2. REACHING THE AGE OF ADOLESCENCE

"It is the fact that,
flesh, blood and bones
are hidden under
a cover of skin in your body.
You also have thoughts
and feelings,
that are not visible.
But they have an important role
in making you
the special person that you are."

2.1. ADOLESCENCE AND PUBERTY

The word 'Adolescence' is derived from the Latin word 'adolescere' which means 'to grow'. The period of transition from childhood to adulthood is called adolescence. The World Health Organization (WHO) defines **adolescence as the period of life between 11 and 19 years of age**. Since adolescent period covers the "teens period", adolescents are usually called teenagers. It is a period when lots of changes take place in the body and mind. Hormonal changes result in unusual swings in emotions.

Adolescents shoot up in height and gain weight. The growth spurt begins two years earlier for girls than for boys. But it lasts longer for boys.

The rapidly changing body proportions and the new sensations attributed to sexual development confuse and cause anxiety to the adolescents. This chapter aims at helping adolescents understand the physical, cognitive, social and emotional changes during adolescence.

Puberty

Puberty is the period in life when the body's reproductive system gets ready to work. Generally, boys attain puberty at the age of 14 to 15 years, while girls reach puberty at a comparatively lower age of 11 to 12 years.

As you grow up, people will be quick to notice that you are getting taller but they may not see that you also changing shape. Let us see this in detail.

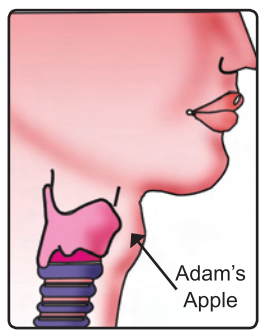
Changes at Puberty

The following changes take place in the body of boys and girls at Puberty

1. Increase in Height: There is a sudden increase in the height of both boys and girls during Puberty. The rate of growth in height varies from person to person. Some may grow rapidly at the start of Puberty and then slow down, while as others may grow gradually. The height of an individual depends upon the genes which are inherited from parents.

2. Change in Body Shape: The changes occurring in adolescent boys and girls are different. In girls hips become broader and the pelvic region widens. In boys, shoulders broaden and the body muscles grow more than that of the girls.

3. Change in Voice: At Puberty the voice box or the larynx begins to grow. The larynx in boys is larger than that in girls. The voice box in boys can be seen as the Adam's Apple, in their throat In boys, the voice becomes deep and harsh, where as girls have high pitched voice.



4. Increased activity of Sweat and Sebaceous glands: The secretion of sweat and sebaceous glands (Oil glands) increases during Puberty. This causes acne and pimples on the face of boys and girls at this time.

Development of Sex Organs

The Reproductive Organs in boys and girls become fully functional at Puberty. In boys, the male sex organs like the testes and penis develop completely. The testes start producing sperms.

In girls, the ovary enlarges and eggs begin to mature. Ovaries start releasing matured eggs.

These sex organs produce sex hormones, which play an important role in the process of reproduction and in the development of secondary sexual characteristics.

Apart from these changes that are taking place in emotional, mental and intellectual areas, they may experience various moods such as being happy, sad, angry, excited or irritated.

2.2. SECONDARY SEXUAL CHARACTERS

Certain characters help to distinguish the male from the female. They are called secondary sexual characters. Some of the secondary sexual characters that develop in girls and boys are as follows:

Boys

1. Facial hairs such as beard and moustaches develop.
2. Hair develops under the armpit, under chest and in the pubic regions.
3. Voice becomes deeper.
4. Muscles develop, and shoulder becomes broad.
5. Increase in weight.

Girls

1. Development and enlargement of breasts.
2. Hair develops under the armpit and in the pubic regions.
3. Hips broaden and pelvic region widens
4. Initiation of menstrual cycle.
5. Deposition of fat around hips,
6. These changes which occur at adolescence are controlled by hormones.

