



GROWTH AND DEVELOPMENT DURING ADOLESCENCE

You have learnt in previous classes that growth is a natural phenomenon. ‘Growth’ is a characteristic of all living beings. The period of growth and development from childhood to adulthood is a period full of joy and challenges is known as ‘adolescence’. This chapter deals with key aspects and issues related to the period of adolescence.



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GROWING UP DURING ADOLESCENCE

Life cycle begins at birth. It is generally divided into seven functional stages of development of life as shown in Table 1.

Table 1: Biological changes in human life cycle—names, duration and characteristics

Biological stages of human life	Duration	Characteristics of growth and development
Prenatal	280 days of pregnancy	Development of foetus in mother’s womb till delivery of fully formed fetus.
Neonatal	Birth to 28 days	Rapid growth and development such as smiling, recognising mother, etc.
Infancy	28 days to 1 year	Speedy growth in size and height, beginning of milk tooth, trying to stand and take steps.
Childhood	1 to 10 years	Rapid to moderate growth depending on nutrition. Permanent molar teeth eruption.

Adolescence	10 to 19 years	Rapid physical, mental, emotional and social changes.
Adulthood	20 years onwards	Maturation, reproductive period of life.
Old age	60 years and above	Slow weakening of body functions, organs and organ systems.

Note: Adolescence is a crucial period in the life cycle of human beings.

UNDERSTANDING ADOLESCENCE

The period of adolescence begins with the onset of puberty, during which certain hormones get activated. It is an increase in secretion of sex hormones (testosterone in males, estrogen and progesterone in females). Puberty merges into adolescence at around 10 years of age, and adolescence generally lasts till 19 years of age. You may recall the discussion on adolescence in the chapters of your Class VIII textbook of science and the Class IX textbook of Health and Physical Education.

During this phase, significant physical and psychological changes take place. However, as you have already learnt in your previous classes, the timing of these changes varies with every individual.

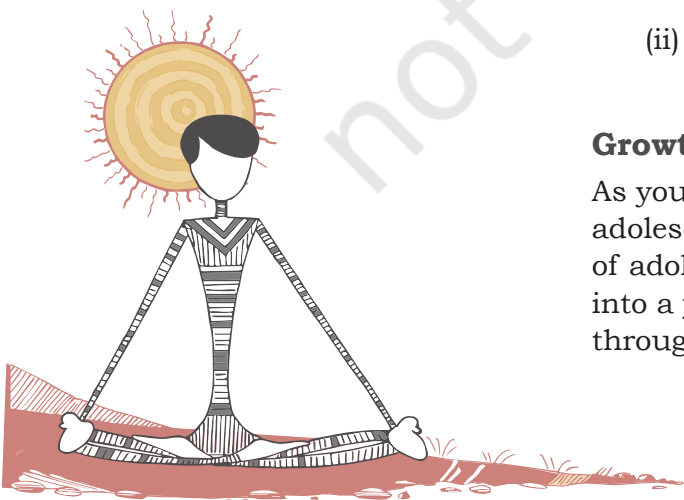
Unique features of adolescence

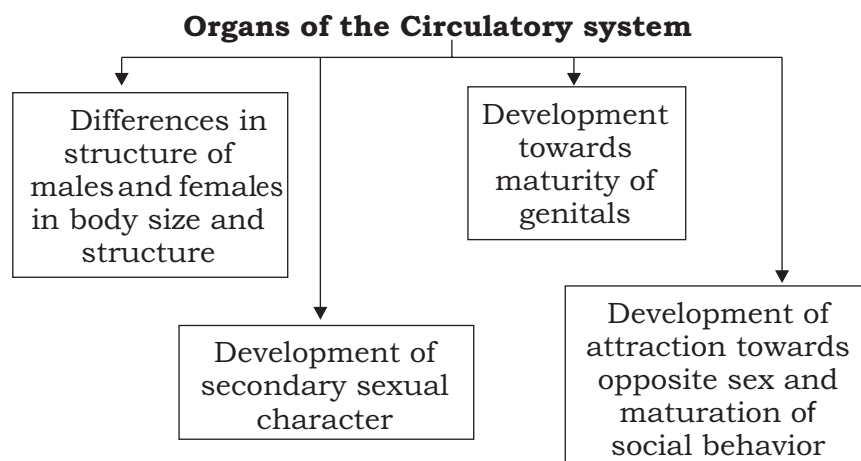
The two unique features of adolescence are —

