

3.0 DEFINITION OF HEALTH

✓ "Health means soundness of body or mind; that condition in which its functions are duly and efficiently discharged."

-Oxford English Dictionary

✓ "Health is a state of complete physical, mental and social well being and not merely an absence of diseases or infirmity."

✓ Recently this definition has been amplified and it has been added, "attainment of a level of health that will enable every individual to lead a socially and economically productive life."

- World Health Organisation

"Health is considered as that condition, mental and physical, in which the individual is functionally well adjusted internally as concerns his body parts, and externally as concerns his environments."

-Votmer and Esslinger

"Health is the condition of being sound in body, mind or spirit, especially freedom from physical disease or pain."

-Webster

"Health aims at making growth more perfect, life more vigorous, decay less rapid and death more remote."

-Siddalingayra

"One's ideal of health should be the highest realisation of his physical, mental and spiritual possibilities rather than mere freedom from diseases and deformities."

-W.A. Yeager

✓ It is the quality of life that enables an individual to live most and serve best."

-J.F. Williams

"Health is a state of relative equilibrium of body form and function which results from its successful dynamic adjustment to forces tending to disturb it. It is not passive interplay between body substance and forces impinging upon it but an active response of body forces working towards readjustment."

-Perkins

"Health is a condition or quality of the human organism expressing the adequate functioning of the organism in given conditions, genetic and environmental."

-W.H.O. Tech. Rep. (1957)

"Health is the condition of the organism which measures the degree to which its aggregate powers are able to function."

-Oberteuffer

"Health is that state in which the individual is able to mobilize all his resources - intellectual, emotional, and physical, for optimum daily living."

- Encyclopaedia of Health

4.0 DIMENSIONS OF HEALTH

Authorities in the field of health have recognised three closely interwoven dimensions of health (1) Physical dimension, (2) Mental dimension, and (3) social dimension. However, recently it has been felt that few more dimensions of health can be added viz emotional, spiritual, vocational, educational, nutritional, environmental, and curative and preventive.

4.1 Physical Dimension

Physical dimension purely refers to the perfect functioning of the body externally as well as internally. **Externally:** having good physique, good appearance, good texture and complexion, attractive features, well structured and strong body parts and limbs, well groomed posture, graceful carriage and efficient movement.

Internally: all systems of the human body i.e. digestive, circulatory, respiratory, nervous, and excretory system, and sensory organs are functioning optimally. The pulse rate, blood pressure and body weight being in normal limits according to the age and sex. Physical dimension i.e. physical health means proper functioning of the systems and physical well being of the body, cumulative result being perfect and harmonious functioning of the human body.

4.2 Mental Dimension

Mental health is the balanced development of an individual's personality and emotional attitudes which enable him to live harmoniously with his fellow beings. Sartorius has defined mental health as "a state of balance between the individual and the surrounding world, a state of harmony between oneself and others, a co-existence between the realities of the self and that of other people, and that of the environment" It is influenced by both biological and social factors. A good mental health implies that an individual has adjusted satisfactorily to his environment, home, work place, and other people of the society, so that he is realizing the maximum amount of happiness from living.

Generally mental ill health is the result of a combination of various psycho-bio-social factors. Some of the common causes of mental ill health are anxiety, tension, fear, insecurity, a sense of inequality and prejudices etc. However, mental health is not mere absence of mental illness. A mentally healthy person is free from internal conflicts, feels comfortable and secure about himself, accepts his short-comings, has self respect, feels right towards other and is able to feel a part of the group, takes responsibilities, is able to meet the demands of life, is able to identify and face the problems as they arise, takes his own decision, sets reasonable goals for him self and has control over his emotions, fear and anger. Mental health can be summed up in the words of H.B. English, "Mental health is a relatively enduring state wherein the person is well adjusted, has a zest for living, and is attaining self actualisation or self realisation. It is positive state and not mere absence of mental disorder."

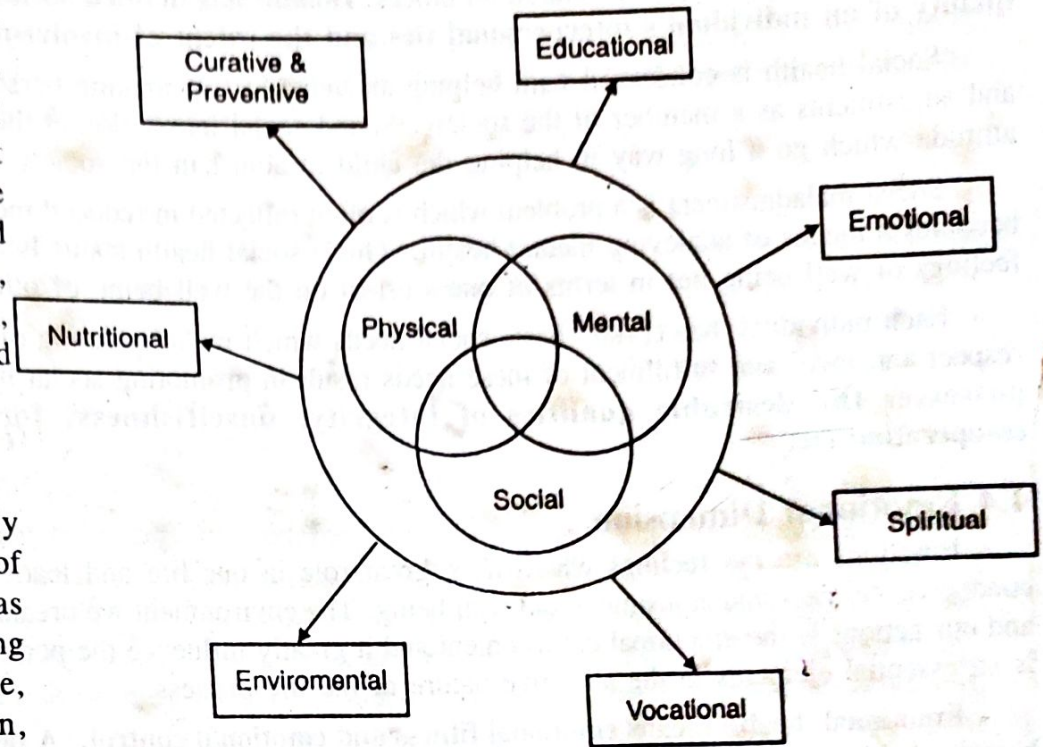


Fig. 1. Dimensions of Health

4.3 Social Dimension

Social health is the ability to get along with one self and with others, to be independent but at the same time to realize how dependent one is on others. **Donald has defined social well being as "the quantity and quality of an individual's interpersonal ties and the extent of involvement with the community".**

Social health is concerned with helping an individual in making personal adjustment, group adjustment and adjustments as a member of the society. Sound social interaction at the early stage life builds up correct attitude which go a long way in helping the child to adjust in the society.

Social maladjustment is a problem which is often reflected in reduced mental health. Thus social interaction becomes a means of achieving mental health. One's social health status is measured not in terms of personal feelings of well being but in terms of one's effect on the well being of others.

Each individual has certain basic social needs which include feeling of belongingness, recognition, self-respect and love, and fulfillment of these needs result in promoting social health. **A socially healthy person possesses the desirable qualities of, integrity, unselfishness, forgiveness, sense of fairness, co-operation etc.**

4.4 Emotional Dimension

Emotions are the feelings which have great role in our life and lead to the modification of attitude, conducive to personal adjustment and well being. The environment we create by our behaviour, our attitudes, and our actions is the emotional environment and it greatly influence the personality of an individual. Emotion is an essential elements in the adjustive nature of the life process.

Emotional health means emotional fitness and emotional control. A person can be called emotionally healthy if his emotions are always positive, and has full control over his emotions. On the other hand, a person who has no control over his emotions or is over powered with negative emotions can be called emotionally imbalance or emotional ill.

4.5 Spiritual Dimension

In the context of Indian culture, where people are having faith in divine powers, and another distinctive feature of human life, the presence of spiritual element **spiritual health refers to that part of the individual which reaches out and strives for meaning and purpose in life. Man is a complex multi-dimensional being. He is not only having spirit, he also has mind, body and life. But these multiple sides of his nature are not contradictory. He is indivisible and nothing in him can be rejected. According to Radhakrishnan, "the end of man is to let the spirit in him permeate his whole being, his soul, flesh and affections".** Thus, with divine philosophy having great influence on our culture, spiritual health is very important dimension of health. Sound spiritual aspect results in developing man into a healthy human being.

4.6 Vocational Dimension

Vocational dimension is essentially a sub-domain of physical, mental and social health. The capacities or limitations of an individual, in relation to his working and occupation, to achieve the desired targets, play an important role in promoting physical, social, and mental health. Livelihood is a very serious problem being faced by an individual. Vocational health emphasizes upon the problem of livelihood and ensures the fulfillment of the economic needs of an individual. Man's progress in all fields depend upon his capacity to earn his livelihood and to meet his wants. **Vocational satisfaction provides him social efficiency, social status, social prestige, emotional stability and mental relaxation. Vocationally satisfied individuals also contribute to the increase in production and national wealth. Vocational health is thus of great national importance as well.**

4.7 Educationa/Dimension

Education is the consciously controlled process whereby changes in behaviour are produced in the person, and through the person, in the group. It causes certain changes in one's behaviour and attitude

Health and Health Education
 enabling him to understand his responsibility to the society and the nation. **Educational dimension of health** i.e. **health education has heavy responsibility to discharge.** Health education creates awareness regarding health rules, promotes health, builds up healthy environment and shows the path to follow towards the healthful living. Regarding the importance of educational dimension of health, **Ruth E. Grout states,** "health education is the translation of what is known about health into desirable individual and community behaviour patterns by means of the educational process."

4.8 Nutritional Dimension

Good nutrition is a basic component of health. It is of prime importance in the attainment of **normal growth and development, and in the maintenance of health throughout life.** There is a growing realization that adequate nutrition is a necessary step in improving the quality of life. The importance of malnutrition and under nutrition as an obstacle to social and economical development, has brought nutritional health to the forefront of national and international concern.

4.9 Environmental Dimension

The internal environment of man himself and external environment which surround him reflect the health status of the individual, the society and the nation. Sanitation is one of the important aspect of environmental health. It is the quality of living that is expressed in clean home, clean neighbourhood and clean community. **Environmental sanitation can be defined as "the control of all those factors in man's physical environment which exercise or may exercise a negative effect on his physical development, health and survival."** Being a way of life, it must come from within the people. In the recent years, the subject of environment and its pollution has become a critical health area, as much of the ill health in the country is due to defective and polluted environment. Understanding the environment is becoming more and more important as people have been placing ever larger demands on the environment and in the process, bringing about ever more severe changes in it.

4.10 Curative and Preventive Dimension

This dimension deals with the study and application of curative medicine and preventive measures for the preservation of the health of an individual. **The primary objective of curative medicine is the removal of disease.** Over the years curative medicine has accumulated a vast body of scientific knowledge, technical skills, and machinery highly organised, not merely to treat disease, but to preserve life itself as far as it could be possible.

The main objective of preventive medicine is **prevention of disease and promotion of health.** It is applied to all healthy people. Modern preventive medicine can be defined as **"the art and science of health promotion, disease prevention, disability limitation and rehabilitation."** In simple words preventive medicine is a kind of anticipatory medicine and measure. Scientific advances, improved living standards, and fuller education of the public, have opened up a number of new avenues for curative and preventive medicine.

5.0 MEANING OF HEALTH EDUCATION

Health education is rather an abstract term, meaning different things to different people. To some, it is a matter of public relations stating the activities of health department, and to many others it provides knowledge about health and diseases.

