CHAPTER TWO

SPORTS AND NUTRITION

FOOD: Any liquid or solid item which a person wants and digests them through digestive process to get energy for various physical purposes is called food. In other words, food is what people and animals eat to survive. It is eaten by living things to provide energy and nutrition.

DIET: It is the daily intake of food by the human body. In other words, diet is the sum of food consumed by a person or other organism.

BALANCED DIET: A diet which contains the proper amount of each nutrient, i.e. like carbohydrate, fat, protein etc is called Balanced Diet. A diet which consists of all the essential food constituents' viz. protein, carbohydrates, fats, vitamins, minerals and water in correct proportion is called balanced diet. In other words, a complete food, a diet contains adequate amounts of all the necessary nutrients required for proper growth & maintenance of body.

NUTRITION: – It is the process of obtaining & consuming food or breaking down food & substances taken in by the mouth to use for energy in the body.

SPORTS NUTRITION: Sports nutrition is the study and practice of nutrition and diet with regards to improving anyone's athletic performance. It is concerned with the type and quantity of fluid and food taken by an athlete, and deals with nutrients such as vitamins, minerals, and organic substances such as carbohydrates, proteins and fats.

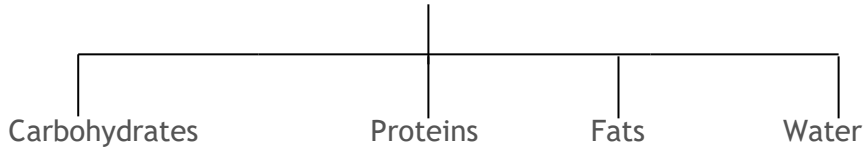
MACRO NUTRIENT: Macronutrients mainly include carbohydrates, proteins and fats and also water which are required in large quantities and their main function being the release of energy in body. Macronutrients include Carbon, Oxygen, Hydrogen, and Nitrogen.

MICRO NUTRIENTS: Micronutrients mainly comprise vitamins and minerals which are required in minute quantities. However, both macro nutrients as well as micro nutrients are essential. Micro nutrients are chlorine, iron, manganese, zinc, boron, sodium, copper, molybdenum and nickel.

Difference between Micro Nutrients and Macro Nutrients

Basis	Macro Nutrients	Micro Nutrients
Definition	Macronutrients mainly include carbohydrates, proteins and fats and also water which are required in large quantities and their main function being the release of energy in body.	Micronutrients mainly comprise vitamins and minerals which are required in minute quantities.
Example	Carbohydrates, Proteins and fats.	Minerals and Vitamins
Proportion required	Carbohydrates 60-75 Proteins 10-15% Fats 20-25%	These nutrients are required in small amounts-milligram and microgram.

MACRO NUTRIENTS



1. CARBOHYDRATES:

Composition:

- It is a compound formed by chemical compositions of Carbon(C), Hydrogen (H) and Oxygen (O2) in the ratio of 1:2:1.
- It includes sugar, starches, cellulose and many other compounds found in living beings.

Types of Carbohydrates:

- In their basic form, carbohydrates are made up of simple and complex carbohydrates.
- Simple carbohydrates are a single unit of sugar in simple carbohydrate. It consists of Monosaccharides, Disaccharides and Oligosaccharides.
- Complex carbohydrates have three or more sugars. It consists of Polysaccharides.

Sources of simple carbohydrates:

- Sugar, jelly, jam, sweets, chocolates, deserts, ice creams etc.

Sources of complex carbohydrates:

- Rice, cereal grains, fruits, vegetables, potato, pasta, pulses etc.

Functions of carbohydrates:

- It is the main source of energy.
- It provides fuel in our central nervous system.
- It helps in excretory system.
- It is also essential for oxidation of fats and for synthesis of certain non-essential amino acids

Lack of carbohydrates:

- **It causes weight loss**

Need of carbohydrates in or body:

- 1 Gram of carbohydrates gives 4 calories.

2. PROTEINS:

Composition:

- It is a compound formed by chemical compositions of carbon(C), hydrogen (H) and oxygen (O2), Nitrogen (N) and sometimes Sulphur.
- Proteins are macromolecules formed by amino acids.
- The Amino acids are 20 in total in which 8 are not produced in body and has to be supplemented through diet.