- (i) The spurt in physical growth, when a physical appearance of an individual gradually becomes different. This is due to the rapid acceleration in growth of skeletal tissue (bones and cartilage) and muscular and glandular tissue. For examples, breasts begin to develop in girls due to the release of estrogen hormone. Changes in voice are quite noticeable among boys.
- (ii) It is a time period between the onset of puberty and adulthood.

Growth spurt in adolescents

As you would have experienced yourself, the changes during adolescence occur speedily and alter the body size and shape of adolescents. Suddenly the child seems to have grown up into a young adult. This is called growth spurt and is shown through the following flow chart.





CHANGES IN BODY SIZE AND STRUCTURE

Under the influence of growth hormone, the body size increases. Sex hormones stimulate growth and maturity of gonads (reproductive organs). In males, testes grow in size and start producing sperms. In females, the eggs or ova present in the ovary since birth begins to mature. Sex organs also increase in size. Thus, there is an overall growth in body size. As sexual maturity progresses during adolescence, hormones act on growth centers of bones which are responsible for increase in length of bones. The long bones, the vertebrae and limbs grow and the adolescent gains height. The limbs become stronger. The heart, lungs and other internal organs also grow to match the increase in body size. The muscle mass undergoes a spurt at adolescence. Eventually, growth rate slows down and then stops. Generally, at the age of 14 to 18 years of age, adult height is already reached. The peak of growth of muscle mass is also typically around the age of 14 to 16 years. In the females, the pelvis region undergoes a growth spurt and becomes wider.

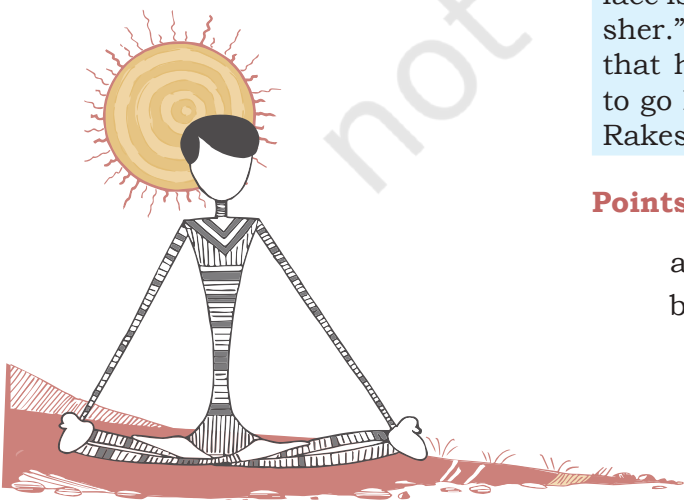
SECONDARY SEXUAL CHARACTERISTICS

In earlier classes, you have learnt about secondary sexual characteristics. As a result of physical changes, secondary sexual characteristics begin to develop in both girls and boys. Some characteristics are related to girls; some to boys and some are common for both. You may understand this development better by conducting Activity 3.1.

Activity 3.1

Identify the secondary sexual characteristics of adolescence during 10 to 19 years in the given table. Fill the following table by putting a tick mark (✓) at appropriate place in each column.