Anything that educates anyone in the matter of health, is health education, i.e. the education given for identifying the health needs and matching it with suitable adaptive behaviour, can be termed as health education. In simple words, **the entire process of involving people in learning about health and disease, making efforts for improving health and facilitating them to act appropriately for overcoming ailments and promoting a positive health, is health education.**

9.0 PRINCIPLES OF HEALTH EDUCATION

- (1) This is a universal fact that people are not interested to listen those things **which are not of their interest** and therefore, health teaching and health programmes should be conducted in such a way that **it relates to the interest of the people.**
- (2) It is necessary to find out **the real health needs** of the people and only then people will gladly participate in the programme, i.e. **programme should be need based.**
- (3) Health education **should not become an artificial situation** or formal teaching - learning.
- (4) Health education programme should proceed from **known to un-known**. It is better to start from where people are and slowly be build up to avoid any clash of ideas and for better understanding.
- (5) It is important for health educationist to **get into the culture of the community**, and only thereafter, to introduce novel ideas with natural ease and a little caution as well.
- (6) **Active participation is the key to learning.** Through group discussions, workshops etc. positive and negative points should be discussed in detail and thoroughly dealt with.
- (7) **A close study and application of relevant behavioural sciences is necessary for health education** because these are concerned with individual, groups and society.
- (8) In health education, **one must know the level of understanding, educational background, mental capacity and literacy of the people.** One should use simple language so that they can understand it better.
- (9) Generally, it is difficult to demonstrate the beneficial effects of preventive and promotive health care. Therefore, to enable the people to understand the same, apart from reinforcement through repetitions at regular intervals, **a close, friendly and sympathetic attitude of the teacher is must.**
- (10) Success of any health programme **depends on having a free flow of communication.** It is necessary to get feed back and to get doubts cleared.
- (11) The health educator **has to identify himself with the group by melting barriers, if any,** and only thereafter meaningful interaction and exchange of ideas can take place.
- (12) It is necessary to **motivate the pupil for participating in the health programme** by providing **appropriate incentives.**
- (13) Health programme should be based on the well known principle of learning **by doing, and it should be practical oriented and positive in nature.**
- (14) There has to be **co-ordination and link between the people, teacher and the subject matter** for effective results of the programmes.
- (15) A variety of teaching methods including **audio-visual aids are essential** not only for effective teaching of health but also for **creating interest and involvement of the pupil.**
- (16) Health education programme should be planned according to **the needs, the resources available,** and results to be achieved under the prevailing environmental conditions.
- (17) **Continuity of health programme is necessary to identify the problems, review the same from time to time** and to find out its solution step by step.

1.0 INTRODUCTION

Nutrition is the science that deals with food and its uses by the body. We, like all other living things, need food to live. Food supplies the energy for every action we undertake from eating banana to running a race. Food also provides material that our body needs to build up and repair its tissues and to regulate the functions of its organs and systems.

To keep our body cells running properly, they must be supplied with correct amount food having required chemicals in ratio of the food. **The chemicals in food, which our body needs, are called nutrients.**

What we eat directly affects our health. A proper diet helps in prevention of certain illnesses and also helps in recovery from diseases/injuries. An inadequate or improper diet increases the risk of different diseases. Eating a balanced diet is the right way to have all the nutrients that our body needs.

2.0 BALANCED DIET

The balanced diet is the intake of appropriate types and adequate amounts of foods and drinks to supply nutrition and energy for the maintenance of body cells, tissues and organs and to support normal growth and development.

“A balanced diet is that contains the proper amounts of each nutrient.”

2.1 Functions of Diet

1. It provides energy for the various activities of the body.
2. It helps the body to grow and replace worn out tissues.
3. It has the chemicals, which help to control the body functions and protect the body from diseases.

2.2 Factors Affecting Diet

Diet depends on the following factors: -

1. **Age, sex and body surface area:** Diet differs from age to age. Young ones need different types of food both in quality as well as quantity as compared to older people who need diet in less quantity and with lesser fats.
2. **Types and duration of activity:** Diet also depends on types of activity that we do and its duration. An athlete involving in vigorous training needs more caloric food as compared to office clerk. A sedentary person requires light food whereas a worker who does eight to ten hour hard work needs good diet.
3. **Eating habits and social customs:** Eating habits and social customs also affect the diet of an individual. Some individuals are habitual of eating fast food whereas others do not like it. Similarly,

our social customs play an important role in food preparation. A section of society prefers non-vegetarian food whereas in other section of society only vegetarian food is served.

4. **Climatic factors:** Food is varied in different climates. As you have an experience of having different diet in summer and winter. Similarly, people living in different climatic zones have different foods.
5. **Health status and growth:** If you are in good state of health then you will have good diet whereas unhealthy individual cannot have similar diet. In growing age we give good food to the children. Sick individuals cannot have normal diet; usually they take light meal or as recommended by a doctor.
6. **Psychological considerations:** Some of the psychological factors affect the diet like how the food is cooked Or what is the taste of food? If the meal is tasty then everybody likes to have it.

2.3 Elements of Balanced Diet

There are hundred nutrients in the food. These are mainly grouped into six classes namely **carbohydrates, proteins, fats, vitamins, minerals and water**. Three nutrients, **carbohydrates, proteins and fats supply** us energy. Before details of these we must know about measuring unit of energy. The energy value of food is measured in heat units called **calorie or kilo calorie**. Calorie is the amount of heat required to raise the temperature of 1 gram of water by 1°. A Kilocalorie is equal to 1000 calories. A Kilocalorie is written as calorie with a capital C.

3.0 DAILY ENERGY REQUIREMENTS

Personal energy requirement = basic energy requirements + extra energy requirements

Basic energy requirements

- For every Kg of body weight 1.3 calories of energy is required every hour. (An athlete weighing 50Kg would require $1.3 \times 24\text{hrs} \times 50\text{Kg} = 1560$ calories/day)

Extra energy requirements

- For each hour of training you require 8.5 calories of energy for each Kg of body weight. (For a two hour training session our 50Kg athlete would require $8.5 \times 2\text{hrs} \times 50\text{Kg} = 850$ calories)

An athlete weighing 50Kg who trains for two hours would require an intake of approx. 2410 calories (1560 + 850)

3.1. Energy Fuel

Like fuel for a car, the energy we need has to be mixed. The mixture that we require is as follows:

- 57% Carbohydrates (sugar, sweets, bread, cakes)
- 30% Fats (dairy products, oil)
- 13% Protein (eggs, milk, meat, poultry, fish)

The energy yield per gram is as follows: Carbohydrate - 4 calories, Fats - 9 calories and Protein - 4 calories.

What does a 50kg athlete require in terms of carbohydrates, fats and protein?

- **Carbohydrates** - 57% of 2410 = 1374 calories - at 4 calories per gram = $1374/4 = 343$ grams
- **Fats** - 30% of 2410 = 723 calories - at 9 calories per gram = $723/9 = 80$ grams
- **Protein** - 13% of 2410 = 313 calories - at 4 calories per gram = $313/4 = 78$ grams

50kg athlete requires: - 343 grams of Carbohydrates, 80 grams of Fat and 78 grams of Protein

4.0 NUTRIENT BALANCE

Carefully planned nutrition must provide an energy balance and a nutrient balance. The nutrients are:

- **Carbohydrates** - our main source of energy.
- **Proteins** - essential growth and repair of muscles and other body tissues.
- **Fats** - A source of energy which is important in relation to fat-soluble vitamins.
- **Vitamins** - water and fat-soluble groups play important roles in many chemical processes in the body.
- **Minerals** - those inorganic elements occurring in the body and which are critical to its normal functions.
- **Water** - essential to normal body function - as a vehicle for carrying other nutrients and because 60% of the human body is water.

4.1 Carbohydrates

Carbohydrates are the main source of energy in all activities. They provide quick energy to the body and are not stored in the body for long. The ratio of carbohydrates is increased in endurance events/activities. Carbohydrates i.e. CHO_2 are compounds of carbon, hydrogen and oxygen. Carbohydrates are of two type (a) simple carbohydrates (b) complex carbohydrates.

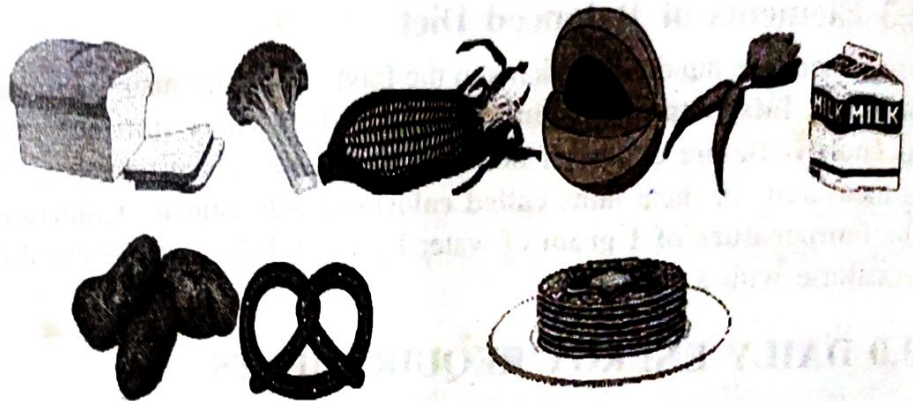


Fig. 1.

(a) **Simple carbohydrates contain vitamins and minerals.** Sugars are simple carbohydrates, which are used to provide energy immediately. These are called quick energy foods.

Sources of simple carbohydrates: They naturally occur in fruits, milk and milk products and vegetables. (Potatoes, Carrots). They are also found in processed and refined sugars such as honey, jam, cakes, pastries, ice cream, table sugar, candy, syrups and regular carbonated beverages (drinks), jaggery (gurh).

Refined sugars provide calories, but lack in vitamins, minerals and fibers.

(b) **Complex carbohydrates are good source of minerals, vitamins and fibers.** Starches are complex carbohydrates that contain several sugar molecules combined together chemically. Their energy content is higher than sugar but is released more slowly.

Sources of complex carbohydrates: They are found in breads, cereals (wheat, bajra, rice), starchy vegetables and whole pulses (chana, moong, rajma).

4.1.1 Function of Carbohydrates

The primary function of carbohydrates is to provide energy for the body, especially the brain and nervous system. The body breaks down starches and sugars into substance called glucose that is used for energy by the body.

4.1.2 Recommendations

Nutrition experts recommend that 55, to 60% of our total calories should come from carbohydrates, preferably from complex carbohydrates (starches and naturally occurring sugars rather than processed or refined sugars).

To increase complex carbohydrates we should eat more fruits, vegetables, whole grains, rice, bread and cereals and also more beans, dried peas and low fat milk.

Excess of carbohydrates are converted into fat by the liver and stored in adipose tissue.

It is recommended by the experts that processed and refined sugars should be used within the limits. **The consumption of excess sugar prior to exercise reduces performance and endurance.**

4.2 Proteins

Proteins are the basic structure of all living cells. These are complex organic compounds. **The basic structure of proteins is a chain of amino acids that contain carbon, oxygen, hydrogen and nitrogen.** The presence of nitrogen differentiates protein from carbohydrate and fat. There are two types of proteins (a) **Non essential proteins** (b) **essential proteins.**

(a) **Non-essential protein:** The human body needs approximately 20 amino acids for the synthesis of its proteins. The body can make only 13 of the amino acids that are known as the non-essential proteins or amino acids. In fact, they are essential but we do not have to get them from food we eat.

(b) **Essential proteins:** There are 9 essential amino acids, which are taken only from food and not made in the body. Thus, they are called essential proteins or amino acids.

If the proteins of a food supplied is enough of the essential amino acids it is called a **complete protein** food. If the proteins of a food does not supply all the essential amino acids, it is called an **incomplete protein** food.

4.2.1 Sources of Complete Proteins

All meat and other animal products are sources of proteins. The best sources of complete proteins are eggs, milk, meat, poultry, beef and milk products.

4.2.2 Sources of Incomplete Proteins

Grains, fruits and vegetables are the sources of incomplete proteins as they lack one of the essential amino acids.

The plant protein can be combined to all of the essential amino acids and from a complete protein. For example complete plant proteins are **rice and beans, milk and wheat cereal, and corn and beans.**

4.2.3 Functions of Proteins

Protein is the main component of muscles, organs, and glands. Every living cell and all body fluid except urine and bile contain protein. **The cell of muscles, tendons and ligaments are maintained with protein.** Proteins are needed for growth and developments of children and adolescents. **Proteins are required for the formation of hormones, enzymes and hemoglobin.**

It works as a source of energy in starvation (hunger) otherwise it is not a source of energy.

