

Reaching The Age Of Adolescence 10

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Adolescence begins with puberty beyond 12 years of age, and lasts when a youth is a young man or woman of 20. In the previous chapter, you have learnt how animals reproduce. In this chapter we will learn about changes that take place in the human body after which a person becomes capable of reproduction. Here we will also discuss the role that hormones play in bringing about changes that make a child grow into an adult.

ADOLESCENCE

Adolescence is the transitional stage of human development, during which a juvenile matures into an adult. It is the phase in which physical and more subtle changes are noticed in children, and a period of psychological and social transition from childhood to adulthood.

Growth begins from the day one is born. From baby to childhood is infancy. This period is generally up to the age of 7 to 8 years. But upon crossing the age of 10 or 11 there is a sudden spurt in growth which becomes noticeable. Then begins the reproductive maturity. The changes taking place in the body are part of growing up. They indicate that you are no longer a child but are on the way to becoming an adult.

Girls at the age of 11 to 12 years and boys at the age of 14 to 15 years attain puberty (the reproductive maturity). Simultaneously, some major changes in the body of the girls and boys take place which continue up to the age of 19 or 20 to bring about complete maturity. This period of life, when the body undergoes change, leading to reproductive maturity, is called adolescence. Adolescence begins around the age of 11 and lasts up to 18 or 19 years of age. In girls adolescence may begin a year or two earlier than in boys.

Puberty

Puberty is the stage in which a child develops secondary sexual characteristics such as deeper voice or large Adam's apples in boys, increase in height in both, etc., as the hormonal balance of the boy or a girl shifts strongly towards an adult state. These changes mark the onset of puberty. The most puberty is that boys and girls become capable of reproduction. The onset of sexual maturity occur in boys at he age of 11 - 16 years, and in girls at the age of 10 - 15 years. Puberty ends when an adolescent reaches reproductive maturity.

Changes At Puberty

Increase Height : The most consicuous change in height is the first noticeable effect at puberty. At this time the bones of the arms and the legs elongate and make person tall. The rate of growth is not the same. It varies from individual to individual. The following table gives the average rate of growth in height of boys and girls with age.

It has something been seen that girls grow quickly at the onset of puberty. There is a marked progress and then the growth suddenly stops.

Calculation for full height (cm) :

$$\frac{\text{Present height (cm)}}{\% \text{ of full height at this age}} \times 100$$

Age in Year	% Full Height	
	Boy	Girls
8	72%	77%
9	75%	81%
10	78%	84%
11	81%	88%
12	84%	91%
13	88%	95%
14	92%	98%
15	95%	99%
16	98%	99.5%
17	99%	100%
18	100%	100%

Example : A boy is 12 years old and 130 cm tall. At the end of the growth period he is likely to be

$$\frac{130}{84} \times 100 = 154.76 \text{ cm tall}$$

You must have noticed that height of an individual is more or less similar to that of some family member. This is because height depends on the genes inherited from parents. It is however, very important to eat the right kind of food during these growing years. This helps the bones, muscles and other parts of the body get adequate nourishment for growth.

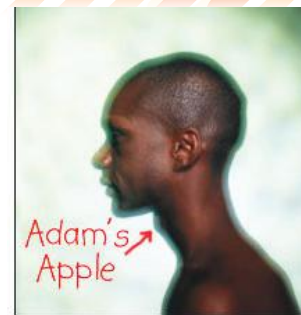
Do You Know ?

Pituitary is called the master gland of the body as it secretes many hormones.

Changes in Body Shape : Sometimes the arms and legs of or hands and feet of adolescents look oversized and out of proportion with the body. But soon the other parts each up and result in a proportionate body. Have you noticed that students in your class have same shoulders and same chests than the students in junior class ? This is because they have entered the age of puberty when shoulders generally broader as a result or growth. In boys change in body shape with broader shoulders and wider chest, while in girls change in body shape with broader shoulders, narrow waist and this region below the waist and around the hip girdle gets wider.

Thus, changes occurring in adolescent boys and girls are different.

Change in Voice : In boys voice change due to better growth of larynx, which may produce on the throat forming 'Adam's apple'. The voice in boys is deep and hoarse. While in girls the larynx is hardly visible from the outside because of its small size. Generally, girls have a high pitched voice. In adolescent boys, sometimes, the muscles of the voice becomes hoarse. This state may remain for a few days or weeks after which the voice becomes normal.