Changes	Girls (1)	Boys (2)	Both (3)	Don't know (4)
1. Increase in height and weight				
2. Menstruation				
3. Change in voice				
4. Growth of hair on private parts				
5. Widening of shoulders				
6. Broadening of hips				
7. Development of breasts				
8. Sweat and oil glands become active				

WET DREAMS

Wet dreams are a normal and natural physiological process which starts during adolescence among boys. It usually occurs during sleep. Wet dreams is a discharge of semen (seminal fluid) containing sperms. Many adolescent boys are usually not aware of this phenomenon and get worried when they face this situation first time.

Semen is the fluid formed by glands associated with male reproductive system. Semen carries mature sperms formed in the testes.

Read the following case studies which confirm the uniqueness of every individual with regard to time of occurrence of changes during adolescence.

CASE 1: My father calls me 'Sher'

Rakesh and Dibang, students of Class IX, are walking home together from school. Rakesh begins to tease Dibang, saying that he speaks in a girl's voice. He also laughs at the fact that Dibang has got no hair on his upper lip. "Look at me," Rakesh says, "I am a real man. My voice is strong and my face is manly - I have so much facial hair. My father calls me sher." Dibang wonders what is wrong with him. He recalls that his mother still calls him 'my sweet boy'. He decides to go home and ask his mother why he is so different from Rakesh and whether something is wrong with him.

Points for Discussion

- What do you think Dibang felt with Rakesh's remarks?
- Do you think that there is something wrong with Dibang? Why?

- c) What should Dibang's mother tell him?
- d) Do you think it is important to prepare children regarding the changes likely to occur in them? Why?

CASE 2: Each one is unique

Pooja, Sujatha, Abida and Radha are good friends. All of them are 13 years old and love to spend time with one another. They have so much to talk about, a new film, a new dress, home work, the boys in the class and just about everything.

Yesterday, Radha seemed uncomfortable. She was having her periods and was concerned about staining her uniform. Last month, Sujatha's family had organised a big celebration in her honour as she had started her periods. Pooja recalled that three months ago, Abida had started her periods in school and had to borrow a sanitary napkin from her older cousin. Except Pooja, all her friends have started their periods. Is there something wrong with her?

Points for Discussion

- a) What do you think Pooja felt when she realised that she is the only one who had not started her periods?
- b) Do you think there is something wrong with Pooja?
- c) If Pooja came to you for advice, what would you tell her as a peer?
- d) Do you think it is important to prepare children regarding the changes likely to occur in them? Why?

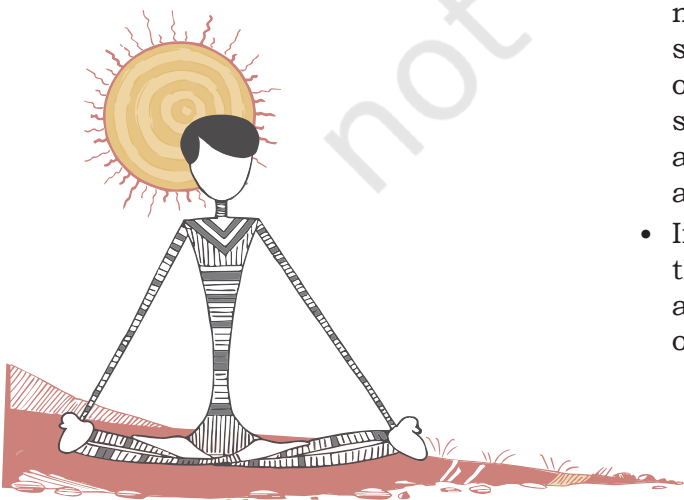
CASE 3: Puberty in boys

Suresh heard from someone that wet dream (nocturnal emission) causes weakness. When Naresh who is Suresh's best friend first experienced wet dream, he confided in Suresh. Suresh encouraged Naresh to visit the nearest Health Centre to have a discussion about wet dream with the doctor.

Points for Discussion

- a) Do you think something is wrong with Naresh?
- b) According to you, the advice given by Suresh is correct or not?
- c) What are the myths associated with wet dream?
- d) What advice was given by the doctor to Naresh?
- Adolescence is a period of physical and emotional changes which are triggered by a set of hormones. These changes are part of growing up.
- These changes occur at different times for different individuals.