4.2.4 Recommendations

Protein requirements depend on the individual and daily activity. Tissue growth whether due to growth, injury, weight training or pregnancy, affects protein requirements. During sickness, proteins are not only needed for repair work but are also used as an energy source. Experts recommend that approximately

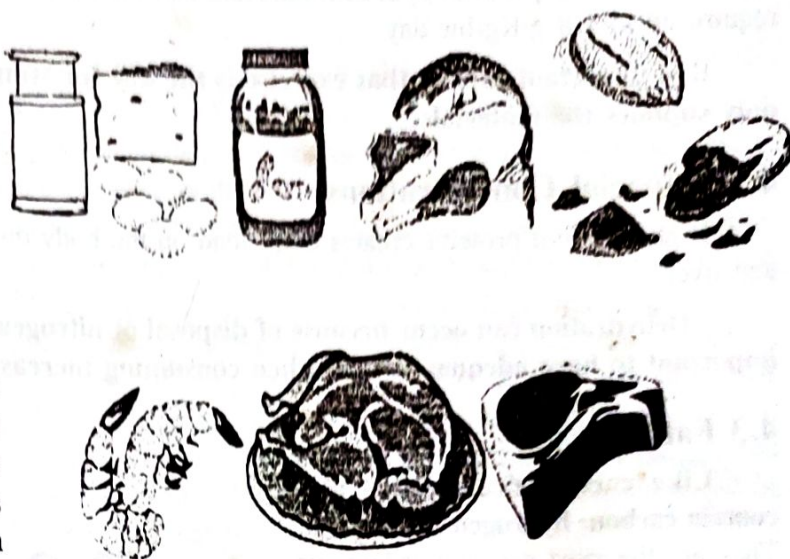


Fig. 2.

20% of the total daily calories should come from protein. Two or three servings of protein rich food will meet the daily needs of most adults.

In other terms, a sedentary individuals need 0.8 g./Kg./bw/day 0.8 gram per kilogram bodyweight per day. Athletes who participate in activities that demand different degrees of strength, speed and endurance may require up to 1.8 g/Kg/bw/day.

It is important to note that exercise is the key for stimulating growth of new muscle tissue. Protein only supplies the materials.

4.2.5 Special Considerations

High intake of proteins creates extra load on the body due to disposal of nitrogen especially for kidneys and liver.

Dehydration can occur because of disposal of nitrogen, which may affect workout. It is, therefore, important to have adequate water when consuming increased level of proteins.

4.3 Fats

Like carbohydrates, fats also contain carbon, hydrogen and oxygen. They are the most concentrated source of energy in foods. One gram of fat provides double the energy provided by one gram of carbohydrates. Since our body can store fats, they work as energy banks and are called stored energy foods. The energy is provided when there is a need. If we eat more carbohydrates than required by our body the body converts the extra amount into fats and stores it. Our body mainly stores fats under skin and also in the regions of the kidneys and the liver.



Fig. 3.

Simple Fats. Consist of a glyceride molecule linked to one, two, or three units of fatty acids. According to the number of fatty acids attached, simple fats are divided into **monoglycerides** (one fatty acids), **diglycerides** (two fatty acids), and **triglycerides** (three fatty acids) **More than 95 percent of the stored fat in the human body is in the form of triglycerides.**

Based on the degree of hydrogen saturation, fatty acids are said to be **saturated** or **unsaturated**.

In **saturated** fatty acids the carbon atoms are fully saturated with hydrogens, therefore only single bonds like the carbon atoms on the chain (see Table...). These saturated fatty acids frequently referred to as **saturated fats**. The major sources of saturated fats are meats, cheese, and butter (Animal Origin).

In **unsaturated** fatty acids, the carbon atoms are not completely saturated with hydrogen, rather double bonds are formed between the unsaturated carbon atoms (see Table...). These are generally found in plant products.

Unsaturated fatty acids can be further classified as :—

* Monounsaturated Fatty Acids, and

* Poly-unsaturated Fatty Acids

In **monounsaturated** fatty acids, only one double bond is found along the chain. Olive oil is the best example of triglycerides high in monounsaturated fatty acids.

In **polyunsaturated** fatty acids, two or more double bonds between unsaturated carbon atoms along the chain are available. Corn or cottonseed oils are high in polyunsaturated fatty acids.

Tables—Chemical structure of saturated and unsaturated fats.

Note :—In general, saturated fats increase the blood cholesterol level, and polyunsaturated fats tends to decrease cholesterol.

Compound fats are a combination of simple fats and other chemicals. Examples of compound fats are **Phospholipids, Glucolipids, and Lipoproteins**. Phospholipids are similar to **triglycerides**; **Glucolipids** are formed by a combination of **carbohydrates, fatty acids, and nitrogen**; and **Lipoproteins** are water soluble aggregates of protein with either **triglycerides, phospholipids, or cholesterol**. Lipoproteins transport fats (Cholesterol, triglycerides) in the blood and have a significant role in the development and prevention of heart disease. The total cholesterol/HDL-cholesterol ratio should be 4.5 and 4.0 or lower for men and women respectively. For the information of readers, HDL-cholesterol refers to High Density Lipoprotein cholesterol, also known as "**good cholesterol**". Whereas, LDL-cholesterol refers to Low-Density Lipoprotein Cholesterol, this type of cholesterol is not good for the heart, it increases proportionally with the amount of **saturated fat** and cholesterol intake in the regular diet. Total fat consumption on a daily basis should not exceed 30% of the total caloric intake, and less than half of the fat consumed should be in the form of **saturated fat**. The average intake of cholesterol also should be limited to less than 300 mg per day. The LDL-cholesterol can be further lowered by losing excess body fat and using medication.

Derived Fats are a combination of simple and compound fats. Sterols are an example of derived fats.

Table —Major Types of Fats lipids

Unsaturated	Saturated
Sunflower oil	Beef
Olive Oil	Bacon
Rice Oil	Cheese
Nuts	Butter
Rapeseed Oil	Biscuits
Fish-Oil - Sardines	Crisps

4.3.1 Sources of Fats

Saturated fats are found in foods from both animal and vegetable sources. Animal sources include meat, poultry and dairy products like milk, cream, cheese, butter and ice cream. Vegetable sources include palm, coconut oils. Monounsaturated fat is found in large amounts in foods from plants including peanut and olive oil. Polyunsaturated fats are found in foods from plants including sunflower, corn and soyabean and also fish oil.

4.3.2 Functions of Fats

Fat is one of the three nutrients (along with carbohydrates and protein), which supply calories (energy) to the body.

Fat is important for the proper functioning of the body. Fatty acids provide the raw materials, which help in the control of blood pressure, blood clotting and other body functions.

Fats are also an important energy sources. When the body has used up the calories from carbohydrate, which occurs after the first 20 minutes of exercises, it begins to depend on the calories from fat.

Fats help in transportation of fat-soluble vitamins A, D, E and K. Fat maintains skin and hair.

4.3.3 Recommendations

Experts recommend that saturated fat should be limited to 10% of the total calories for the day and remainder of the day's fat (i.e. 20%) intake should be equal amounts of monounsaturated and polyunsaturated fat.

Today, many people are worried with the amount of fat in their diet. Diets those are high in fat lead to increase the risk of obesity (over weight) and heart disease. It is, therefore, recommended by the experts that fat intake should not exceed 30% of daily calories.

4.3.4 Special Considerations

It is to be noted that fats are not easily digested. It also requires more oxygen for releasing energy, for example, if one litre of oxygen is required to release 5 K calories from carbohydrates whereas 3.7 litre of oxygen will be required to release the same amount of calories i.e. 5 K calories from fats.

Insufficient fats produce fast fatigue.

Blood cholesterol is the most affected by the amount of fat we eat. We can reduce fat intake by choosing low fat or non-fat dairy products (cheese, milk and yogurt), lean meat, fruits, vegetables, whole grains and foods that are baked, broiled, steamed or roasted.

4.4 Vitamins

Vitamins are compounds of carbon that are absolutely essential for the normal working of the body. They are required in very small quantities. However, if our diet is lacking in any vitamin, we suffer from certain diseases called deficiency diseases.

Vitamins are obtained from food, except for vitamins D and vitamin K, which the body can produce. There are 13 vitamins needed by the body. The important ones are vitamins A, C, D, E, K and B complex (B₁ and B₂) Niacin (B₃) and B₁₂. These vitamins can be divided into two groups (A) fat soluble and (B) water soluble.

(A) Fat Soluble Vitamins: The fat-soluble vitamins, which include vitamin A, D, E and K are stored in the liver and in body fat.

- (i) **Vitamin A** is found in milk, butter, egg, carrots, cod liver oil, tomatoes, pumpkin and green leafy vegetables. **Vitamin A is needed for normal growth especially for keeping the eyes and skin healthy.**

Deficiency of vitamin A can cause night blindness, which is the inability to see in dim light and also irregular growth of teeth.

- (ii) **Vitamin D** is found in cheese, butter, milk, green vegetables, fish liver oil and sunlight. Vitamin D is important for formation of strong bones and teeth. **It is also known as the "Sunshine Vitamin".**

Deficiency of vitamin D causes a disease called rickets which affects children and in which the bones are soft and out of shape.

- (iii) **Vitamin E** is found in vegetable oils, butter, milk, whole grains, corn, nuts, seeds, spinach and other green leafy vegetables. **Vitamin E is important to protect the cell membranes and also important in the formation of red blood cells (RBC).**
- (iv) **Vitamin K** is found in cabbage, cauliflower, spinach and other green leafy vegetables, cereals, soyabeans. Bacteria in the intestines normally also produce vitamin K. **Vitamin K helps in the clotting of blood.**

Deficiency of vitamin K causes excessive bleeding from wounds.

(B) Water soluble vitamins: The water soluble vitamins which include vitamin B₁, B₂, Niacin (B₃), B₁₂ and vitamin C are not stored by the body.

(i) **Vitamin B₁** also called **thiamin** is found in seafood, milk, meat, peas, cereals and green vegetables. **Vitamin B₁ is important for growth and development. It is necessary for changing carbohydrates into energy.**

(ii) **Vitamin B₂** or **riboflavin** is found in yeast, egg, meat and peas. **It is important for body growth and red blood cell production. It also helps in releasing energy from carbohydrates.**

Deficiency of vitamin B₂ causes skin disease and retarded growth.

(iii) Vitamin B₃ or niacin is found in whole cereals, tomatoes, potatoes, meat and fish. It is important for healthy skin, digestion and nerves system. Deficiency of vitamin B₃, or Niacin causes a disease called pellagra, which affects the skin alimentary canal and nerves system.

(iv) Vitamin B₁₂ is found in liver, milk, eggs and fish. Vitamin B₁₂ is needed for forming red blood cells (RBCs) and for a healthy nervous system.

Deficiency of vitamin B₁₂ causes a disease called anemia in which there is a deficiency of red blood cells (RBCs)

(v) Vitamin C is found in Amla, citrus fruits, tomatoes, green leafy vegetables and potatoes. Vitamin C is needed for the maintenance of the ligaments, tendons, and other supportive tissue and strong blood vessels.

Deficiency of vitamin C causes a disease called scurvy in which gums swell up and bleed.

4.4.1 Special Considerations

- (i) Vitamins are essential for metabolism of fats and carbohydrate.
- (ii) Vitamins do not yield energy but act for repair and maintenance work.
- (iii) Water-soluble vitamins (B & C) are not stored; thus supplement of vitamin B and C is required.
- (iv) Fat-soluble vitamins (A, D, E & K) can be stored in liver and fatty tissues.
- (v) Vitamins do not increase physical work capacity; rather it is a psychological concept.
- (vi) Vitamin E helps in recovery of muscle cramps.
- (vii) During training fresh fruits and vegetables are recommended.

4.5 Minerals

Minerals contain elements needed by our body in small quantities. But these are essential for proper growth and functioning of the body. Their deficiency in our diet causes deficiency diseases. They are supplied in the form of salts by different foods some of the important minerals are mentioned below.

- (i) **Iron** is important for the formation of hemoglobin (which is the oxygen-carrying pigment found in red blood cells (RBC)). Iron is found in meat, fish, liver, eggs, green vegetables, turnip, germinating wheat grains and yeast. **Recommended daily allowance of iron is about 10 mg.**
- (ii) **Calcium** is needed for the formation of strong bones and teeth and also for clotting of blood and muscle contraction. Calcium is found in milk and milk products, green leafy vegetables. **Daily-recommended allowances of calcium are about 800 mg.**
- (iii) **Phosphorus** is required for the development of strong bones and teeth and also for making energy rich compounds in the cells from body. Phosphorus is available in meat, eggs, fish & whole grains. **750 mg. of phosphorus is recommended daily allowance.**
- (iv) **Potassium** is important for growth and keeping cells and blood healthy. It is available in green and yellow vegetables. **The recommended daily allowance of potassium is about 2000 mg.**
- (v) **Sodium** is needed for the proper functioning of the nervous system. It is found in common salt and also in meat and milk products. **Daily-recommended allowances of sodium is about 500 mg.**
- (vi) **Iodine** is essential for proper thyroid function. Its deficiency causes a disease called goiter in which a gland in the throat swells up. **Iodine is found in iodized salt, seafood and water.**
- (vii) **Fluoride** is important to make the enamel (polish) of the teeth hard and prevents dental caries. It is available in coffee, spinach, onion and tea. **Daily-recommended allowances of fluoride is 4 mg.**
- (viii) **Copper** is helpful in red blood cells, connective tissue and nerve fibers formation & functioning. It is found in grains, nuts & chocolate. **Recommended daily allowances of copper is 3 mg.**
- (ix) **Zinc** is required for insulin production and also for functioning of male prostate, digestion and metabolism. **It is available in meat, eggs and fish.**

diagnosed as chronic tuberculosis

4.0. TUBERCULOSIS

Tuberculosis is a specific communicable disease caused by Myco tuberculosis or, more rarely by Myco bosis. It affects both pulmonary and extra-pulmonary tissues. The disease is usually chronic with varying clinical manifestations. The bovine form generally affects extrapulmonary organs, viz Intestine, bones, lymph nodes. Tuberculosis continues to be a major public health problem in India.