2.3. DUCTLESS GLANDS

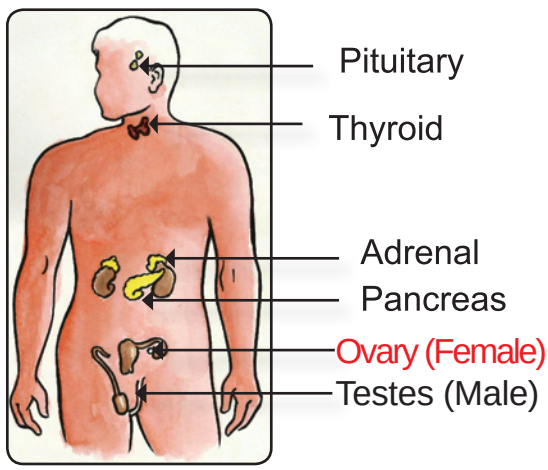
Introduction

The word gland means having some secretions. There are two types of glands.

1. Exocrine gland – gland with duct
2. Endocrine gland – gland without duct.

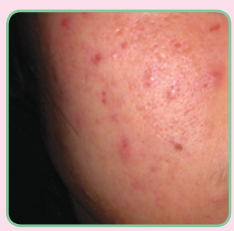
The exocrine gland secretes enzymes which are important for digestion. The ductless or endocrine glands secretes hormones. They are special chemical substances that make wonders in our body.

The following are the important Endocrine Glands (Ductless) present in our body.



1. Pituitary
2. Thyroid
3. Pancreas
4. Adrenal
5. Testes (Male) Ovaries (Female)

Pimple:
A small papule or pustule. Pimples are sebaceous glands that are infected by bacteria, become inflamed and fill with pus.



The secretions of the ductless glands (hormones) are carried away by the blood stream.

Let us see the functions of these glands.

1. Pituitary gland: It is located just below the brain. It is called as the master gland because it controls the functioning of all other endocrine glands. Your growth depends on the secretion of the pituitary gland. It secretes growth hormone. A person having less growth hormone remains very short (Dwarfism) ; on the other hand, a person having much growth hormone becomes very tall (Gigantism). In adults, excess secretion leads to a condition called **acromegaly.**

2. Thyroid gland: It is located in the throat region. It secretes a hormone called thyroxine. The function of thyroxine is to control the rate of **Metabolism,** growth and respiration.

The deficiency of thyroxine hormone in children is known as **cretinism**. It slows down growth and mental development. Sometimes the gland may enlarge causing a disease called **Goitre**.

3. Pancreas: Pancreas is located just below the stomach in the body. Pancreas is both exocrine and endocrine. The endocrine part is called **Islets of langerhans**. It has alpha and beta cells, which secretes glucagon and insulin. Both control sugar metabolism in the body.

Deficiency of insulin in the body causes a disease known as **diabetes mellitus**.

4. Adrenal gland: These are also known as supra renal glands, as they are located just on the top of the kidneys. It secretes adrenalin hormone. This hormone is produced during stress or emergency situations. It regulates heart beat, breathing rate, blood pressure etc.

5. Testes and ovaries: Testes and ovaries secrete sex hormones. Testes produce testosterone and ovaries produce oestrogen hormones. We have already learnt that these hormones are responsible for male and female secondary sexual characters.

2.4. ROLE OF HORMONES IN REPRODUCTION

Most hormones are at work from the moment you are born. Sex hormones are different because they start to work later on. They gradually prepare the body for reproduction.

The sex hormones are responsible for the fundamental change in growth and development and stimulate the developments of secondary sexual characters.

The testes and the ovaries are the reproductive Organs; both are stimulated by the pituitary hormone during Puberty.

IN BOYS

In male, the testes produces the male sex hormone testosterone. This hormone helps in the development and maintenance of the primary and secondary sexual characters and functions of sperms.

IN GIRLS

In female, the ovaries secrete estrogen and progesterone responsible for the primary and secondary sexual characters.

Apart from testes and ovaries the Adrenal Cortex also secretes steroid hormones in both the sexes. These hormones are responsible for adolescent growth spurt.

2.5. REPRODUCTIVE PHASE OF LIFE IN HUMANS

What is Reproductive Phase? How long does it last in males and females?

The phase during an individual's life during which there is production of gametes is called Reproductive Phase. In females it is normally between 13 to 50 years, and in males, it is from the age of 13 to life long. The reproductive age may vary from person to person.