- You should not compare your physical changes with others – the pace at which changes take place differ from person to person.
- It is natural to feel awkward or conscious of the changes that occur but try to support each other by accepting these as part of a natural process and don't let these decrease your self-confidence.
- If you have any doubts or concerns about changes that are occurring to you reach out to a trusted adult or you can talk to a counsellor in the adolescent friendly Health Clinic near where you live.
- Many young boys due to feeling of shame visit quacks and waste lot of time and money. It is best to visit the doctor or the health centre. One can discuss the myths related to growing up with a trusted person (teacher, parents, friends).
- There is a myth that wet dream causes weakness among the males because semen is lost from the body. However it is not so, semen and sperms are continuously made in the testes and semen lost during wet dream gets replaced very soon.

MENSTRUATION

The first menstruation is termed as menarche. In India, age of menarche is 12-13 years but may vary from individual to individual. Menstruation generally stops between the age of 45 and 55 years and is termed as menopause. Menopausal age varies in different individuals. Age of menarche has decreased due to various lifestyle changes. Menstruation hygiene and cleanliness is very important. Points to remember —

- Regular bath and washing self properly are important for avoiding infections, especially during menstruation.
- Change undergarment regularly (at least once a day) and avoid synthetic cloth.
- During menstruation, cloth, cloth pads or napkins should be changed after every four to six hours to avoid infection.
- One can also use sanitary napkins to manage menstrual hygiene. Many girls and women also make sanitary napkins at home with old cloth and cotton. If one makes a sanitary napkin at home, use only clean, soft cotton cloth. Do not use old cloth that may have any metal or plastic parts in it like glitter, gota or hooks and buttons. This may hurt or cause infection.
- If a cloth is used again as pad, it should be washed thoroughly with soap and dried in sun before next use as sunlight is an excellent disinfectant. Do not use dirty or damp cloth as it causes infections.

- Child With Special Need (CWSN) should be shown the process of maintaining hygiene or explained in detail if necessary.
- Sanitary pads should be wrapped in paper and disposed in trash bins or buried deep in a pit. Some schools have Incinerators which offer another safe way to dispose sanitary pads. There should be no shame attached in the process of disposing sanitary pads.

Government is supporting schemes for promoting menstrual hygiene among adolescent girls (10-19 years). Sanitary napkins are made available in schools or by ASHAs at a subsidised rate.

PSYCHOSOCIAL CHANGES DURING ADOLESCENCE

Psychosocial changes mean changes in thoughts, mood, attractions and friendships. The word 'social' is associated with the word 'society'. As adolescence sets in, a boy or girl becomes psychologically aware of self and society. As a result, the adolescents build their own image and personality. This gives confidence to the adolescent to move in the society.

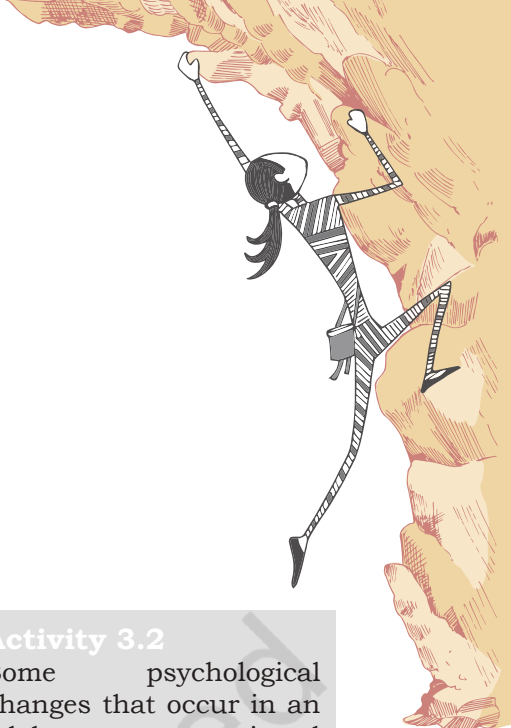
Adolescence is a transitional phase between childhood and adulthood. During this transitional period the adolescents get confused regarding their emerging role in the family and society at large. The physical changes in adolescents are accompanied by psychosocial changes. Adolescents get attracted towards opposite sex or become part of a peer group. Such changes tend to make them more dependent on the peer group in neighborhood, among classmates, etc. This often creates stressful relationships with parents, teachers and elders. Sometimes these developments may make them insecure about future. Adolescents who become aware of these changes, overcome this phase comfortably.