It can occur at any age but it is more prevalent in the older age than in the younger age group. Tuberculosis is communicable as long as bacilli are excreted by the infected host, and this period may extend weeks, months or even years. It is more prevalent among males than among females. Tuberculosis is often described as a social disease with medical aspects. It is due to poor quality of size e.g. overcrowding, substandard housing, ignorance, low level of education, poor sanitation, poverty, large families etc. These are not specific but all these factors are inter-related and favour the spread of infection.

4.1. Mode of Transmission

Mainly droplet infection and droplet unuclei generated by an "open" case transmits tuberculosis. To transmit infection, the particles must be fresh enough to carry a viable organism. Cough is a prominent symptom of pulmonary tuberculosis. Coughing generates larger number of droplets of all sizes than speaking.

Two main sources of infection - the human and bovine.

- (i) **The human Source-** In this the bacillary cases constitute by far the most important source of infection. The smere-positive patients are the real source of infection, and patients in whose sputum bacilli can be demonstrated by culture.
- (ii) **Bovine Source -** Bovine tuberculosis is not a problem in India because milk is boiled before consumption.

The common source of tubercle bacilli is the sputum of the patients suffering from pulmonary tuberculosis.

4.2. Prevention

The basic principles of prevention and control are the same as far as any other infectious disease; these are:

- Early detection of cases.
- Chemotherapy.
- BCG Vaccination.
- Chemoprophylaxis.
- Rehabilitation
- Surveillance.

4.2.1. Early Detection of Cases: In the prevention of tuberculosis programme the basic principle is the early detection of cases i.e. identification of individual spreading the tuberculosis infection. In this cases a patient whose sputum is positive for tubercle bacilli and such cases are the target of case - finding. Sputum

examination by direct microscopy is considered the method of choice. Due to the reliability, cheapness and accuracy, direct microscopic examination has become number one case-finding method. The examination of consecutive specimens e.g., on the spot and overnight sputum, is sufficient to detect a large number of tuberculous cases. If tuberculosis is to be diagnosed early, facilities for microscopic examination of sputum should be available in all health institutions. In the early detection following are the chest systems.

(a) Cough of about 3 or 4 weeks duration, continuous fever.

(b) Chest pain case finding should not be an end in itself. It is of little value as a control measure unless followed by chemotherapy.

4.2.2. Chemotherapy: It has completely revolutionised the treatment of pulmonary tuberculosis. The objective of chemotherapy is bacterial cure - i.e. to sterilize lesions quickly and completely, render the patients non-infectious and prevent the development of new cases in the community. The effects of chemotherapy are judged not by the anatomic healing of lesions, but mainly by the elimination of bacilli from the patients sputum. Chemotherapy should be easily available, free of charge to every patient detected. It should be adequate and applied to the entire pool of infectors in the community. In complete treatment puts the patients at risk of relapse and the development of bacterial resistance and the community at risk of infection with resistant organisms.

An anti-tuberculosis drug should satisfy the following criteria (a) it should be highly effective (b) it should be free from toxic side effects (c) It should be easy to administer (d) It should be reasonably cheap chemotherapy. Anti tuberculosis drugs are used in combination to increase therapeutic effectiveness and minimise the emergence of drug resistant strains. This requires the patients full cooperation through preparation of the patient socially, economically and psychologically.

4.2.3. BCG Vaccination: BCG, known as bacille calmette Guerin, is harmless yet capable of conferring a stage of immunity when administered by vaccination. Recognition of value of BCG came in 1948 when it was accepted by tuberculosis workers from all over the world as a safe preventive.

The main aim of BCG vaccination is to induce a benign, artificial primary infection which will stimulate an acquired resistance. There are two types of vaccine - the liquid (fresh) vaccine and the freeze-dried vaccine. Freeze-dried vaccine is a more stable preparation than liquid vaccine. BCG vaccination is now under way throughout the world as part of the WHO Expanded Programme on Immunization.

4.2.4. Chemoprophylaxis: Isoniazid has been tried in the chemoprophylaxis (termed as preventive treatment) of tuberculosis. It may be primary or secondary. Primary is giving the drug to persons who are unaffected to prevent the occurrence of infection in them. By secondary chemoprophylaxis is meant giving to already infected persons to prevent the development of the disease.

4.2.5. Rehabilitation : The people who need rehabilitation are those who are chronically ill and are still excreting tubercle bacilli. Those who had resection may require rehabilitation to suit their physical and mental abilities.

4.2.6. Surveillance: It is an integral part of any effective tuberculosis programme. It is concerned with two aspects (a) Surveillance of the tuberculosis situation, e.g. by measuring the annual "infection rates" which will guide the epidemiologist and health administrator by indicating whether the TB problem is static, increasing, or decreasing; (b) surveillance of Central measures applied such as BCG vaccination and chemotherapy.

5.0. MALARIA

Malaria is a general term applied to a group of diseases caused by infection which specific sporozoon parasites of the genus *Plasmodium* is transmitted to man by certain species of infected, female Anopheline mosquito; and is clinically characterized by episodes of chills and fever with periods of latency, enlargement of spleen and secondary anemia.

It is one of the most widespread diseases. Malaria comprises three stages (a) Cold stage: This is characterized by sudden onset of fever and sensation of extreme cold. The patient desires to be covered with blankets. This stage lasts between 15 minutes to one hour (b) Hot Stage: The temperature may rise to 106°F. The patient feels burning hot and casts off his clothes. There is severe headache. This stage lasts for 2 to 6 hours (c) Sweating Stage: Fever comes down with profuse sweating. This stage lasts for 2 to 4 hours.

Malaria affects all ages. It is a seasonal disease and the maximum prevalence is from July to November. The length of time between the bite of an infected mosquito and the first attack of fever is usually not less than 10 days.

5.1. Mode of Transmission

1. Vector Transmission: A single infected vector, during her lifetime, may infect several persons. The mosquito is not infective unless the sporozoites are present in its salivary glands.
2. Direct Transmission: Malaria may be induced accidentally by hypodermic intramuscular and intravenous infections of blood or plasma, e.g. blood transfusion, malaria in drug addicts.

5.2. Prevention

Traditionally, the measures for the prevention and control of malaria have been classified as (a) Protection against mosquito bites, (b) Anti-larval measures, (c) Anti-adult (mosquito) measures, and (d) Control of the human reservoir.

In order to prevent malaria, following measures should be applied.

1. Measures to be applied by the individual:
 - (a) Prevention of man / vector contact - using repellents, protective clothing, bed nets, screening of houses.
 - (b) Destruction of adult mosquitoes - use of domestic space sprays including aerosols.
 - (c) Destruction of mosquito larvae - peridomestic sanitation, intermittent drying of water containers.
 - (d) Source reduction of mosquitoes - filling, small scale drainage, and other forms of water management.
 - (e) Measures against malaria parasites - chemoprophylaxis and chemotherapy.
2. Measures to be applied by the community:
 - (a) Prevention of man / vector contact - site selection and screening of houses.
 - (b) Destruction of adult mosquitoes - residual spraying or space spraying of insecticides.
 - (c) Destruction of mosquito larvae - using larvicides (chemical and biological).
 - (d) Source reduction - prevention of man-made malaria, environmental sanitation, water management, drainage schemes.
 - (e) Measures against malaria parasites - presumptive treatment, radical treatment, mass drug administration.

1.0. INTRODUCTION

The upright posture, which distinguishes man from all other animals, is the product of perhaps 350,000,000 years of evolution. There are numerous concepts and views regarding posture and its significance. Posture, broadly speaking, may be understood from the stand point of an individual's own body and the way he uses his body, carries his body and holds his body. Each person must take the body he has and should make the best of it by adopting good posture as a habit. It is, therefore, necessary to understand the meaning of good posture, its importance and also to examine the causes of poor posture, its prevention and remedial measures.

2.0. MEANING OF POSTURE

The meaning of posture varies from individual to individual. One posture which may be considered good for one individual may not hold true for another individual. It is well nigh impossible to lay-down strict or absolute standards for a universally good posture. There is no definite form, shape or standard for any part of the human body or for the body as a whole. The single, rigid body mechanics specification for all, regardless of body type or other factors which influence the human form, is scientifically unsupportable. Hence, there can be no single good posture.

There are numerous concepts and views regarding human posture and its significance. To doctors, artists, sculptors, dancers, psychologists, and physical educationists, the term posture conveys different meanings. To a physical educator, posture is a measure of mechanical efficiency, of kinesthetic sense, of muscle balance, and of neuromuscular coordination.

Posture means position or pose, and a multi-segmented organism such as human body cannot be said to have a single posture. It assumes many postures and seldom holds any of them for an appreciable time.

Broadly speaking, the posture concerns the way an individual carries himself while sitting, standing, walking, and lying. It means carriage or the manner of holding one's body. The way we carry ourselves reflects our activeness, alertness, inner strength, confidence, and attitude toward our body. The criterion of good posture should be grace, poise, rhythm, and skill of the individual in motion rather than at rest. Good posture implies change of posture as necessitated by the body requirements. We cannot even sleep in one posture throughout night. Body itself compels an individual to change the posture. Similarly, sitting in a particular rigid position or standing attention or in erect military like position cannot be said to be good posture.

According to Metheny, "There is no single best posture for all individuals. Each person must take the best he has, and make the best of it. For each person, the best posture is that in which the body segments are balanced in the position of least strain and maximum support. This is an individual matter."

The term posture often conveys the thought of a standing position, fulfilling certain aesthetic and mechanical requirements. However, good posture no longer means merely the ability to assume an erect position when it is desired, but to handle the body easily, gracefully, and efficiently under all circumstances. The effective and efficient functions of the body should be the key to a good posture. Many famous athletes have attributed their success, in part, to the fact that they were almost completely relaxed between movements, thus conserving their energy for purposeful expenditure. Good posture both static and dynamic, requires normal muscle tonus, mechanical freedom, better coordination, good neuro-muscular control, and well developed postural reflexes.

The general characteristics of a good posture are erectness, balance, alignment, and ease. In good postural body alignment, the centre of gravity of all the segments such as head, neck and trunk will fall as nearly as possible, in a straight vertical line which passes through the approximate centre of the feet. There is definitely a relationship between the alignment of body segments and the integrity of joint structure. The human machine functions more efficiently when the weight bearing segments are in proper alignment with a minimum of stress and strain on them.

A good posture is one which requires a minimum expenditure of energy for the maintenance of good alignment, whereas utilization of excess energy and effort indicate poor posture. Good posture permits mechanically efficient functioning of joints wherein friction in the joints is minimised, tensions of opposing ligaments are balanced, and pressures within the joints are equalised, requiring minimum wear and tear of the joints. A posture can be said to be good if it fulfills the purpose with maximum efficiency and minimum efforts. To conclude, in good posture, body will be at ease involving less effort, weight equally distributed, all the axes being parallel to a vertical line, the curves of the spine are not twisted, abdomen held inside, chest held high in such a way that the shoulders are in an erect position.

3.0. TYPES OF A GOOD POSTURE

Broadly there are two types of postures: (a) inactive posture - when a person is sleeping or having rest and body requires minimum muscular efforts, and (b) active posture - where integrated muscular activity is required.

Active posture may be static or dynamic. Static posture is one where the body is passive, not active or changing stance and forces are acting in equilibrium. Dynamic posture is one where the body is in motion, active and changing its stance. Postural positions whether inactive or active (static and dynamic), can be broadly classified in four categories.