The following are the various reproductive phases in the life of a female.

1. Ovulation: Release of an ovum from the ovary - usually one egg is released every month.

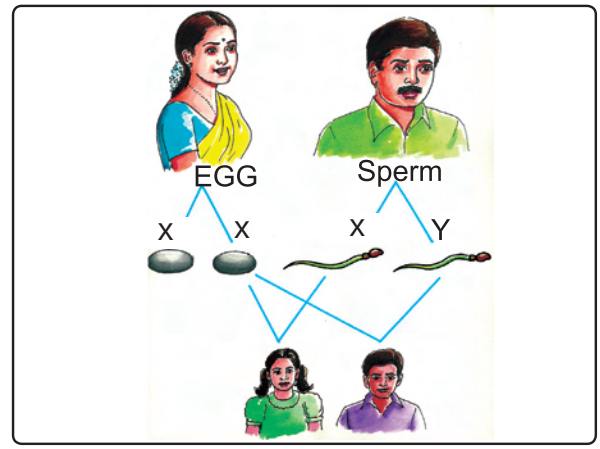
2. Menstruation or the period: This is the outward sign of the routine cycle of egg production and hormone change in a women's body. It takes about 3 – 5 days.

3. Pregnancy: When the egg gets fertilized by the sperm, the zygote is implanted in the uterus for further development this results in pregnancy.

4. Menopause: The menopause marks the end of the reproductive phase of a women's life, the chief outward sign is the cessation (stop) of the monthly flow of menstrual blood. The usual age is around 50.

2.6. SEX DETERMINATION

Do you know which is responsible for the determination of sex? What makes the fertilized egg to develop either into a boy or a girl?



If you want to know about that, you should know about the chromosomes. Chromosomes are thread like structures present in the nucleus of the cell. All the cells contain 23 pairs of chromosomes, The last pair of chromosome is different in males and females. The last pair determines the sex, so it is called as **sex chromosome**.

Sex chromosomes are of two types, These are named as X. and Y chromosomes. Usually a woman has two 'X' chromosomes (XX) and male has one 'X' and one Y chromosome (XY), in their cells. During gamete (reproductive cell) formation the number of chromosomes is reduced into half. (46 chromosomes are reduced into 23).

When a sperm containing 'X' chromosome fertilizes the egg, the zygote will have two 'X' (XX) chromosomes. The zygote will develop into a female child.

Similarly, when a sperm containing 'Y' chromosome fertilizes the egg,

the fertilized egg will have one 'X' chromosome and one 'Y' chromosome (XY), and it will develop into a male child.

Now you know that the sex chromosomes of the father determine the sex of a child. The belief that the mother is responsible for the sex of her baby is completely wrong.

2.7. REPRODUCTIVE HEALTH

During adolescence growing children need special attention towards diet, exercise and personal hygiene. The personal hygiene includes female and male reproductive health.

The following are some of the measures that girls and boys need to take to maintain personal hygiene.

- Take bath atleast once a day, paying special attention to underarms, groins and genitals.
- Change the underwear daily. The underclothes should be made of cotton.

Menstrual hygiens for girls:

Menstruation in females is as natural as our regular physiological activities like breathing, drinking, eating, urinating, and defecation etc., It is a cyclical process that is present in all the mammalian females.

- So It is a natural phenomena, that is neither to be worried nor to be ashamed. Sanitary napkins (pads) or a pad made of clean soft cloth which can absorb moisture should be used for absorbing menstrual flow.
- Sanitary napkins or cloth should be changed frequently depending upon the menstrual flow. If a cloth is being used repeatedly, it should be cleaned with soap and hot water and dried in sunlight for reuse.
- Wash with soap and water before using a fresh napkin.

2.7.1. Nutritional Needs

The adolescents need more calories and other nutrients due to spurt in growth and increase in physical activity.

The nutritional deficiencies during this period not only retard the physical growth, but also impair the intellectual development and delays sexual maturation. The diet of adolescents should meet the demands of physical and intellectual growth, provide adequate reserves for illness / pregnancy and prevent adult onset of diseases related to nutrition e.g., Hypotension and osteoporosis. (Bones become brittle)

A very good amount of proteins and carbohydrate is necessary during this growth period. Apart from that, adolescents need to keep in mind the following dietary consideration:

Minerals: Since there is an increase in skeletal mass and blood volume, the body needs calcium, phosphorous and iron.