Adam's apple in a grown up boy

Increased Activity of Sweat and Sebaceous Glands

During puberty the secretion of sweat glands and sebaceous glands (oil glands increases). In boys, more of secretions from oil glands (sebaceous Glands) making skin oily and shining (glowing). While in girls, more of secretions from oil glands making skin soft, oily and glowing, may develop acne (pimples). Many youth develop acne and pimples of their faces because of the increased activity of these glands in the skin.

Development of Sex Organs : At puberty, in boys, sex organs like the testis and penis develop complete. The testis also begin to produce sperms. In girls the ovaries enlarge and eggs begin to mature. Also ovaries start releasing mature eggs.

Reaching Mental, Intellectual and Emotional Maturity : At puberty, adolescence is also a period of change in a person's way of thinking. Intellectual development takes place and they tend to spend considerable time thinking. In fact, it is often the time in one's life when the brain has the greatest capacity for learning. Sometimes, however an adolescent may feel insecure while trying to adjust to the changes in the body and mind, but as adolescent learners, you should know that there is no reason to feel insecure. These changes are natural part of growing up.

Secondary Sexual Character : These are the traits that distinguish the two sexes of an individual. In girls breasts begin to develop at puberty and boys begin to grow facial hair, that is moustaches and beard. As these features help to distinguish the male from the female they are called secondary sexual characters. Boys also develop hair on their chest. In both, boys and girls, hair grows under the arms and in the region above the thighs or the pubic region. The male adolescent usually becomes significantly taller. Shoulders and chest get broader. Skull and bone structure become heavier. Muscle mass and physical strength also increase. In females, the secondary sex characteristics are seen as height gain, but with shoulder stature than boys less facial hair, high-pitched voice and enlarged and functions mammary glands.

The changes which occur at adolescence are controlled by hormones. These are secretions from endocrine glands or endocrine system. The male hormone or testosterone begins to be released by the testes at the onset of puberty. This causes changes in boys about which you have just learnt. For example, the growth of facial hair.

Role of Hormones in Initiating Reproductive Function

Reproductive functioning begins with the maturation of sex organs and with the secretion of Follicle Stimulating Hormone (FSH) from the pituitary gland. We have learnt that hormones are responsible for the male and female secondary sexual characters. Further the sex hormones are under the control hormones from the pituitary gland. The pituitary secretes many hormones, one of which makes ova mature in the ovaries and sperms form in the tests.

Reproductive Phase of Life in Humans : Adolescence is the transitional stage of human development, during which a juvenile matures into an adult. Adolescents become capable of reproduction when their testes and ovaries begin to produce gametes. The capacity for maturation and production of gametes lasts for a much longer time in males than in females.

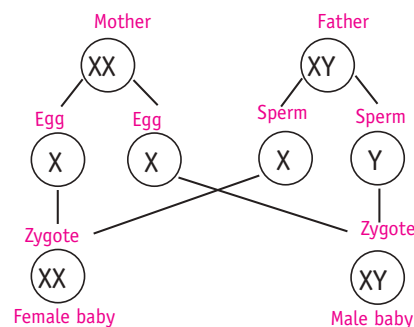
In females the reproductive phase of life begins at the age of 10 to 12 years and last up to the age of 45 to 50 years. During puberty, ova begin to mature in ovaries. One ovum from any one of the two ovaries is released into the fallopian tube once in about 28 to 30 days. During this period, the wall of the uterus becomes thick, so as to receive the egg, in case it is fertilised and begins to develop. This result in pregnancy. If fertilisation does not occur, the released egg and the thickened lining of the uterus along with its blood vessels are shed off. This is known as menstruation. Menstruation occurs once in about 28 to 30 days. Since menstruation occurs one in about 28 to 30 days, it is called 'period' or menstrual flow is called menarche and begins with puberty.

At the age of 45 to 50, the menstrual cycle stops. Stoppage of menstruation is called menopause. Menstrual cycle is controlled by hormones. The cycle includes the maturation of the egg. Its release thickening uterine wall and its break down if pregnancy does not occur. In case the egg is fertilised it begins to divide and then gets embedded in the uterus for further development.

How is the Sex of the Baby Determined ?

Inside the fertilised egg or zygote is the instruction for determining the sex of the baby. This instruction is present in the thread like structures called chromosomes.

All human beings have 23 pairs of chromosomes in the nuclei of their cells. Two chromosomes named X and Y. A male has one X and one Y chromosomes, while a female has two X chromosomes. The gametes (egg and sperm) have only one set of chromosomes. The unfertilised egg always has one X chromosomes. But sperms are of two kinds : One kind has a X chromosomes and the other kind has a Y chromosomes.