1. Standing position or posture.
2. Sitting position or posture.
3. Lying position or posture, and
4. Walking posture.

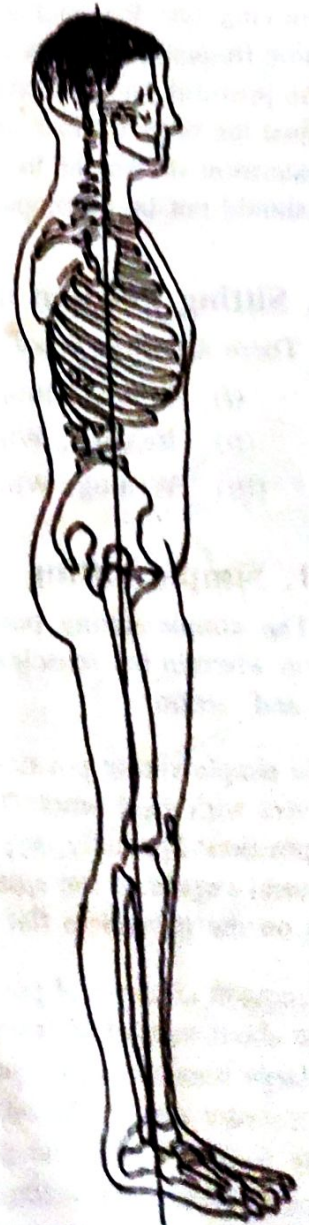


Fig. 1. Good Posture

5.0. CAUSES OF A POOR POSTURE

The causes of poor posture can broadly be classified into two categories:-

- (i) Acquired - due to some accident or disease.
- (ii) Congenital - present at birth or hereditary.

The deformities caused due to poor posture can be of two types:

- (i) Functional divergency, and
- (ii) Structural divergency.

The main causes of poor posture are listed below:

- (1) **Injury:** When a bone, ligament, or muscle is injured, it is likely to weaken the support at that point and throw the framework out of balance. When such condition exists, it is not possible to have a perfect posture. Even after the injury has fully healed, the habit developed during the injury may still persist, and the faulty posture may continue for a long time.
- (2) **Disease:** Posture is greatly effected by the disease that weaken the bones or the muscles or cause the joints to lose their strength or mobility. The examples of this kind of disease are, rickets caused due to faulty nutrition of bone, and tubercular disease of joints or vertebrae. Poliomyelitis may cause weakening or distorting of motor nerve cells in the spinal cord, and thereby causing partial or complete loss of function in certain muscle groups. This type of loss of power in muscle groups upsets the body control and balance and also cause other kind of defects.
- (3) **Habit:** Habits of posture, whether good or bad, are acquired in the same way as the habits of walking, speaking or sitting, i.e. by practicing a certain type of coordination so many times that the act becomes unconscious and habitual. In case of school and college students, though the bones, joints, ligaments and muscles are in normal condition, but due to faulty and wrong habits, their coordination is disturbed, causing poor posture. Wrong habits of posture are also caused by occupation, and environment as well.

- (4) **Weakness:** It is not possible to assume and maintain erect posture without expenditure of some energy. Such efforts, therefore, require some strength and endurance. Experiments have shown that slumped or slouched position of body can be maintained with quite less metabolic energy as compared to the erect position. The muscular weakness and lack of viability is thus responsible for such faulty postures.
- (5) **Mental attitude:** The posture is the manner in which we carry or hold our body and it is bound to reflect our mental attitude. Feelings of happiness, confidence and satisfaction help in maintaining a balanced and erect posture, where as depression and feeling of sadness pose hurdles in maintaining proper posture.
- (6) **Heredity:** Heredity is another factor which is responsible for poor or defective posture. Hereditary defects like kyphosis and other genetic defects may cause poor posture.
- (7) **Improper clothing:** The type of dress one wears also has impact on individual's posture. For example wearing tight fitted dress, tight shoes, high heel shoes etc. will result in adopting poor posture. Such improper clothing makes one uncomfortable and may lead to faulty posture.
- (8) **Improper diet or malnourishment:** Improper diet or malnourishment may result in various diseases due to deficiencies of vitamins and minerals e.g. rickets etc. which result in adopting faulty and poor posture.
- (9) **Chronic fatigue:** Due to continuous work, lack of rest and sound sleep, body tends to develop fatigue, and such condition becomes chronic with persistence of such conditions. Without proper relaxation, rest and sleep, the body and the mind becomes over worked and inefficient. Such conditions put undue stress upon muscles thereby causing postural deviations.
- (10) **Over load:** One may develop round shoulders and deformities of spine like kyphosis and scoliosis by continuously lifting and carrying heavy weight on shoulders and the upper back. Everyday example of overloading can be observed as we find school children carrying heavy school bags on their back.
- (11) **Imitation:** Due to over exposure of the children to the popular media like TV, net work etc., there is general tendency among children to imitate their favourite heroes, models, stars, teachers, friends etc. Such imitation may distort their natural posture and may cause postural deviations.
- (12) **Unhygienic conditions:** It is very common to find crowded class rooms with improper sitting arrangements, improper furniture, improper and insufficient lighting arrangements etc. in our country. Such unhygienic conditions result in postural deviations.
- (13) **Inappropriate time tables:** Improperly planned school curriculum puts extra stress upon the children, e.g. during long practical hours they have to maintain a static and most of the time bent posture which may be a factor causing postural defects.
- (14) **Lack of exercise:** Exercises tone up the spinal nerves and abdominal organs, improves appetite and digestion, promotes flexibility and co-ordination, reduces mental strain, provides energy, improves the physical ability and efficiency. Lack of exercises has several adverse effects which may lead to postural deformities and defects.
- (15) **Lack of awareness:** Many people are unaware regarding the concept of proper posture and continue to follow wrong or faulty postures. This becomes their permanent habit and a life style which leads to postural defects and deformities.
- (16) **Obesity:** Obesity or undue body overweight puts extra stress and strain on the muscular as well as skeletal structure of the body which may result in postural deviations.
- (17) **Poverty:** Lack of essential and basic facilities due to poverty is another important factor which may lead an individual to adopt bad or faulty posture.
- (18) **Occupation:** Certain occupations require sitting, standing or working in an imbalanced or improper posture constantly for long hours, which may result in postural defects and deviations

REMEDIAL MEASURES OF A POOR POSTURE

The appropriate remedial action should be started as soon as possible. Immediate attention is required as bad posture exerts unusual and atypical stress on the soft tissues, muscles and ligaments of the body segment. Time to time screening of body posture will go a long way in preventing postural defects. It must be remembered that the means of correcting postural deviations must be based upon medical diagnosis and recommendations. As ignorance regarding the basic concept of posture is one of the major cause for postural divergencies, proper knowledge regarding the importance of posture and appropriate guidance for correcting the same is necessary so as to develop a 'postural sense' regarding body mechanics in the mind of an individual.

Whenever faulty posture is caused due to any disease, the disease must be treated first before anything else is attempted. If faulty posture is due to an injury, the injury must be treated and allowed to heal. In general, the cause or the reason must be removed or cured before any measures for improvement of posture can be effectively implemented. The treatment of patients with severe injury or disease may often require surgical operations.

As general muscular weakness is also one of the common causes of poor posture, an active childhood involving vigorous exercise, by engaging in games, sports and developmental exercises, is perhaps the best preventive measure that can be undertaken. The type of activity or game selected is equally important. Proper attention should be given while preparing time tables for schools, colleges etc. The time table must provide for extra curricular and recreational activities along with intermittent rest intervals. An hour in the gymnasium will not cure bad posture when many hours are spent in the environment that caused it. This highlights the necessity of improving hygienic condition and making environment conducive to healthy living. Some cases of faulty posture are due to fatigue, mental strain, improper digestion and assimilation of food, malnutrition or similar causes. Rest and proper nutrition are equally as important as a programme of corrective activities. Govt. and Non Govt. Organisations should make sincere efforts to elevate the standard of living of poor people and new drives or programmes like mid-day meals, free education, free vaccination and free health check-ups should be launched.

Due care should be taken to identify the cause of each individual's shortcomings, and corrective procedures in line with best educational and orthopedic practice should be instituted. Postural defects which cannot be corrected by an individual's own efforts are known as resistant or structural defects and all such cases should be referred to a physician or orthopedic surgeon. Coaches and physical education teachers make a valuable contribution when they recognize postural defects and deformities and make appropriate remedial suggestions.

7.0 COMMON POSTURAL DEFORMITIES

There are number of postural deformities which may either be acquired or may be congenital. Each type of postural deviation has its own peculiar causes and effects. Each postural deformity, therefore, demands and requires proper attention and specific treatment for correcting the same. It is, thus necessary to know about various major postural deformities. In this part of chapter four major postural deformities, alongwith their causes, prevention and remedial measures, have been dealtwith.

8.0. KYPHOSIS (Figure 6)

Kyphosis is an exaggeration or increase in the amount of the normal convexity of the thoracic region of spine. It is an abnormal increase in the flexion of the spine i.e. outward curvature of the spine with round shoulders and head drooped forward, resulting in a hump towards the back. Such a condition may arise due to tuberculosis of spine and from various other causes.

Lack of strength or tonus of the extensors of the spine in thoracic region may allow too much flexion. The weight of the body parts, such as head inclined forward or forward position of arms, may cause stretching of a posterior muscles. Excessive relaxation may also allow gravital forces to flex the spine too much. An example can be of a tall, self-conscious individual who tries to shrink himself by slumping.

Preventive and Remedial Measures

Through regular and appropriate exercises the extensors should be strengthened and their tonus should be improved. Excess gravital stresses can be removed by realignment of head, arms, and shoulder girdle or

by variety in occupational positions. Swimming is recommended as an important exercise and performing Chakrasana and Bhujangasana (cobra posture) are also beneficial as remedial measures. However, corrective exercises should be advised only after consultation with physician or physiotherapist.

9.0 LORDOSIS (Figure 7)

It is an exaggeration or increase in the amount of the normal concavity of the lumbar region of the spine, i.e. an increase in the extension curve of the lumbar region beyond normal region. It is inward curvature of the spine with protruding abdomen resulting in hollow back.

This state may occur as a compensatory adjustment to the deviations in the spine above the lumbar region. Relaxation and poor tonus of the abdominal muscles may also allow the curve to collapse. In some cases, when the hips are thrust forward, the curve increases in order to throw the upper trunk back into balance. The muscles of the lower back are shortened and the abdominal muscles are elongated. When this position becomes habitual, too much weight is thrown on the posterior edges of the bodies of the lumbar vertebrae.

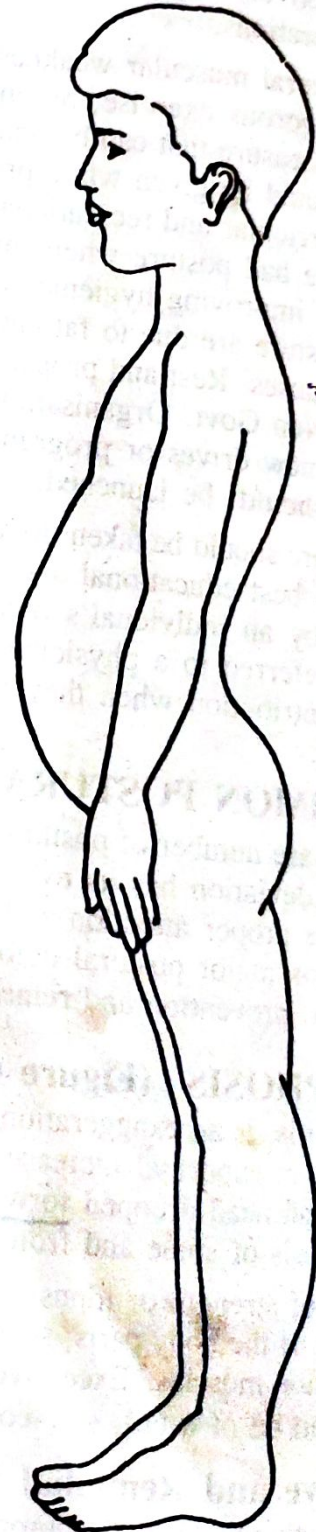


Fig. 6. Kynphosis

Preventive and Remedial Measures

It is necessary to develop the strength in abdominal muscles and exercises should be undertaken to control the position of pelvis. It is necessary that the person, through regular exercises, should secure proper co-ordination of the muscle groups. For effective strengthening of the muscles, it is recommended to sit on a bench against a wall and pushing the trunk backward so that it touches the wall in the lumbar region. This position tilts the pelvis backward and helps to straighten the lumbar spine. Another beneficial exercise is, while lying on the back on the floor with hips flexed, feet vertically over the face, and from this position move the feet in a circle as large as one can, as in bicycling. Performing Halasana is also beneficial for curing this deformity. However, one should consult the physician before undertaking any corrective exercises.