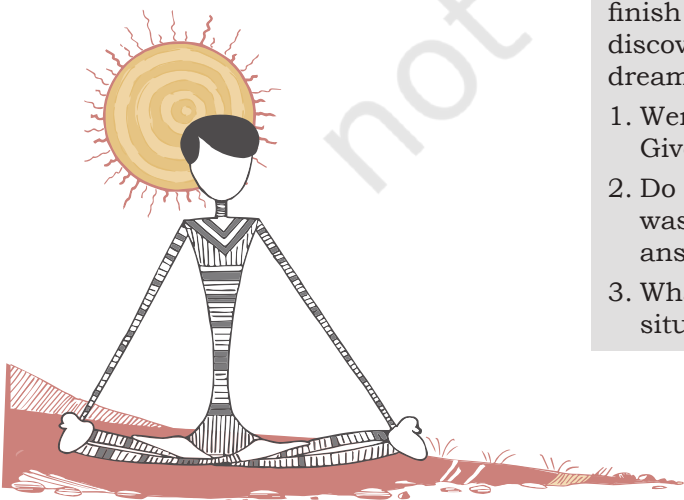
The social changes are reflected in the behavior of adolescents with peers and parents. They differ from parents on many issues and develop the confidence to express their own opinion emphatically if parents are friendly and understanding. Adolescents are more friendly with their peer group. However belonging to a vulnerable age group, adolescents may feel pressurised under the influence of peers. Everyone feels the need to have friends but during adolescence the need for friendship is more pronounced. The friendship may be with a peer or relative of one's own age and someone of own sex or the other sex. It is, therefore, important for them to identify with whom they can share their ideas and identify 'safety net' in friends, parents and teachers.

Activity 3.2

Some psychological changes that occur in an adolescent are mentioned here. Write one or two sentences regarding them from your own experience. You may quote incidents involving others of your age.

- Developing a sense of identity.
- Distancing from parents.
- Closeness with peers.
- Curiosity for gaining knowledge.
- Experimentation





ADOLESCENT OR TEENAGE PREGNANCY

An adolescent is capable of reproduction. However, the reproductive maturity is reached only when a teenager is fully developed physically and physiologically. In India, because of early marriage, there are large number of adolescents or teenage pregnancies. If pregnancy occurs before reaching complete reproductive maturity, girls may risk their own health and that of the fetus (developing embryo).

Risks involved in adolescent pregnancy are mentioned below —

- An adolescent mother is not mentally prepared for motherhood.
- An adolescent mother is likely to be anemic.
- An adolescent mother is more prone towards maternal death while giving birth.
- Infant death are more among teenage mothers.
- There is likelihood of developing complications during giving birth.
- The baby born from teenage mother requires greater care which the teenage mother may not be able to give.
- The reproductive tract may be damaged during childbirth.
- Early pregnancy and motherhood delays development of education and career of adolescent mother.
- There may be economic problems and also problems due to psychological immaturity of the adolescent mother. This may hamper proper care of the infant.

Activity 3.3

Read the case study given below. Think and answer the questions that follow.

