.
 - Lange's caliper**



MCQ point

- More accurate index of body fat: Total body water/ Body weight
 - Difficult to do accurately in children

Concept of Bone Age

00:04:23

- Bone age refers to the **age of a person or a child** according to **bone maturity** (number of ossification centers).
 - It may or may not relate to chronological age.
- Chronological age is age according to date of birth.
- X-ray of the bones is taken to calculate bone age.
 - These ages are virtually together in a normally growing child.
 - In children of short stature**, it is often found that the **chronological age** is more than bone age.
- Methods to calculate bone age are-
 - Greulich and Pyle's atlas method
 - Tanner-Whitehouse method

Sites for Bone Age Determination by X-Ray

00:06:43

- Newborns (neonatal) - Foot and Ankle
- 3-9 months - Shoulder

- 1-12 years - Hands and Wrist
- 12-14 years - Elbow and Hips

Significance of Bone Age

- It refers to the skeletal maturity of an individual.
- In most cases of short stature, **the chronological age > bone age**.

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Exceptions

- In **Familial short stature**- chronological age = bone age.
- In **Precocious puberty and thyrotoxicosis**, bone age may exceed chronological age.

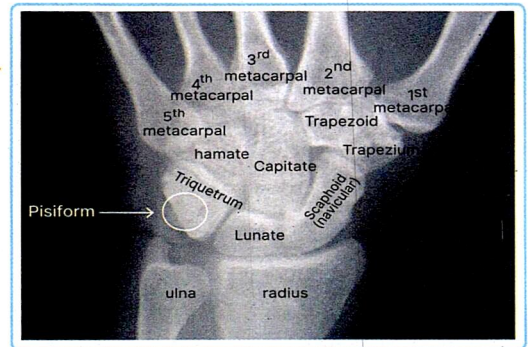
Ossification centres

- At birth, 5 ossification centres are present
 - Distal end of femur
 - Proximal end of tibia
 - Talus
 - Calcaneus
 - Cuboid bone

00:09:06

Time Frame of Appearance of Ossification Centres in Carpal Bones

- **The first bone to ossify is the capitate bone**, which ossifies around 1-3 months.
- **Hamate** appears at 2-4 months.
- **Triquetrum** appears at 2-3 years.
- **Lunate** appears at 2-4 years.
- **Scaphoid** appears at 4-6 years.
- **Trapezoid** appears at 4-6 years
- **Trapezium** appears at 4-6 years.
- **Pisiform** appears at 8-12 years.



Important Information

- Number of ossification centers at the wrist = Age in year + 1

Dentition in Children

00:12:14

- It is broadly of two types
 - **Deciduous teeth** (Temporary)
 - They are 20 in number.
 - The **first tooth** to arise is **the incisor**.
 - They erupt around **6-7 months of age**.
 - By 2 and a half - 3 years of age, all 20 teeth are present.
 - **Permanent teeth**
 - They are 32 in number.

MCQ

Q. What is the number of teeth expected in a normal infant aged 10 months?

- A. 2
 - B. 3
 - C. 4
 - D. 6
- Number of deciduous teeth in infancy = age in a month - 6
 - $10 - 6 = 4$