Types of Proteins:

- Animal proteins are derived from animals.
- Vegetable proteins are derived from vegetables.

Sources of Animal Protein:

- Milk, egg, milk products, meat, fish etc..

Sources of Vegetable Protein:

- Pulses, soyabean, cereals, nuts, seeds etc.

Functions of Proteins:

- It helps in repair and maintenance of body tissue.
- It helps in the regulation of body processes.
- It helps in the formation of enzymes and hormones.
- The amino acids are used by the body to create blood, muscles, nails, skin, hair and internal organs.
- It acts as the building block to our body.

Lack of Proteins:

- It causes deficiency diseases like Marasmus and Kwashiorkor.
- It can cause physical and mental tiredness.

Need of Proteins in or body:

- 1 gram of proteins gives 4 calories.

3 FATS:

Composition:

- It is a compound formed by chemical compositions of carbon(C), hydrogen (H) and oxygen (O2) in the ratio of 76:12:12.

Types of Fats:

- Saturated fats do not have double bond and are solid at room temperature. They cause rise in blood cholesterol and fatty build up in coronary arteries which leads to high blood pressure and coronary heart diseases.
- Unsaturated fats have two or more double bonds and are liquid at room temperature. They are of three types
  - i) Monosaturated fats: They are least harmful of fatty acids. It lowers the low density lipo proteins or bad cholesterol. It helps to digest Vitamin A, D E and K.
  - ii) Poly Saturated fats: In this fat, there are two types between carbon and hydrogen. It reduces cholesterol.
  - iii) Hydrogenated fats: These are liquid vegetable oils made creamy when manufactures convert some of unsaturated fats into saturated through a process called hydrogenation.

Sources of fats:

- Animal sources: Fats derived from animals.
- Vegetable sources: Fats derived from vegetables like coconut, soyabean, mustard oil, dry fruits etc.

Animal sources:

- Ghee, butter, curd, milk, paneer, meat, egg etc.

Vegetable sources:

- Coconut, soyabean , mustard oil, dry fruits etc.

Functions of fats:

- It helps in production of hormones.
- It helps in beautification of body.
- It controls and regulates body temperature.
- It moistures skin and protect from excess heat and cold.
- It helps in growth and development.

Lack of fats:

- Remembering or an overall lack of mental energy could be caused by an essential fatty acid deficiency

Need of fats in or body:

- 1 Gram of fats gives 9 calories.

4 WATER

Composition:

- Water, a substance composed of the chemical elements hydrogen and oxygen in the ratio of 2:1.
- It exists in gaseous, liquid, and solid states.
- About 90% of human blood contains water.
- It is tasteless and odourless.
- It is liquid at room temperature.

Functions of water:

- Water regulates body temperature.
- It carries nutrients to the tissues.
- It eliminates body wastes.
- It lubricates and cushions body parts.
- It is involved in the absorption and digestion of food.

MICRO NUTRIENTS

MINERALS:

Composition:

- Oxygen, silicon, aluminium, iron, calcium, sodium, potassium and magnesium make up most minerals.
- All minerals have a specific chemical composition.
- Each mineral has its own chemical formula.

Types of Minerals:

- Macro minerals are present at larger levels in the animal body or required in larger amounts in the diet.
- Micro minerals are often referred to as trace minerals, meaning they are present at low levels in the body or required in smaller amounts in the animals diet.

Micro Minerals

Minerals	Composition	Functions	Sources	Deficiency
Calcium	Calcium (Ca) and atomic number 20.	i)Essential in muscle contraction. ii) Building strong bones and teeth, blood clotting, regulating heart beat. iii) Helps in blood clotting	Milk, cheese, eggs, cereals, green leafy vegetables, soya beans, nuts etc.	Rickets
Magnesium	Magnesium (Mg) and atomi c number 12.	i)It repairs and maintains body tissues and cells.	Meat, brown rice, beans and whole grains etc.	Diabetes, Chronic diarrhoea,