Calcium: Calcium intake needs to be increased to prevent osteoporosis in later life. It is present in milk and milk products.

Iodine: It helps to prevent thyroid gland related diseases.

Iron: Lack of iron in the diet results in anemia. To make up for the loss, have a diet rich in iron. In boys, iron deficiency occurs due to muscle spurt if it is not adequately supplemented. In girls, iron deficiency occurs due to menstruation in addition to the spurt in muscular growth if it is not adequately supplemented.

Green leafy vegetables, jaggery, whole pulses are rich sources of iron.

During adolescent period, take hygienic balanced diet.

2.7.2. Personal Hygiene

Personal hygiene is a clear indicator of man's personality. Personal hygiene should start from the hair tip and ends down at the toes.

Remember and practise the following 10 tips for your personal hygiene

1. Shower or bath daily.
2. Always wash your hands before and after meals.
3. Keep fingernails clean, and avoid wearing nail polishes or jewellery.

GERM FARM

4. Wash your teeth and mouth before and after each meal.
5. Avoid touching your face, nose, or mouth, while preparing food.
6. Avoid coughing or sneezing around food.
7. If you want to taste the food, use a clean spoon.
8. Change your clothes, especially undergarments, everyday.

9. Do not defecate in open field. Use clean toilets for defecation.
10. If you are not well, do no take self medication. Go to a doctor.

2.7.3. Prevention of and protection from sexual and other abuses

Preventing childhood sexual abuse

Taking steps to prevent childhood sexual abuse is an ongoing parental responsibility. In 80% of cases the abuser is someone the child knows a trusted or loved adult or older child who may use threats, bribery or tricks to take advantage of the child's innocence.

There are three stages in the Prevention of sexual abuse. They are.

1. Primary Prevention
2. Secondary Prevention
3. Tertiary Prevention

Primary Prevention: It involves preventing the abuse from happening in the first place. Avoid being alone in company of suspected person. Don't wear provocative dresses. Do not let allow anyone to hug, pet or kiss you. Take care of the way you sit. When you are going to school by auto, bus or by train keep distance from the other sex.

Secondary Prevention: It includes early detection and reporting of perpetrators for the purpose of stopping the perpetrators and minimizing the negative effect on the child.

Tertiary prevention: It focuses on the treatment of abused children and adults who have developed signs and symptoms of distress.

Warning signs of sexual abuse: Children who have been sexually abused often show the following signs:

A sudden dramatic change in behaviour or personality.

- Recurring nightmares.
- Regression to early behaviour patterns such as bed wetting.
- Withdrawal from friends and family members.
- Imitating adult sexual behaviour.
- Hostile, aggressive behaviour.

Substance abuse: To pre-teens and teens, alcohol tobacco and drugs may seem like a quick way to move into the adult world. These substances cause serious problems, and their use leads to **addiction.** Alcohol is the most abused substance among teenagers. Consumption of alcohol leads to frequent memory loss and hepatitis (liver damage).

Drug: (Fr. drogue – a dry herb) is a chemical which is taken for some illness and is withdrawn when the desired effect is achieved.

Illegal Drugs: Illegal drugs are drugs used for recreation, but it is against the law to take them, because it is extremely dangerous. The side effects

are serious and the drugs are highly addictive, ruining peoples lives. The effects of the drug and addict's life style can lead to a very unpleasant death. These drugs slowly reduce the functioning of nervous system and heart functions. Opium, Heroine, Marijuana and Cocaine are some of the illegal drugs.

These drugs slowly change the behaviour of the users:

some of the behavioural changes are as follows:

1. Rejection of old friends and the acquiring of new ones.
2. Sudden lack of interest in hobbies on extracurricular activities.
3. Staying away from home after school.
4. Drop in grades and disinterest in school work.
5. Less concern with Personal appearance.
6. Mood swings or extreme irritability.
7. So, please say a big 'No' to drugs if you come across any temptation in your life.