19.0 SCOLIOSIS (Figure 8)

It is an exaggerated lateral curvature i.e. sideward curvature or deviation of the spine, with the shoulder lower and hip higher on one

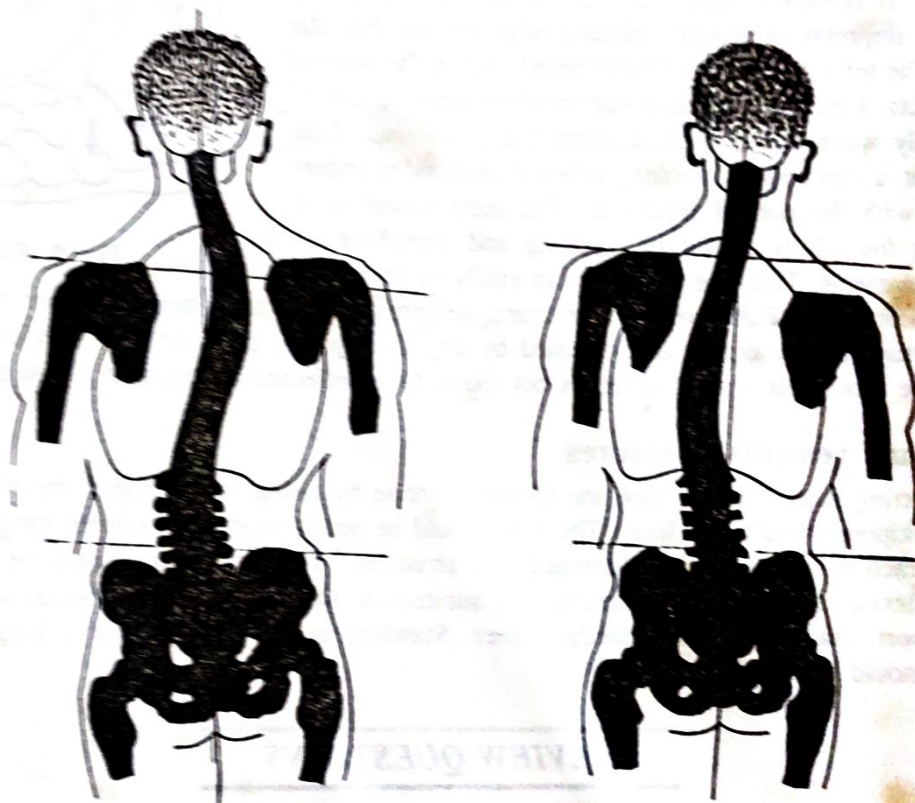


Fig. 8. Scoliosis

side. The curve may be convex to either side, in either the thoracic and lumbar region, or to either side through both regions, or to one side in one region and to the other in the adjacent region. Lateral curvature lessens the ability of the spine to support the body weight, distorts the body cavities, crowds the organs out of place, and in advance cases, causes pressure on spinal nerves also. Scoliosis generally begins with a single C-curve. This can be on the either side, but as most of the people are right handed, the muscles of the right side of the body are generally stronger and the convexity tends to develop on the left side.

Scoliosis may be caused due to : (i) hereditary defects in structure (ii) deterioration of vertebrae, ligaments, or muscles as a result of infections or disease (iii) unilateral / one side paralysis of spinal muscles, (iv) short leg of one side, (v) one side flat foot, (vi) one side or unilateral vision and hearing defects, (vii) imbalance of muscular development as a result of occupation or habit, and (viii) due to constant asymmetrical weight bearing.

Preventive and Remedial Measures

In the early stages, scoliosis may be functional, or postural. This can be cured through voluntary efforts e.g. by hanging oneself from the hands, using body weights, correction of the poorly balanced gravital pull, and by developing strength in spinal extensors through corrective exercises. Lateral bending to the side of convexity e.g. Trikonasana will help in developing those muscles which have become relaxed and stretched. However, in the later stages, the condition becomes resistant, or structural, and the curve can no longer be corrected through above mentioned exercises and advice and guidance of a qualified physician should be obtained before resorting to any corrective exercises.

11.0 FLAT FOOT (Figure 9)

If one can not slide his fingers under the arch of an individual's foot while he is standing in his habitual position, or if the arch is resting on the supporting surface, the foot is classified as a flat foot. It is easy to detect this defect by walking on the sand, as foot impressions would indicate whether one has flat foot or not. The term flat foot or "fallen arch" refers to several different defects. Flexible flat foot is one in which there is loss of the arches only when one is bearing some heavy weights. This condition is not a very serious problem, unless it causes discomfort or interferes with the normal functions. The most common is functional flat foot. It is caused by weakening and stretching of muscles and ligaments. This type of defect can easily be corrected through exercises. 'True Flat Foot' is a structural deformity, sometimes hereditary or congenital. This type of deformity may or may not be accompanied by any discomfort, pain, or any interference with normal functions of the foot. This type of defect is not likely to be effected beneficially through exercises.

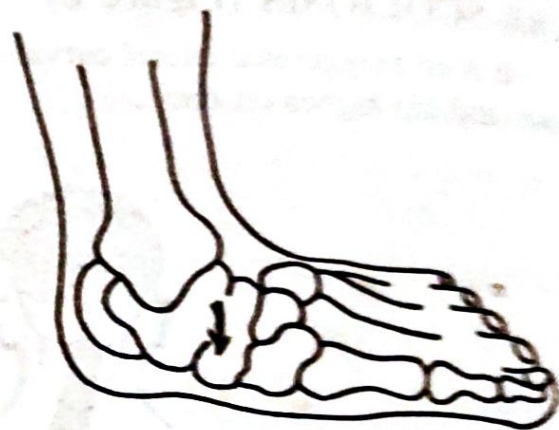


Fig. 9. Flat Foot

Preventive and remedial measures

For correcting functional flat foot one should exercise by rising on the toes, by climbing stairs on the toes, by rope skipping, and by cycling. The foot should be put through the extreme range of its motions by voluntary contraction to stretch the shortened soft structure. The emphasis should be upon the exercises involving toe flexion, foot and ankle flexion, and supination. One should wear special shoes properly fitted with arch support, made by an orthopaedic center. Standing in one position for a long time and wearing heavy shoes should be avoided.

SPORTS INJURIES

1.0. INTRODUCTION

Every day, millions of people (of all ages) in the world participate in games and sports activities, from soccer fields to softball diamonds and kabaddi courts. It's called playing, but sports activities are more than play. Participation in sports improves physical fitness, coordination, and self-discipline, and gives children/individuals valuable opportunities to learn teamwork. Games and Sports can also result in injuries - some minor, some serious, and still others resulting in lifelong medical problems.

Young athletes/sportspersons taking part in games/sports/physical activities are in majority and they are not merely small adults. Their bones, muscles, tendons, and ligaments are still growing, which makes them more susceptible to injury. **Growth plates - the areas of developing cartilage where bone growth occurs in youngsters - are weaker than the nearby ligaments and tendons. What is often a bruise or sprain in an adult can be a potentially serious growth plate injury in a young athlete/sportsperson.**

Young sportspersons/athletes of the same age can differ greatly in size and physical maturity. Some youngsters may be physically less mature than their peers and try to perform at levels for which they are not ready. Thus, Coaches, Physical Educators and Parents should try to group youngsters according to skill level and size, not chronological age, particularly during contact sports. If this is not practical, they should modify the sport/game to accommodate the needs of children with varying skill levels.

2.0. TYPES OF SPORTS INJURIES

Injuries among sportspersons/athletes may be classified into two basic categories:

1. Acute Injuries, and
2. Overuse Injuries.

Both types include injuries to the soft tissues (muscles and ligaments) and bones.

2.1 Acute Injuries

Acute injuries are caused by a sudden trauma. Common acute injuries among young sportspersons/athletes include sprains (a partial or complete tear of a ligament), strains (a partial or complete tear of a muscle or tendon), contusions (bruises) and fractures.

2.2 Overuse Injuries

Not all injuries are caused by a single, sudden twist, fall, or collision. A series of small injuries to immature bodies can cause minor fractures, minimal muscle tears, or progressive bone deformities, known as overuse injuries. As an example, "**Little League Elbow**" is the term used to describe a group of common overuse injuries in young throwers involved in many sports. Other common overuse injuries occur in the heels and knees with tears in the tissue where tendons attach to the leg bone or the heel bone.

Contact sports have inherent dangers that put young athletes/trainees at special risk for severe injuries. Even with rigorous training and proper safety equipment, youngsters are at risk for severe injuries to the neck, spinal cord, and growth plates. However, obeying the rules of the game and using proper equipment can decrease these risks.

3.0. COMMON SPORTS INJURIES

Some of the common sports injuries are sprain, strain, fracture, dislocation, abrasion, and contusion.

3.1 SPRAIN

A sprain is a stretch and/or tear of a ligament, the fibrous band of connective tissue that joins the end of one bone with another. Ligaments stabilize and support the body's joints. For example, ligaments in the knee connect the upper leg with the lower leg, enabling people to walk and run.

3.2 STRAIN (Figure 1)

A strain is a twist, pull and/or tear of a muscle and/or tendon. Tendons are fibrous cords of tissue that attach muscles to bone.

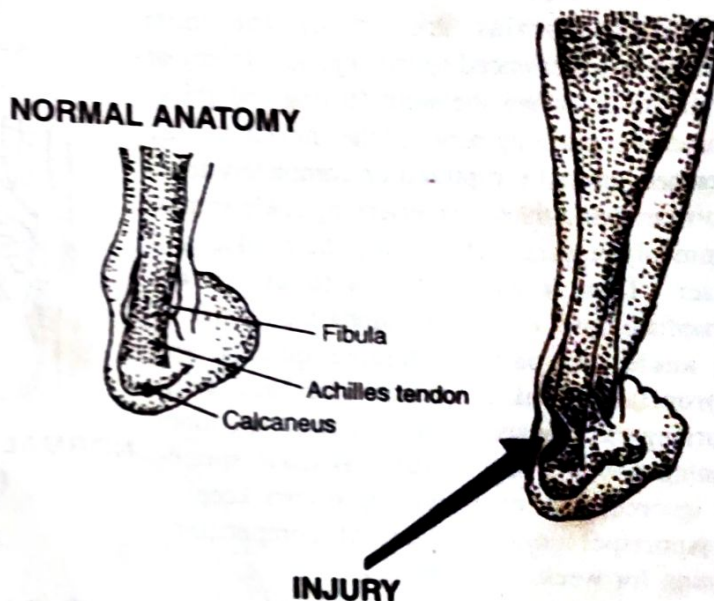


Fig. 1. Tendon Strain

3.3 Causes of Sprains and Strains

A sprain is caused by direct or indirect trauma (a fall, a blow to the body, etc.) that knocks a joint out of position, and overstretches, and, in severe cases, ruptures the supporting ligaments. Typically, this injury occurs when an individual lands on an outstretched arm; slides into a base; jumps up and lands on the side of the foot; or runs on an uneven surface.

Chronic strains are the result of over-

use - prolonged, repetitive movement - of muscles and tendons. Inadequate rest breaks during intensive training precipitates a strain. Acute strains are caused by a direct blow to the body, overstretching, or excessive muscle contraction.

Sportspersons/athletes and the general public, as well, can sustain this injury. People at risk for the injury have a history of sprains and strains, are overweight, and are in poor physical condition.

3.4 What Activities Make Sportspersons/Athletes Most Susceptible to Sprains and Strains

All sports and exercises, even walking, carry a risk of sprains. The anatomic areas most at risk for a sprain depend on the specific activities involved. For example, basketball, volleyball, soccer, and other jumping sports share a risk for foot, leg, and ankle sprains. Soccer, football, hockey, boxing, wrestling, and other contact sports put players/athletes at risk for strains. So do other activities sports that feature quick starts (hurdling, long jump, running etc.). Gymnastics, tennis, rowing, golf-sports that require extensive gripping-have a high incidence of hand strains. Elbow strains frequently occur in racquet, throwing, and contact sports.