Phosphorus	Phosphorus(P) and atomic number 15	i) Formation of bones and teeth. ii)It is also needed for the body to make protein for the growth, maintenance, and repair of cells and tissues.	Milk, Fish, Rice , eggs etc.	Rickets in children, Osteomalacia in adults.
Sodium	Chemical (Na), atomic number 11	i)It maintains the balance of water in the body cells. ii)It's important for proper muscle and nerve function. iii)It also helps maintain stable blood pressure levels.	Salt, pickle and butter	Hyponatremia*
Potassium	Potassium (K) and atomic number 19.	i) It helps regulate fluid balance, muscle contractions and nerve signals. ii) It prevent osteoporosis and kidney stones.	Salt, Pickle, Green leafy vegetables, citrus fruits	Muscles feel weak, cramps etc.
Sulphur	Sulphur (S) and atomic number 16.	i) It is required for growth of brain, nails and hairs.	Egg, radish, carrot, peas and spinach.	Obesity, heart disease, Alzheimer's *and chronic fatigue

***Hyponatremia:** In hyponatremia, one or more factors — ranging from an underlying medical condition to drinking too much water — cause the sodium in your body to become diluted. When this happens, your body's water levels rise, and your cells begin to swell. This swelling can cause many health problems, from mild to life-threatening.

*Alzheimer's: **Alzheimer's disease** is a type of dementia that causes problems with memory, thinking and behaviour.

Macro Minerals

Minerals	Composition	Functions	Sources	Deficiency
Iron	Iron (Fe) in the crust is combined with various other elements to form many iron minerals.	i) It is essential in formation of haemoglobin.	Yeast, Meat, Eggs, Dry fruits, Banana Green leafy vegetables	Anaemia
Sodium	Sodium(Na) atomic number 11	i) Better neuromuscular response. ii) It is helpful in preventing the disease of stomach and kidney. iii) It maintains the balance of acid and bone.	Salt, Pickle, Butter etc.	Cramps Tiredness, Kidney failure, Heart failure, Hyponatremia
Chromium	Chromium(Cr) and atomic number 24	i) It activates the process of insulin. ii) Breakdown of fats and carbohydrates. It stimulates fatty acid and cholesterol synthesis. iii) They are important for brain function and	Soyabean, Carrot, Tomato, Nuts, Egg yolk	Diabetes Heart disease Mental stress

		other body processes.		
Copper	Copper (Cu) and atomic number 29.	i) It is essential in formation of haemoglobin. ii) It is essential for physical and mental activities. iii) It is helpful in digestion.	Eggs, Pulses, Green leafy vegetables	Cancer, Lack of immunity.
Cobalt	Cobalt (Co) and atomic number 27.	i) It helps treat illnesses such as anaemia and certain infectious diseases. ii) It helps in the formation of haemoglobin (red blood cells).	Green leafy vegetables, Meat Milk	Anaemia
Zinc	Zinc (Zn) and atomic number 30.	i) It increases immunity of body.	Water lemon seeds, Chocolates, Nuts	Hair loss, Diarrhoea,

VITAMINS:

Composition:

- An organic compound required in tiny amounts for normal growth and development.

Types of Minerals:

- **Water soluble vitamins:** A vitamin that can dissolve in water.
- **Fat soluble vitamins:** A vitamin that can dissolve in fats and oils. Fat-soluble vitamins are absorbed along with fats in the diet and can be stored in the body's fatty tissue.

Fat soluble vitamins

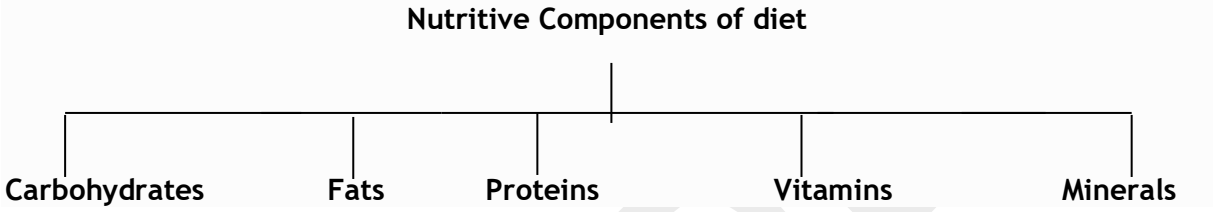
Vitamins	Chemical Name	Functions	Sources	Deficiency
Vitamin A	Retinol	Vitamin A helps form and maintains healthy teeth, skeletal and soft tissue, mucus membranes, and skin.	Milk, Butter, Cheese, Tomato, Papaya, Orange	Night blindness
Vitamin D	Calciferol	It absorbs calcium and promote bone growth. It promotes good eyesight, especially in low light.	Green leafy vegetables, Tomato, Milk	Rickets
Vitamin E	Tocopherol	It is important for reproduction system. It is helpful in bone metabolism and regulates blood calcium levels.	Cereal, Yeast, Cauliflower, Spinach	Infertility in men and women, Vision problems, Muscle weaknesses
Vitamin K	Phylloquinone	help reduce free radical damage and slow the aging process of your cells	Green leafy vegetables, cereals, fruits and meat.	Delay in blood clotting, Osteoporosis