Rahul's grandmother and Sangeeta's grandmother were great friends. When Rahul grew up, his grandmother would often ask him to drop Sangeeta at her home. As a result Rahul and Sangeeta developed a liking for each other. When Sangeeta turned sixteen, the grandmothers insisted that Rahul and Sangeeta be married off as they were developing a relationship and that people would talk about it. Rahul was in college and Sangeeta had yet to finish school when they got married. After six months Sangeeta discovered that she was pregnant. Sangeeta was sad as she had dreams of pursuing higher studies and a career.

1. Were Rahul and Sangeeta right in agreeing to get married? Give reasons for your answer.
2. Do you think the adverse consequence of teenage marriage was greater on Sangeeta than on Rahul? Give reasons for your answer.
3. What would you have done, if you were in Rahul or Sangeeta's situation?

VITAL STATISTICS AND FUNCTIONS OF THE BODY

As you grow in years, you grow in size with increased length and circumference of body parts till you are a full-fledged adult of age 19. While you must maintain hygiene of all external parts, the internal organs also have to function normally. You know that certain vital functions of the body for enjoying good health are maintenance of blood pressure, pulse rate, respiratory rate, etc. Some ways of assessing the vital functions and statistics of human beings are given below.

Blood pressure (BP) and its measurement

Pressure exerted by blood on the wall of the arteries is called blood pressure. When the heart contracts, blood surges through aorta, BP is highest (Systolic Pressure) pressure of blood on the arterial wall recorded when ventricles relax is lowest (Diastolic Pressure).



Fig. 3.1: Checking blood pressure



Fig. 3.3: Sphygmomanometer

The pressure wave along the arteries with each heartbeat can be felt at the pulse. Blood pressure is measured by the instrument called “Sphygmomanometer”. Diastolic and Systolic pressure is measured and in a normal healthy young adult it is 110/75, which means 110 mm Hg systolic and 75 mm Hg diastolic. Sphygmomanometer consists of cuff with an inflatable bladder which is wrapped around a person’s upper arm and a rubber bulb inflates the bladder. An attached device indicates the blood pressure. There is now a digital device which is also used for measuring the BP. BP increases with age to about 130/90mm Hg. Abnormally high BP is called hypertension.

Activity 3.4

Measuring mid-arm Circumference

Biceps is the muscle of mid arm.

Place the beginning of the tapes in the middle of the biceps (midway between shoulder and elbow joint) take the reading and record it. When you do this in a group, record the circumference of all the students of the group and observe the variation.



Fig. 3.2: Measuring mid-arm circumference

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Activity 3.5**Measuring height**

- Take your own height at intervals as you grow. You have learnt that your height at age 19 is almost the maximum height that you shall attain. Do this with your friends and try to figure out the reasons for variations. You need only an inch tape for this.
- Go to a clinic or any medical practitioner and see the working of the Sphygmomanometer. Collect data from persons where BP is checked. Analyse the variations and the reasons.

Activity 3.6

At the exit gate of Nehru Place Metro Station in New Delhi, there is a provision for measuring height and weight and also to calculate BMI for 10 rupees. Find out where else measurement of BMI is available. Do you have this in your school?

- My Height =
- My Weight =
- My BMI =

Normal, Overweight, obese.
Tick whichever is relevant

Calculate your Body Mass Index (BMI)

BMI can be calculated by adopting the following formula. Divide your weight by square of your height.

$$BMI = \frac{\text{weight (kg)}}{\text{height (m)}^2}$$

- If you measured your weight in kg then measure height in meters.
- Normal BMI Range = 18 to 25.
- Overweight = more than 25 and less than 29.
- Obese = more than 30.

Examination of conjuction

The conjuction is a transparent membrane over the eye. A smooth shiny moist conjuction is normal. If red or thick or covered by a secretion or foreign body, it requires immediate medical attention or consultation of a eye doctor.