Boy or Girl : X chromosomes stands for female and Y chromosomes for male character. When an egg is fertilised by sperm having X chromosomes, the zygote is XX and the baby developing from

it is a female baby (a girl child). When an egg is fertilised by sperm having Y chromosomes, the zygote is XY and the baby developing from it is a male baby (a boy child).

Sex of the child depends upon the sex chromosomes present in the sperm fertilising the egg. Thus, sperm from the father is responsible for the sex of the child and not the mother. The belief that the mother is responsible for the sex of her baby is completely wrong and to blame her for this is totally unjustified.

Endocrine Glands : Hormones other than Sex Hormones : A gland is a group of cells that produces and secretes chemicals. A gland selects and removes certain materials from the blood, processes them and secretes the refined chemical product for use somewhere in the body.

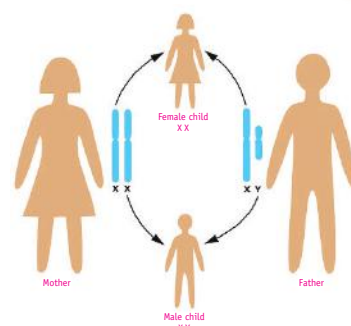
Endocrine glands and their functioning is called the endocrine system. The endocrine system consists of a number of glands which release substances called hormones into the blood. Hormones regulate many functions in the body. Each hormone is required in very small quantities and has its own specific function. Hormones control growth, development, behaviour and reproduction. Glands that produce hormones are located in various parts of the body. These glands are of two kinds :

- 1. Glands Secreting Hormones** are pushed into the blood stream. Blood carries the hormones secretion to the affective organ where they stimulated the required changes. These glands do not have and released the hormones directly into the blood stream. They are also called ductless glands.
- 2. Glands Secreting Juice** which come out and directly through ducts. Examples are tear glands secreting tears, sweat glands secreting sweat, salivary gland secreting saliva. Similarly gastric glands, pancreatic glands and intestinal gland secreting digestive juice, and liver secreting bile. Such glands are called duct glands.

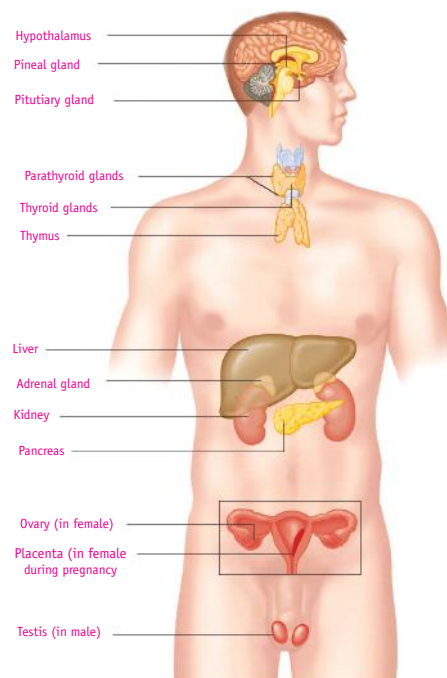
The hormones secreted by the pituitary stimulate testes and ovaries to produce their hormones. We have learnt that the pituitary gland is an endocrine gland. It is attached to the brain.

Apart from the pituitary, the testes and the ovaries, there are other endocrine glands in the body such as thyroid, pancreas and adrenals.

Pituitary gland : The pituitary gland is located at the base of the brain just beneath the hypothalamus. It is no longer than a bee, but it is considered the most important part of the



Sex determination in humans



The endocrine gland in humans

endocrine system. It is often called the master gland because it produces hormones that control several other endocrine glands.

Thyroid Gland : The thyroid gland produces a hormone (thyroxine) that affects growth. Thyroxine which regulates physical and mental growth, metabolism (cell formation) and blood cholesterol. Tall, short, fat and thin body is regulated by thyroxine. Calcitonin which maintains calcium level in blood.

Pancreas Gland : The pancreas re-creates the hormone insulin which regulates the amount of sugar in blood. Deficiency of insulin results in diabetes.

Adrenal Gland : Adrenal glands are two, located one on each kidney. They secrete hormones which maintain the correct salt balance in the blood. Adrenal also produce the hormone adrenalin. It helps the body to adjust to stress when one is very angry, embarrassed or worried. It prepare the body to fight or to run away. Thyroid and adrenal glands secrete their hormones when they receive orders from the pituitary through its hormones. Pituitary also secretes growth hormone which is necessary for the normal growth of a person.