Water soluble vitamins

Vitamins	Chemical Name	Functions	Sources	Deficiency
Vitamin B1	Thiamine	It is an essential nutrient that all tissues of the body need to function properly.	Wheat, Sprouts seeds, Rice, Fish, Liver, Kidney, Meat	Beriberi
Vitamin B2	Riboflavin	It helps convert carbohydrates into adenosine triphosphate (ATP). It helps to keep healthy eyes, nose, mouth, lips and tongue.	Wheat, Yeast, Fish, Pulses,Eggs, Green leafy vegetables	Immunity power in white blood corpuscles Cracks in limbs, Inflammation of tongue
Vitamin B3	Niacin	It contributes to the normal function of the nervous system and normal psychological function. It also contributes to the reduction of tiredness and fatigue.	Dry fruits, egg yolk, milk	Pellagra*
Vitamin B5	Pantothenic acid	It's necessary for making blood cells. It helps you convert the food you eat into energy.	Liver and Kidney, yeast, Egg yolk, Peanuts, Fish, Chicken, Milk	Fatigue, Insomnia, Depression, Irritability, vomiting, Stomach pains.
Vitamin B6	Pyridoxine	It is helpful in making haemoglobin.	Meat, Fish, egg yolk, rice, wheat pulses, Green leafy vegetables, liver	Anaemia
Vitamin B7	Biotin	Biotin supplements increase the health of their skin, hair and nails.	Walnuts, Peanuts, Cereals, Milk and egg yolks.	Impaired growth
Vitamin B9	Folic acid	It is especially important when cells and tissues are growing rapidly, such as in infancy, adolescence, and pregnancy. Folic acid also works closely with vitamin B12 to help make red blood cells and help iron work properly in the body.	Beans. Citrus fruits. Whole grains. Green leafy vegetables. Beets. Cauliflower.	Pregnant women may lead to birth defects
Vitamin B12	Cobalamin	It is crucial to the normal function of the brain and the nervous system. It is also involved in the formation of red blood cells. It is helpful in energy production.	Fish, liver, kidney, meat	Anaemia

Vitamin C	Ascorbic acid	It is necessary for the growth, development and repair of all body tissues. It's involved in many body functions, the immune system, wound healing, and the maintenance of cartilage, bones, and teeth.	Citrus fruits, tomato, cabbage	Scurvy

*Pellagra: Symptoms include inflamed skin, diarrhoea, dementia, and sores in the mouth.



Nutritive components of diet

Carbohydrates - Composition: It is a compound formed by chemical compositions of carbon(C), hydrogen (H) and oxygen (O2) in the ratio of 1:2:1**.** It includes sugar, starches, cellulose and many other compounds found in living beings.

Starch: It is derived from wheat, maize, corn flour, rice, potato, beet etc.

Sugar: They are made up of Monosaccharide's and Disaccharides. They can be obtained from honey, sugarcane, beet, milk etc.

Cellulose: It is a fibrous substance and is obtained from fruits, vegetables and cereals.

Functions of carbohydrates: It is the main source of energy.It provides fuel in our central nervous system. It helps in excretory system.It is also essential for oxidation of fats and for synthesis of certain non-essential amino acids

Need of carbohydrates in or body: 1 Gram of carbohydrates gives 4 calories.

PROTEINS:-Composition: It is a compound formed by chemical compositions of carbon(C), hydrogen (H) and oxygen (O2), Nitrogen (N) and sometimes Sulphur.Proteins are macromolecules formed by amino acids. The Amino acids are 20 in total in which 8 are not produced in body and has to be supplemented through diet.

There are two main dietary sources of proteins:

Animal Sources: Milk, egg, milk products, meat, fish etc..

Vegetable Sources: Pulses, soyabean, cereals, nuts, seeds etc.