Tongue examination

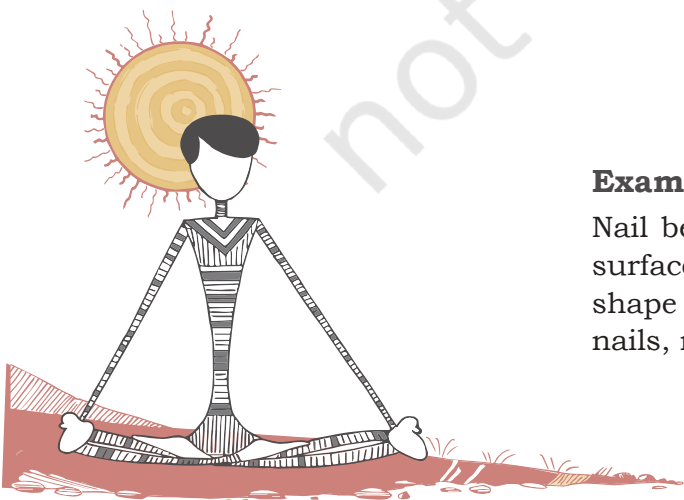
Nutritional deficiencies, infections, dysfunction of nerves or even cancer can be detected by examining the tongue.

Some key characteristic features of a tongue in normal condition can be noted by physical examination. These are —

- (i) Colour: Pink red on both upper and lower surface. On lower surface blood vessels may be seen.
- (ii) Texture: Rough on upper surface due to presence of papillae or taste buds. Hair, farrows or ulceration indicates dysfunction.
- (iii) Size: If not swollen, tongue will fit comfortably inside the mouth. The tongue can be examined by the following steps —
 - Make tip of tongue touch roof of mouth to inspect ventral surface.
 - When protruded out, colour and texture can be noted for any deviation.
 - Use gauze to hold protruded tongue (wearing gloves) between tongue and index figure and fill the fender areas.

Examining nail bed

Nail bed also needs direct physical examination. Nail plate surface discolouration, abnormal cuticle, nail fold or nail shape require inspection. Loss of nails and lesions around nails, need medical attention.



Pharmacology and its impact on the body

Pharmacology deals with biological effects of drugs. Drugs are chemical substances used for healing, curing diseases, slowing them or preventing diseases.

Effects

Therapeutic desired actions for cure are —

- Stimulating or inhibited cell function
- Blocking biochemical of tissues
- Anti histaminic (anti allergic)
- Laxative (relieving constipation)

Unwanted effects

Side effects are —

- Dry mouth or dangerous effects on tissues
- Damage or toxicity or excessive bleeding are some effects of drugs used as medicine

Prevention

Never buy medicines over the counter (OTC) without Doctor's prescription with dosage and instruction written.

- Unusual responses are reasons for harmful effects of drugs
- Medication error or overdose



ASSESSMENT

I. Fill in the Blanks

1. Childhood is _____.
2. Adolescence is _____.
3. Five changes occurring in boys and girls during adolescence are _____, _____, _____, _____ and _____.

II. Choose the Correct Option

1. Proper hygiene should be practised during adolescence.
(Yes/No/Don't know)
2. Wet dream is a normal phenomenon. (Yes/No/Don't know)
3. Government is supporting schemes for promoting menstrual hygiene among adolescent girls. (Yes/No/Don't know)
4. The adolescents begin to be extremely conscious of their physical appearance once secondary sexual characteristics begin to develop. (Yes/No/Don't know)
5. The adolescents begin to develop a strong sense of identity due to increased mental development. (Yes/No/Don't know)
6. Early pregnancy may end in damaged reproductive tract in girls. (Yes/No/Don't know)
7. Physical growth spurt during adolescence is embarrassing. (Yes/No/Don't know)
8. Change of voice in boys is a sign of adolescence. (Yes/No/Don't know)

III. Answer the following Questions

1. What are the health and educational implications of adolescent pregnancy?
2. Write down the process of the —
 - (i) mid-arm circumference.
 - (ii) measurement of height.
 - (iii) body mass index.
 - (iv) tongue examination.
 - (v) examination the nail beds.
3. Write a short note on pharmacology.