3.5 Signs of a Sprain

While the intensity varies, pain, bruising, and inflammation are common to all three categories of sprains—mild, moderate and severe. The individual will usually feel a tear or pop in the joint. A severe sprain produces acute pain at the moment of injury, as ligaments tear completely, or separate from the bone. This loosening makes the joint nonfunctional. A moderate sprain partially tears the ligament, producing joint instability, and some swelling. A ligament is stretched in a mild sprain, but there is no joint loosening.

3.6 Ankle Sprains (Figure 2a, b, c)

Ankle sprains are among the most commonly experienced sports injuries. Injury or sprain occurs when the stout (strong and thick) ligaments connecting bones of the ankle are either stretched, partially ruptured or completely torn. Sportspersons/Athletes experiencing ankle sprains commonly remark that they felt their ankle turn under. This is associated with an almost immediate onset of swelling along the outside of the ankle and pain. If treated quickly and appropriately ankle sprains can heal well, returning the sportsperson/athlete to competition/training within a few of days. If ankle sprains are ignored, enormous swelling occurs keeping the sportsperson/athlete out of competition/training for weeks to months.

Ankle sprains are graded by health care specialists in terms of degree of severity. The more severe the sprain, the higher the degree and the longer the time to recover. First degree ankle sprains are the most common. In this injury the ligaments including the anterior talofibular ligament(ATFL) are stretched but not completely torn. There is modest swelling but no gross instability.

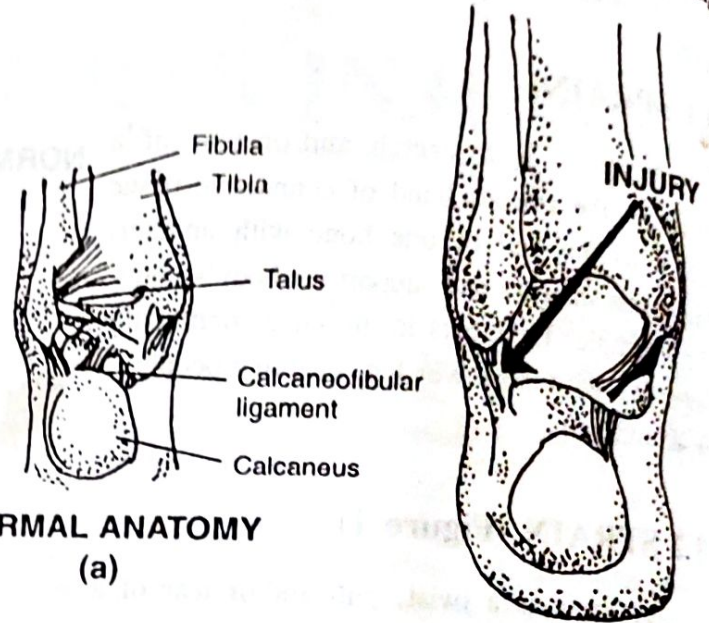


Fig. 2 (a) Ankle Sprain (Mild)

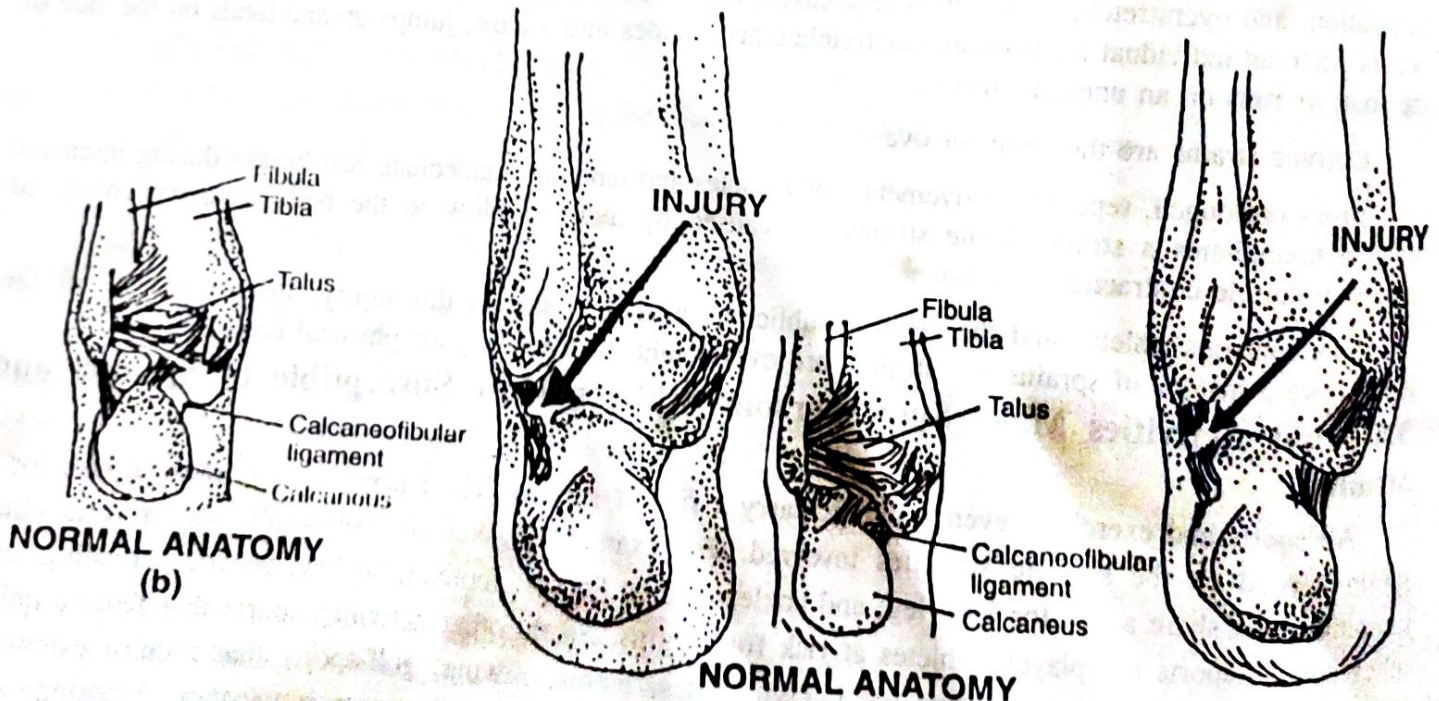


Fig. 2 (b) Ankle Sprain (Moderate)

Fig. 2. (c) Ankle Sprain (Severe)

Second-degree sprains involve partial tearing of the anterior talofibular ligament. There is more swelling, more pain and generally longer time to recover. Third degree ankle sprains involve complete rupture of the lateral ankle ligaments beginning with the **anterior talofibular ligament and extending posteriorly to the talocalcaneal ligament.**

Initial treatment for all three degrees of ankle sprains is the same. The ankle should be compressed with an elastic bandage such as an Ice wrap. Ice should be applied and the ankle should be elevated. Sportspersons/Athletes should be placed on crutches allowing weight bearing as soon as comfortable. After taping, icing, elevating and protecting the ankle through the inflammatory stage usually upto three days, taping is continued but work has now begun on range of motion. Once painless motion has been restored to normal, strengthening begins. This may be performed on your own or under the auspices of a coach/trainer or physical therapist. Once strength has returned, sportspersons/athletes may begin walking on their ankle, then jogging, then advancing to sports specific cutting and twisting activities.

If the ankle is allowed to swell initially after the injury, the time taken to recover is markedly delayed making immediate care the most important aspect of ankle injury.

A second type of ankle sprain involves a disruption of the ligaments connecting the two bones, the tibia and fibula, at the ankle. This is a rupture of the syndesmotic ligament commonly known as a high ankle sprain. This injury takes a significantly longer period of time to recover.

3.7 Signs of a Strain

Typical indications include pain, muscle spasm, muscle weakness, swelling, inflammation, and cramping. In severe strains, the muscle and/or tendon are partially or completely ruptured, often incapacitating the individual. Some muscle function will be lost with a moderate strain, where the muscle/tendon is overstretched and slightly torn. With a mild strain, the muscle/tendon is stretched or pulled, slightly. Some common strains are:

3.8. Back Strain

When the muscles that support the spine are twisted, pulled, or torn, the result is a back strain. Players/Athletes who engage in excessive jumping (during basketball, volleyball, etc.) are vulnerable to this injury.

3.9. Hamstring Muscle Strain

A hamstring muscle strain is a tear or stretch of a major muscle in the back of the thigh. The injury can sideline a person for up to six months. The likely cause is muscle strength imbalance between the hamstrings and the muscles in the front of the thigh, the quadriceps. Kicking a football, running, or leaping to make a basket can pull a hamstring. Hamstring injuries tend to recur.

3.10 Preventive measures of sprains and strains

No one is immune to sprains and strains, but here are some tips developed by the American Academy of Orthopaedic Surgeons to help in reducing the injury risk:

1. Participate in a conditioning program to build muscle strength
2. Do stretching exercises daily

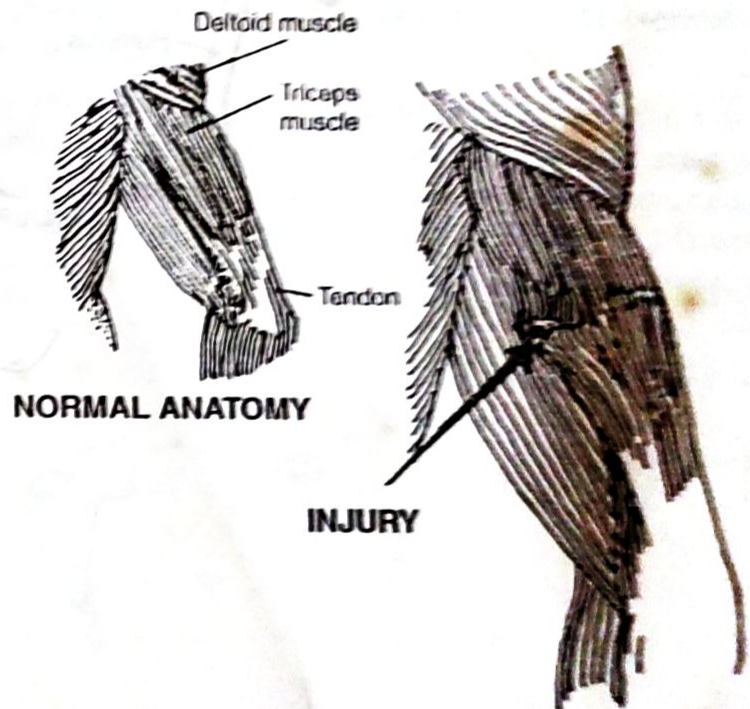


Fig. 3. Arm (Triceps) Strain

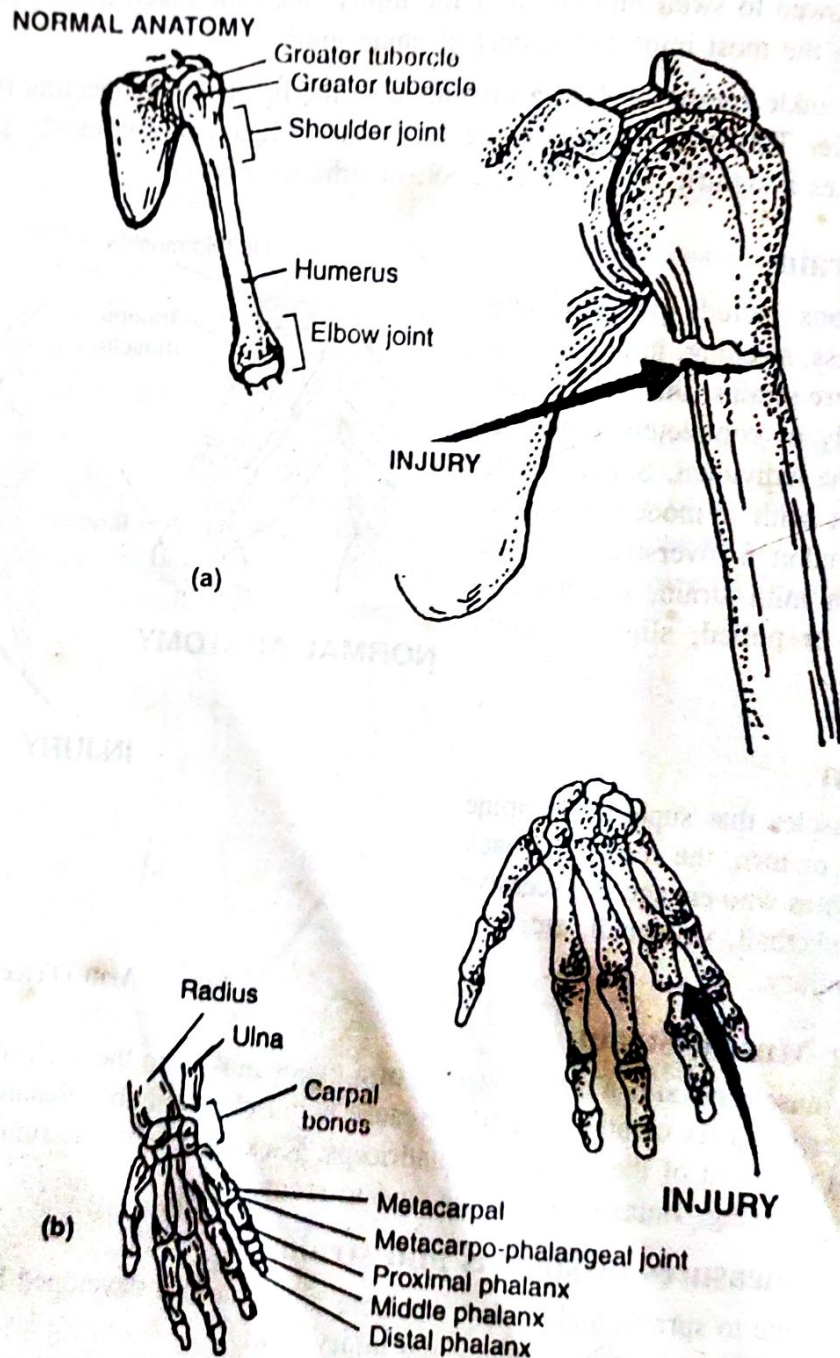
3. Always wear properly fitting shoes
4. Nourish your muscles by eating a well-balanced diet
5. Warm up before any sports activity, including practice
6. Use or wear protective equipment appropriate for that sport