Functions of Proteins: It helps in repair and maintenance of body tissue.It helps in the regulation of body processes. It helps in the formation of enzymes and hormones.The

amino acids are used by the body to create blood, muscles, nails, skin, hair and internal organs.
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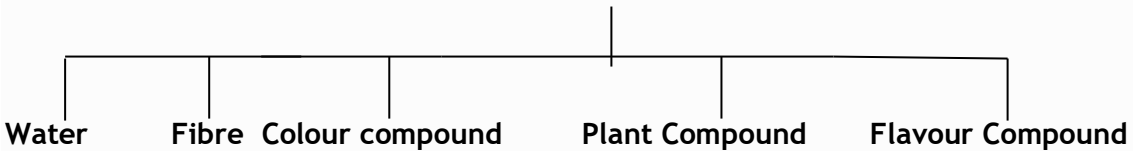
Micro minerals are often referred to as trace minerals, meaning they are present at low levels in the body or required in smaller amounts in the animals diet. Calcium, Magnesium, Phosphorus, Sodium, Potassium, Sulphur, Zinc are some of the examples of micro minerals.

VITAMINS: Composition: An organic compound required in tiny amounts for normal growth and development.

Types of Minerals:
Fat soluble vitamins: Vitamin A, Vitamin D, Vitamin E and Vitamin K.
Water soluble vitamins: Vitamin B, Vitamin B2, Vitamin B3, Vitamin B5, Vitamin B6, Vitamin B7, Vitamin B9, Vitamin B12, Vitamin C.

Non-Nutritive Components of diet



1. Water: Composition: Water, a substance composed of the chemical elements hydrogen and oxygen in the ratio of 2:1.It exists in gaseous, liquid, and solid states. About

90% of human blood contains water.It is tasteless and odourless. It is liquid at room temperature.

Functions of fats: Water regulates body temperature.It carries nutrients to the tissues. It eliminates body wastes. It lubricates and cushions body parts.It is involved in the absorption and digestion of food.

2. Fibre or Roughage:

Composition:

- It scientific name is non-starch polysaccharides (NSP).
- Roughage, or fibre, refers to the carbs in plants that your body cannot digest.
- It is a component of food which has no nutritive value but is very essential.
- They are referred to a dietary fibre.

Types of Roughage:

- **Soluble** fibre is jellylike and dissolves in water. The flesh of fruits and vegetables (no skin) is soluble, as are oats and beans.
- **Insoluble** fibre: It's what keeps your digestive system moving. It's found in the skin of fruits and vegetables.

Sources of roughage:

- **Soluble** fibre: The flesh of fruits and vegetables (no skin) is soluble, as are oats and beans. Citrus fruits, apples, strawberries, peas, and potatoes.
- **Insoluble** fibre: It's found in the skin of fruits and vegetables, and in whole wheat and nuts. Whole grains, cereals, seeds, and the skins of many fruits and vegetables.

Functions of roughage:

- Improves digestion and gut health.
- Helps you manage your weight.
- May benefit blood sugar control.
- May decrease cholesterol and blood pressure levels.
- It adds bulk to the diet.
- It helps to prevent infection and diseases.

Lack of roughage:

- Diets low in fiber is also associated with an increased risk of obesity, colon cancer, and breast cancer.

Need of roughage in our body:

- 4 grams of fibre for every 1,000 calories you consume per day. That’s about 25 grams for women and 38 grams for men.

3. COLOUR COMPOUND

- To make the food more attractive and presentable colours are given importance.
- To make the food more appetizing it is made possible through pigments. Most of the natural pigments are found in fruits and vegetables such as red, yellow, orange, blue and green.
- The food made from animals is less colourful.

4. FLAVOUR COMPOUND

- To develop the taste of the food, the flavours are used in cooking food.

- It does not have any nutritive value like tea in milk and coffee powder in milk add colour and taste.
- It does provide neither calorie nor energy.
- Sometimes colour compounds can be harmful. It varies taste in salty, sweet etc.

5. PRESERVATIVES

- It is used in food to control the spread of bacteria which can cause life threatening diseases salmonellosis or botulism.
- Salmonellosis can cause typhoid while botulism causes food poisoning.

6. ARTIFICIAL SWEETENERS

- These are low calorie sweeteners. They are the best substitutes of sugar because they are non-nutritive components of food.
- They can be used to sweeten food and drinks for less calories and carbohydrates.
- The use of artificial sweeteners controls weight gain of teh body as they are non-nutritive and have no calories.