Prevention of drug abuse

1. Children should avoid the company of drug addicts.
2. Advertisements of drugs on public media should be banned.
3. Doctor's advice and prescriptions should be strictly followed.

2.7.4. Smoking hazards

Cigarettes have been deemed one of the greatest health hazards of the 20th century and are now widely regarded as the chief preventable cause of death. Tobacco products such as cigarettes, cigars, smokeless tobacco (like snuff and chewing tobacco) are more dangerous. When a cigarette is burned, it is broken down into its chemical elements from which lethal chemical compounds are created.

The period between puffs allows time for nicotine, ammonia, acetone, formaldehyde, hydrogen cyanide and some 4000 other chemical constituents to become irritants, poisons, mutagens and more than 40 types of carcinogens.

Some of the evil effects of smoking are

- Raising bad cholesterol (Low Density Lipid), decreasing good cholesterol (High Density Lipid)
- Blood vessels are constricted, damages the lining of the arteries making the blood more sticky. This increases the risk of blood clots and dramatically raises the risk of a heart attack or stroke.

- 80% of cancerous deaths are linked to it.
- Smoking aggravates asthma, bronchitis, pneumonia and emphysema.
- Also the causative agent for peptic ulcers, cataracts.
- Cigarettes increases the risk of infertility in both men and women.
- Children of smokers are also far more susceptible to asthma and ear infections.

Healthy food

- Dear children please avoid junk food. Take healthy foods like bean sprouts. Let us know about bean sprouts.

2.7.5. SPROUTING

Why should we sprout?

Sprouts are a living, enzyme-rich food, natural and low in calories. Their vitamin A content will usually

double, various B group vitamins will be 5 - 10 times higher, and vitamin C will increase by a similar order. Their protein content becomes easily digestible, and rich new nutrients such as enzymes are created. They contain significant amounts of bio-available calcium, iron and zinc.

When a dormant seed sprouts, its starch is converted into simple sugars, and long chain proteins are split into smaller, easily digestible molecules. **Sprouted beans and seeds are like a predigested food, one of the most enzyme-rich and nutritious foods known.**

What you can sprout?

Most seeds sprout easily, as do many legumes. Nuts are more difficult to sprout. It is recommended that soaking all the nuts, legumes and grains that we consume, which then become a wonderful, highly nutritious and essential component of a living food diet.

Best sprouting results in sunflower seeds and mung beans. This may be a reflection of the local conditions and suppliers.

Mung beans make an excellent sprout, used widely in cooking. However, they primarily use the sprouts and not the beans, and the sprouts are often stir-fried.

Soya and kidney bean sprouts are toxic and may be avoided. .

Bean sprouts are easy and cheap to grow at home.

1. Pick over the beans to remove any damages ones.
2. Soak them in a clean water overnight or for about 12 hours.
3. Drain, rinse and place them in a wide mouthed bottle. Allowing room for the sprouts to grow.
4. Cover the jar with cotton cloth.
5. Keep it in the dark area of your house as sunlight makes them taste bitter.

As soon as the bean germinate, all the starches, oil and other nutrients packed into it – to nourish the tiny plant begin to turn into vitamins. Enzymes and other forms of proteins mineral and sugars. The Vitamin C content of the bean increases, when it starts sprouting. Rinse the bean sprouts two to four times a day. They will be pale green fresh and ready for eating in two to six days.

2.7.6 Cancer and its prevention

Normally body cells grow and reproduce in an orderly way. In contrast cancerous cells multiply rapidly. This is due to damaged genetic material of the cell. This stage is known as initiation. It can be influenced by external factors like radiation, viral infections and certain chemicals. These cancerous cells create lots of problem in our metabolism and invade to the other areas through blood streams, where they cause secondary tumours. This stage is called **metastasis**.

What causes cancer?

Cancer is ultimately the result of cells that uncontrollably grow and do not die. Normal cells in the body follow an orderly path of growth, division, and death. Programmed cell death is called apoptosis, and when this process breaks down, cancer begins to form. Unlike regular cells, cancer cells do not experience programmatic death and instead continue to grow and divide. This leads to a mass of abnormal cells that grows out of control.

What are the symptoms of cancer?