3.11 Treatment of Sprains and Strains

"R.I.C.E." - Rest, Ice, Compression and Elevation usually are helpful in minimizing the damage. It is important in all but mild cases for a medical doctor to evaluate the injury and establish a treatment and rehabilitation plan. A severe sprain or strain may require surgery or immobilization followed by months of therapy. Mild sprains and strains may require rehabilitation exercises and activity modification during recovery. Details of R.I.C.E. have been described in later part of this section.

5.0. FRACTURE (Figure 4a & b)

Fracture is a broken bone.



NORMAL ANATOMY
 Fig. 4. (a) Arm (Humerus) Fracture (b) Finger Fracture

5.1. Types of Fractures

There are many kinds of fractures. Common types include simple, compound, multiple, comminuted, greenstick, spiral, stress, complicated and fractures.

5.1.1. **Simple Fracture** - In a simple fracture, a bone breaks, but the skin over it does not.

5.1.2. **Compound Fracture** - In a compound fracture, both the bone and skin break, and there is danger of infection.

5.1.3. **Multiple Fracture** - Multiple fracture means there is more than one fracture in a bone.

5.1.4. **Comminuted Fracture** - Comminuted fracture means the bone has splintered, or shattered, usually owing to a crushing injury.

5.1.5. **Spiral Fracture** - A spiral fracture results when a bone is broken by a twisting force.

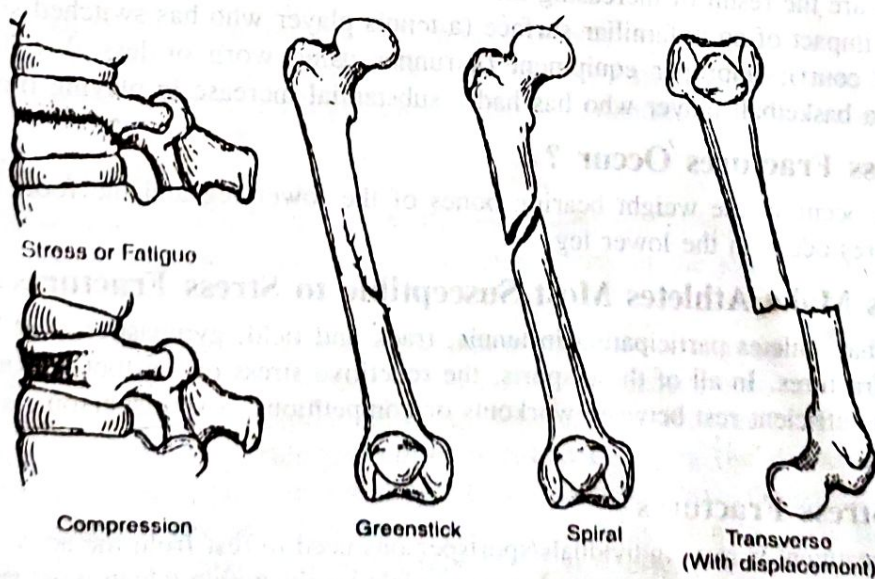
5.1.6. **Greenstick Fracture** - In a greenstick fracture, the break occurs only part way through the bone.

5.1.7. **Impacted Fracture** - When the broken ends of both the bones driven into one another.

5.1.8. **Communicated Fracture** - When the bone is broken into several pieces.

5.1.9. **Stress Fractures** - A stress fracture is an overuse injury. It occurs when muscles become fatigued and are unable to absorb added shock. Eventually, the fatigued muscle transfers the overload of stress to the bone causing a tiny crack called a stress fracture.

Doctors can detect a fracture in several ways. Usually, there is pain, soreness, or tenderness in a fracture area. Swelling and discoloration also occur. Sometimes, there is a movement of the bone under the skin and obvious deformity. Crepitus often signals a broken bone. Crepitus is a harsh grating sound caused when the broken ends of the bone rub together. In some cases, only an X - ray reveals a fracture. Fractures require medical treatment. The injured part of the body should be immobilized until skilled help is available.



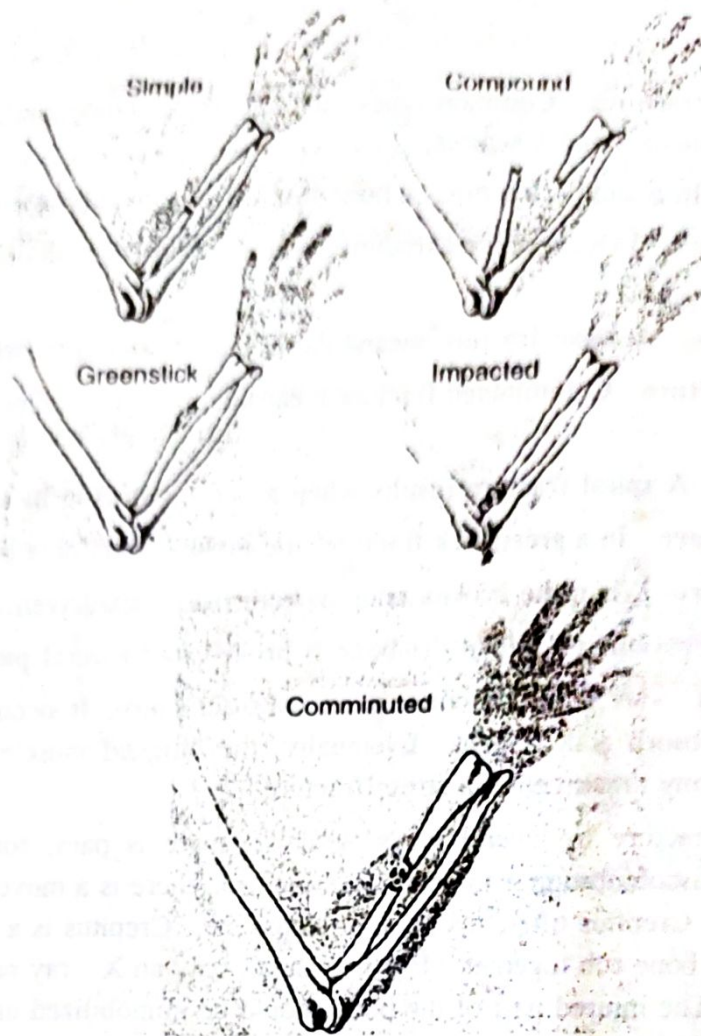


Fig. 5. Types of Fractures

5.2 Causes of Stress Fracture

Stress fractures often are the result of increasing the amount or intensity of an activity too rapidly. They also can be caused by the impact of an unfamiliar surface (a tennis player who has switched surfaces from a soft clay court to a hard court); improper equipment (a runner using worn or less flexible shoes); and increased physical stress (a basketball player who has had a substantial increase in playing time).

5.2.2 Where do Stress Fractures Occur ?

Most stress fractures occur in the weight bearing bones of the lower leg and the foot. More than 50 percent of all stress fractures occur in the lower leg.

5.2.3 What Activities Make Athletes Most Susceptible to Stress Fractures?

Studies have shown that athletes participating in tennis, track and field, gymnastics, and basketball are very susceptible to stress fractures. In all of these sports, the repetitive stress of the foot striking the ground can cause trauma. Without sufficient rest between workouts or competitions, a sportsperson risks developing a stress fracture.

5.2.4 Treatment of Stress Fractures

The most important treatment is rest. Individuals/sportspersons need to rest from the activity that caused the stress fracture, and engage in a pain-free activity for six to eight weeks within which most stress fractures heal.

If the activity that caused the stress fracture is resumed too quickly, larger, harder-to-heal stress fractures can develop. Re-injury also could lead to chronic problems where the stress fracture might never heal properly.

- (a) Slowly increase any new sports activity. For example, do not immediately start running five miles a day; instead gradually build up your mileage on a weekly basis. Running also can be done on alternate days. Try alternating the days you run on a weekly basis.
- (b) Maintain a healthy diet. Make sure you incorporate calcium-rich foods in your meals.
- (c) Use the proper equipment. Do not wear old or worn out running shoes.
- (d) If pain or swelling occurs, immediately stop the activity and rest for a few days. If continued pain persists, see an orthopaedic surgeon.
- (e) It is important to remember that if you recognize the symptoms early and treat them appropriately, you can return to sports/activity at your normal playing level.

6.0. FRACTURES AND DISLOCATIONS

A fracture is a break in a bone. A dislocation occurs when the end of a bone is forced out of its normal position in a joint. Fractures and dislocations frequently result from sports accidents subject to many understandable reasons.

Signs of fractures and dislocations include pain, an unusual position of a joint or bone, and tenderness and swelling around the injury. The victim may also experience a grating sensation, caused by fragments of broken bone rubbing together. The victim may be unable to use a hand or a foot.

One should keep the victim quiet and treat for shock. Whenever possible, the injured person should not be moved until expert help arrives. Improper handling of an injured bone or joint may seriously damage arteries, muscles, or nerves. It may also increase the severity of the fracture or dislocation.

If you have to move the victim before help arrives, apply a splint to the injured area. The splint prevents broken or dislocated bones from moving. You can make a splint from any material that will support the injured part without bending. For fractures of the arm or leg, the splint should be long enough to prevent movement of joints above and below the injury. Pad the splint surfaces that touch the body. Do not try to correct any deformities before splinting. Do not push bone fragments back into an open wound.

Use strips of cloth to tie the splint above and below the point of injury. Do not tie the splint so tightly that it interferes with circulation. Blueness or swelling in fingers, for example, indicates that a splint has been tied too tightly to an arm.

A person who may have suffered a broken neck or other spinal injury should not move. A person may receive such an injury by diving into shallow water, falling from a considerable height, or striking the head in a sporting accident. Moving such person may cause permanent paralysis or even death.

7.0. DISLOCATION

The term dislocation usually refers to the movement out of normal position of the bones of a joint. When bones become dislocated, they do not meet properly at the joint. This usually results in pain and swelling.

Sometimes in dislocation the bones of a joint are pulled out of place only slightly, doctors call this a **subluxation or incomplete dislocation**. In other cases, the bones become completely separated from each other. This is a complete dislocation. A doctor corrects a dislocation by manipulating the bones to return them to their normal position, this procedure is called **reducing the dislocation**. Some dislocated joints may return to their normal position naturally. In simple dislocation, the patient has no external wound. A compound dislocation is one accompanied by a wound opening from the body surface. **When a dislocation occurs in the same joint many times, doctors say it is habitual.**

7.1 Causes of Dislocation

In sports the causes of dislocation vary from game to game and situation to situation. However, some of the main reasons may be a direct blow to the part concerned i.e. knee, wrist, shoulder, ankle etc. Pulling or