Sex Gland : Sex glands are testis in male and ovaries in female. They secrete 'sex hormones' which are responsible for maleness or femaleness-bodily characteristics.

1. Ovaries in female produce two hormones :

(i) Oestrogen : It helps in regulating whole set of female sex character, including formation of ova.

(ii) Progesterone to regulate reproductive (menstrual) cycle.

2. Testes in male produce the hormone 'testosterone' which help :

(i) Male sex characters and

(ii) Production of sperms

Role of Hormones in completing the Life History of Insects and Frogs : We have learnt about the life cycle of the silk moth and the frog. Insect like caterpillar has pass through various stages to become an adult moth. Similarly the tadpole passed through certain stages to become a frog. In the case of tadpoles, they transform into adults capable of jumping and swimming. The transformation of the larva into an adult through drastic changes is called metamorphosis. Metamorphosis in insects is controlled by insect hormones. In a frog, it is controlled by thyroid, the hormone produced by thyroid.

Thyroxine production requires the presence of iodine, in water. If the water in which the tadpole are growing does not contains sufficient iodine, the tadpoles cannot become adults. So hormones play an important role in completing the life history of insects and frogs.

REPRODUCTIVE HEALTH

According to the World Health Organisation (WHO), health is defined as a state of complete

physical, mental and social well-beings, and not merely the absence of disease or 'infirmity. Similarly reproductive health addresses the reproductive process, functions and system at all stages of life. Reproductive health, therefore, implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. To keep the body healthy every human being, at any age, needs to have a balanced diet.

During adolescence and during parenthood both the parents must take care of personal health and hygiene. For this one needs : (1) Physical exercises, (2) Personal hygiene: (i) take daily bath, (ii) clean all the body parts, (3) proper nutrition, (4) No drugs and no smoking and (5) Avoid sexual contact of any kind which may result in HIV (AIDS).

During adolescence, however, these become even more essential as the body is growing.

Nutritional Need of the Adolescents : We learnt that adolescence is a stage of rapid growth and development. Hence, the balance diet for an adolescent has to be carefully planned. A balance diet means that the meals include proteins, carbohydrates, fats and vitamins in requisite proportions. Roti/rice, pulses and vegetable is a balance meal. Milk is a balanced food in itself. Fruits also provide nourishment for infants mother's milk provides all the nourishment that they need. Iron builds blood and iron-rich food such as leafy vegetables, jaggery, meat citrus, Indian gooseberry (amla) are good for adolescents. Therefore, one can eat a balanced diet without expensive food materials.



Nutritious items of food.

Eating the right kind of food is not enough. It should also be cooked properly so that its nutrients are not lost. Check items for lunch and dinner in your meal. Is your meal balanced and nutritious? Cereals, milk, meat, nuts and pulse which provide proteins for growth are necessary in adolescence. Fats and sugar which give energy are also necessary. Fruits and vegetables which are protective food are also necessary for growth.

Personal Hygiene : Right from childhood to the end of the life it is necessary to observe personal hygiene in every walk of life. For this take bath daily. It is more necessary for teenagers because the increased activity of sweat glands sometimes makes the body smelly. All parts of the body should be washed and cleaned everyday. If cleanliness is not maintained there are chances of catching bacterial infection. Girls should take special care of cleanliness during the time menstrual flow.



Playing children



Skipping girl

Physical Exercise : Walking and playing in fresh air keeps the body fit and healthy. All young boys and girls should take walks, exercise and play outdoor games. Exercise and outdoor games keep the body fit and strong. Rope skipping is one of the good exercises for girls and boys. Good health is useful for adolescents.

Say “No” to Drugs : Adolescence is a period of much activity in the body and mind which is a normal part of growing up. So in this age do not feel confused or insecure. If your friend or anybody suggest that you will get relief if you take some drugs, just say “No”. Any kind of drugs are addictive. If you take them once, you feel like taking them again and again,. They harm the body and ruin health and happiness.

You must have heard about **AIDS (Acquired Immune Deficiency Syndrome)**. AIDS is caused by a dangerous virus HIV. This virus can pass on to a normal persons from an infected person by sharing the syringes used for injecting drugs. It can also be transmitted to an infant from the infected mother through her milk. The virus can also be transmitted through sexual contact with a person infected with HIV. So avoid sexual contact of any kind which may result in HIV, infection or any other sexually transmitted diseases (STD).