Cancer symptoms are quite varied and depend on where the cancer is located, where it has spread, and how big the tumour is. Some cancers can be felt or seen through the skin - a lump on the breast or testicle can be an indicator of cancer in those locations. Skin cancer (melanoma) is often noted by a change in a wart or mole on the skin. Some oral cancers present white patches inside the mouth or white spots on the tongue.

Other cancers have symptoms that are less physically apparent. Some brain tumours tend to present symptoms early in the disease as they affect important cognitive functions. Pancreas cancers are usually too small to cause symptoms until they cause pain by pushing against nearby nerves or interfere with liver function to cause a yellowing of the skin and eyes called jaundice. Symptoms also can be created as a tumour grows and pushes against organs and blood vessels. For example, colon cancers lead to symptoms such as constipation, diarrhoea, and changes in stool size. Bladder or prostate cancers cause changes in bladder function such as more frequent or infrequent urination.

How is cancer classified?

There are five broad groups that are used to classify cancer.

1. Carcinomas are characterized by cells that cover internal and external parts of the body such as lung, breast, and colon cancer.
2. Sarcomas are characterized by cells that are located in bone, cartilage, fat, connective tissue, muscle, and other supportive tissues.
3. Lymphomas are cancers that begin in the lymph nodes and immune system tissues.

4. Leukaemia are cancers that begin in the bone marrow and often accumulate in the bloodstream.

5. Adenomas are cancers that arise in the thyroid, the pituitary gland, the adrenal gland, and other glandular tissues.

Prevention

The following are some of the ways to prevent diseases like heart attack, cancer, diabetes, hypertension Smoking cause lung cancer. It is related to mouth, throat, oesophagus, pharynx, larynx and liver. Smoking should be avoided.

High intake of fruits and vegetables are protective against many forms of diseases like heart attack, cancer, diabetes and hypertension. A vegetarian diet is typically high in fibre, low in saturated fat compared to meat eaters.

High intake of beta carotene, vitamin C and other vitamin containing food should be taken. Apart from citrus variety of fruits, bean sprouts is also an excellent source of vitamin C.

Try to reduce your weight, if you are obese.

Avoid pickles and salty foods.

Treatment involves surgery, chemotherapy radiotherapy and hormonal therapy.

SCIENCE

EVALUATION

1. Adolescents sometimes experience various mood swings such as being happy, sad, angry, excited or irritated. What makes them behave so?

2. The deficiency of thyroxine hormone in children is cretinism. It slows down growth. Apart from this, write one more disorder.

3. Note the endocrine glands given in column A with their respective hormones in column B.

A	B
Pituitary	Oestrogen
Thyroid	Adrenalin
Pancreas	Growth hormone
Adrenal	Thyroxine
Ovary	Insulin

4. Give reasons for the following.

   i) Smoking increases the risk of blood clots.
   ii) Smoking aggravates asthma.
   iii) Bean sprout is good for health.
   iv) cancerous cells multiply rapidly

5. Pituitary, thyroid, adrenal, pancreas, testes and ovary. From the glands listed above one gland acts both exocrine and endocrine. Name it.

6. The human sperm consist of head, middle piece and tail. What purpose does the tail in a sperm serve?

7. Babu heard his mother and aunty talking about his cousin who is going to have a baby, they were discussing whether she would give birth to a boy or girl,

   a. Will it be possible to judge the sex of the child by them?
   b. What makes the fertilized egg develop either into a boy or a girl?

Project work

1. How many of your classmates are doing exercises regularly and who do not exercise regularly? Did you notice any difference in their fitness and health? Prepare a chart on their benefits of regular exercise and fix it in your classroom.

2. Collect information from newspapers, magazines and from the local health centre about the evil effects of cigarettes and alcohol. Prepare a chart and display it permanently in your classroom.

3. Prepare a colourful poster on the theme, ‘Say No to Drugs’.

SCIENCE

FURTHER REFERENCE

Books

Biological science by Taylor, Green an Stout – Cambridge University Press

The complete family health book- Donna Shelly, Sharyn Ann Lenhart and Roslyn E. Epps - St.Martin’s Press

Websites

http/en.wikipedia.org/wiki/smokinghazards