

Chapter 10

Reaching the Age of Adolescence

Adolescence and Puberty

◆ Adolescence:

⇒ The period between childhood and adulthood is called adolescence.

⇒ During this period, the body undergoes changes, leading to reproductive maturity.

⇒ Adolescence begins around the age of 10 or 11 years and last lasts up to 18 or 19 years of age.

⇒ This period covers the teen's age of 13 to 18 years if age, the adolescents are also called teenagers.

***Note: Adolescence in girls, may begin a year or two earlier than in boys. It may vary from person to person.**

◆ Puberty:

⇒ The period during adolescent boys and girls reach sexual maturity and become capable of reproduction is called puberty.

⇒ Girls attain puberty at the age of 10 to 13 years and boys at the age of 12 to 14 years.

Changes at Puberty

1. Increase in height:

The most conspicuous change during puberty is the sudden increase in the height of boys and girls. During puberty, the long bones (bones of legs and arms) elongate and make a person tall. During puberty, the girls grow faster

than boys but by the age of 18 years, both girls and boys reach their maximum height.

2. Change in body shape and appearance:

⇒ Changes in boys - Boys develop broader shoulder, wider chest, and Adam's apple (protruding part of the throat). Boys also develop facial hair, mustache, and beard.

⇒ Changes in girls – Girls develop broader hips, the region below the waist becomes wider in girls. Girls also develop breasts.

3. Change in voice:

During puberty, boys develop a larger voice box (larynx). This can be seen in boys as a protruding part of the throat called Adam's apple. The larynx is small in girls so it is not clearly visible.

Note: Boys have deep voices and girls have a very high-pitched voice.

4. Development of pimples and acne on the face:

The secretion of sweat glands and oil glands (sebaceous glands) increases during puberty. Due to this pimples and acne are formed on the face during this time.

5. Development of sex organs:

During puberty, the male sex organs like the testis and penis develop completely. During this time the penis starts producing sperms. In girls, the ovaries enlarge and start releasing mature eggs.

6. Reaching mental, emotional, and intellectual maturity:

During adolescence boys and girls become more mature, independent. Adolescence is the time in boys' and girls' life when the brain has the greatest capacity for learning.

* The average growth rate in height of boys/girls with age:

$$\text{Full height of a person} = \frac{\text{Present height of person}}{\text{Percentage of full height at present age}} \times 100$$

Example: A 11 year old girl is 140 cm tall. If the present height of the girl is 88% of her full height, calculate the full height of the girl at the end of her growth period.

Ans: Full height of the girl = $\frac{140}{88} \times 100 = 159 \text{ cm}$

Secondary Sexual Characters

⇒ The sexual characteristics which are present at birth are called primary sexual characters.

⇒ It includes internal and external sex organs which are present in babies (girls and boys) at the time of their birth.

⇒ During puberty, the reproductive organs start producing sperms and ova in boys and girls.

⇒ Breast development occurs in girls and facial hair, moustaches and beards begin to grow in boys.

⇒ All these features help to distinguish the male from female is called secondary sexual characters.

⇒ Secondary characters in males are:

- Hair growth on the face, chest and underarms.
- Shoulder and chest broaden.
- Adam's apple develops in the front throat in boys.

⇒ Secondary characters in females are:

- Development of breast.
- Hips broaden and become curved.
- Hair grows under the arms.

Role of Hormones in Initiating Reproductive Function

◆ Hormones:

All the changes which occur during puberty in boys and girls are controlled by hormones. Hormones are chemical substances that are made and secreted by specialized tissues in the body called endocrine glands. The endocrine gland secretes hormones directly into the blood and it is carried by the bloodstream to a particular body part called the target site.

◆ Sex Hormones:

Sex hormones are involved in the development and control of the reproductive organs and secondary sexual characteristics. The production of sex hormone is under the control of another hormone secreted by the pituitary gland. There are two types of sex hormones: Testosterone (male hormone) and Estrogen (female hormone).

(a) *Testosterone:*

Testes make a male sex hormone called testosterone at the time of puberty. This causes changes in boys during puberty.

(b) *Estrogen:*

During puberty in girls, the ovaries begin to produce the female sex hormone called estrogen. Estrogen hormone produces female secondary sexual characteristics (development of breast, broaden hips, growth of hair under the arms, etc.).

***Tip: Milk secreting gland or mammary glands develop inside the breasts of the female is under the control of pituitary gland.**

Reproductive phase of life in humans

- The capacity to produce female gamete (ovum) in a woman starts at puberty (10-12 years) and lasts till the age of 45 to 50 years of age.
- But in males, the capacity of producing male gametes (sperms) usually lasts throughout life. Due to this, the reproductive phase of life in men is much longer than in women.

◆ Menstruation:

With the onset of puberty, the egg begin to mature in the ovaries of a woman. One mature ovum is released by one of the ovaries of the women once in about

28-30 days. During this period the inner lining of the uterus grows and becomes thick to receive the fertilized egg. In case the fertilization of eggs by a sperm occurs, the fertilized egg divides to form an embryo. This embryo then gets embedded in the thick uterus. This results in pregnancy. If the fertilization does not occur, the egg released by the ovary dies within a few days and the thick lining of the uterus along with blood vessels breaks down. This causes bleeding in women every month which is called menstruation.

⇒ Menarche: The first occurrence of menstruation at puberty is called menarche.

⇒ Menopause: At the age of 45-50 years the menstruation stops completely in women and it is termed menopause.

How is the Sex of the Baby Determined?

- All human beings have 23 pairs (46) of chromosomes in the nuclei of their normal body cell.
- Out of these 1 pair (2) of chromosomes are called sex chromosomes. There are two types of sex chromosomes: X and Y chromosome.
- The gametes (sperm and ova) contain only 23 single chromosomes. Hence, they have only one sex chromosome (either X or Y). In females, all the gametes (eggs) contain X chromosomes.
- On the other hand, in males, half of the gametes (sperms) have X chromosomes and half of the gametes have Y chromosomes.
- The baby developed from XX combination of sex chromosomes is a girl and the baby developed from XY combination of sex chromosomes is a boy.
- Thus, the sex chromosomes of the father determine the sex of the baby.

Hormones other than Sex Hormones

- A gland is a structure that secretes a specific substance in the body.
- There are two types of glands in our body:

(a) Exocrine gland – The gland which secretes its product into a duct (tube) is called the exocrine gland. Eg: Salivary gland, sweat gland, and oil gland.

(b) Endocrine gland – The gland which secretes its product directly into the bloodstream is called the endocrine gland. They do not have ducts so they are also called ductless glands. Some example of the endocrine gland is the pituitary gland, thyroid gland, pancreas, and adrenal gland.

◆ Thyroid gland:

The thyroid is a large endocrine gland in the neck. The thyroid gland produces a hormone called thyroxin. Thyroxin hormone controls the rate of body metabolism. The thyroid gland requires iodine in order to produce the thyroxin hormone. The deficiency of iodine in the diet causes a disease known as goiter.

◆ Adrenal gland:

An adrenal gland is an endocrine gland. It produces a hormone called adrenaline. Adrenaline helps our body to adjust the stress, anger, fear, shock, surprise, anger, or excitement.

◆ Pancreas:

The pancreas is an endocrine gland that secretes the hormones called insulin. The function of insulin is to lower the blood sugar level. The deficiency of insulin hormone causes a disease called diabetes. The person suffering from diabetes is characterized by a large quantity of sugar in the blood and the person is advised to take insulin injection to control sugar level in the blood.