Take up the responsibilities of parenthood only when you are properly settled in your life. This will keep you mentally, physically, emotionally and financially healthy and you will be able to care for the child in a better way.

Know the Keywords :

Adam's Apple : Projection of cartilage of the larynx especially prominent in men.

Adolescence : Puberty, teenage years.

Balance Diet : Meals include proteins, carbohydrates, fats and vitamins in requisite proportions.

Estrogen : Female sex hormone controlling estrus, etc.

Gland : Groups of cells produces and secretes chemicals.

Hormones : A chemical substance produced endocrine glands.

Insulin : Hormone regulating the amount of glucose in the blood, the lack of which cause diabetes.

Puberty : Period during which adolescents reach sexual maturity.

Sex chromosome : Chromosome determining the sex of an organism.

Target organs : The organs on which the hormones act.

Sperm : The male gamete.

Ovum : The female gamete.

Voice Box : Larynx.

Point to Remember

- Adolescence is the transitional stage of human development, during which a juvenile nature into an adult.
- The most conspicuous change in height is the first noticeable effect at puberty.

- The thyroid gland produces a hormone that affects growth.
- The pancreas secrete the hormone insulin which regulates the amount of sugar in blood.

EXERCISE TIME

A. Answer the following questions :

1. What do you understand by adolescence ?
2. What is an Adam's apple ? Why do males develop Adam's apple in their throat ?
3. What is puberty ? What changes occur in boys and girls during puberty ?
4. What are the secondary sex characters ?
5. What are sex hormones ? Why are they named so ?
6. What are the hormones ?
7. What is the function of 'Thyroid gland' ?
8. What do you understand by 'sex chromosome' ?
9. What is the age of puberty in girls ?
10. Which micro organism causes AIDS ?
11. Name the term used for cell having X and Y chromosomes.
12. How many chromosomes are there in a zygote of a man ?
13. Where are the hormones made in human body ?
14. What is balance diet ?
15. What are drugs ?

B. Fill in the blanks :

1. _____ is the transitional stage of human development.
2. Puberty ends when an _____ reaches reproductive maturity.
3. The changes which occur at adolescence are controlled by _____.
4. Endocrine glands and their functioning is called the _____.
5. _____ regulate the body growth and co-ordinate the activities of the body.
6. Sperm from the _____ is responsible for the sex of the child and not the _____.
7. To take the body healthy every human being, at any age, needs to have _____.

8. In the age of adolescence do not feel _____ or _____.
9. The _____ can also be transmitted through sexual contact with a person infected with HIV.
10. Fruits and vegetables which are _____ food are also necessary for growth.

C. Tick (✓) the correct option :

1. Which of these is the male reproductive organ in humans ?

(i) ovaries	<input type="radio"/>	(ii) testis	<input type="radio"/>
(iii) sperm	<input type="radio"/>	(iv) ovum	<input type="radio"/>

2. Adolescents should be careful about what they eat, because :

(i) tastis buds are well developed in teenagers	<input type="radio"/>
(ii) adolescents feel hungry all the time	<input type="radio"/>
(iii) proper diet develops their brains.	<input type="radio"/>
(iv) proper diet is needed for the rapid growth taking place in their body.	<input type="radio"/>

3. The right meal for adolescents consist of :

(i) chips, noodles, coke	<input type="radio"/>	(ii) chapatti, dal, rice, vegetables	<input type="radio"/>
(iii) rice, noodles, burger, dosa	<input type="radio"/>	(iv) chips, lemon drink, vegetables	<input type="radio"/>

4. Reproductive age in women starts when their :

(i) height increases	<input type="radio"/>	(ii) body weight increases	<input type="radio"/>
(iii) menstruation starts	<input type="radio"/>	(iv) breasts start developing	<input type="radio"/>

5. HIV virus can pass onto a normal person from an infected person by :

(i) sharing the syringes used for injecting drugs	<input type="radio"/>
(ii) infected mother through her milk	<input type="radio"/>
(iii) sexual contact with a person infected with HIV	<input type="radio"/>
(iv) all of the above	<input type="radio"/>

6. Responsible for the sex of baby is :

(i) mother	<input type="radio"/>	(ii) father	<input type="radio"/>
(iii) both	<input type="radio"/>	(iv) God	<input type="radio"/>



Creative Work

- **Select a story and give it to a students of class 5 and a students of class 8. Study the way a child and an adolescent interpret the story. Analyse the difference and write about it in detail in your project file.**