7. PLANT COMPOUNDS

- Some plants have non-nutritive value and also contain colour and flavour that can be used in food. Few plants carry a compound which can inhibit cancer.

HEALTHY WEIGHT

Definition of healthy weight

- A healthy weight is defined as the appropriate body weight in relation to height.
- People who are overweight (BMI of 25 to 29.9) have too much body weight for their height. People who are obese (BMI of 30 or above) almost always have a large amount of body fat in relation to their height.

Category	Weight Status
Under Weight	< 18.5
Normal Weight	18.5-24.9
Over Weight	25-29.9
Obesity Class I	30-34.9
Obesity Class II	35-39.9
Obesity class III	> 40

$$B.M.I = \left[\frac{\text{Body weight (kgs)}}{\text{Height x Height(m)}} \right] \text{ kg/m2}$$

METHODS OF MAINTAINIG HEALTHY WEIGHT

1 Regular Exercise: The best way to burn fats and calories in the body is exercising daily for a couple of hours. Exercise helps the individuals to stay fit. Exercise should be done strictly on the based on the age and weight of the body.

2 Healthy eating habits: Improper diet rich in fats also results to weight gaining. Junk foods which are common in youngsters accumulate lot of calories and fats in the body. To maintain healthy weight junk food should not be consumed regularly.

3 Eat fibre rich food: Fibre rich proteins and vitamins that are present in the vegetables help to maintain body weight. Appetite can be maintained by replacing meals with steamed vegetables as they contain low calories and high nutrition. This habit helps to maintain weight control.

4 Eat fruits: Fruits have similar advantages which help i maintaining health and suppress the appetite. Fruits are the best substitutes to replace with meals. The fruits have low calorie intake.

5 Eat meals in intervals: One should take food at regular intervals like morning brealfast, lunch and dinner. In any case we do not have food, and then we tend to eat more in next interval which causes obesity.

6 Avoid carbonated drinks: Frequent consumption of carbonated beverages like fizzy drinks and packed juices leads to increase in the weight of the body because they have higher calories. On the other and natural fruit juices contains low calories.

THE PITFALLS OF DIETING

Diets that severely restrict caloric intake may offer results, but they trigger a "starvation response" in which the body slows down its metabolic rate to conserve energy. The loss of muscle tissue is responsible for lowering our metabolic rate.

1 Limiting intake of major nutrients: Many people who desire to lose weght cut carbohydrates, proteins and fats drastically. This can lead to many health problems as they can impair functions of body organs.

2 Racing to the loose weight: People often compare with others who are losing weight and try to race. So this attitude can lead to serious health problems.

3 Starvation: Skipping meals has become fashion in youngsters especially in females. There is a misconception that skipping any meal in a day saves calories rather wil end up with health problems.

4 Generates stress: People who are over-conscious about losing weight face anxiety and stress. This worsens mental as well as physical health of a person.

5 Reducing intake of calories: A normal active person requires 2100-2800 calories a day. But people thriving for sudden weight reduction often cut down drastically and can lead to exhaustion.

FOOD INTOLERANCE

- Food intolerance, or a food sensitivity occurs when a person has difficulty digesting a particular food.
- This can lead to symptoms such as intestinal gas, abdominal pain or diarrhoea.
- Food intolerance is sometimes confused with or mislabelled as a food allergy. Food intolerances involve the digestive system.

Causes of intolerance

1) Absence of an enzyme

Enzymes are needed to digest foods fully. If some of these enzymes are missing, or insufficient, proper digestion may be undermined.

2) Chemical causes of food intolerance

- Certain chemicals in foods and drinks can cause intolerance, including amines in some cheeses, and caffeine in coffee, tea, and chocolates. Some people are more susceptible to these chemicals than others.

3) Food poisoning – toxins

- Some foods have naturally-occurring chemicals that can have a toxic effect on humans, causing diarrhoea, nausea, and vomiting.

4) Natural occurrence of histamine in some foods

- Some foods, such as fish that has not been stored properly, can have an accumulation of histamine as they "rot."

5) Lack of fibre in diet

- Diets low in fiber is also associated with an increased risk of obesity, colon cancer, and breast cancer.

6) Other factors

a)Heredity
b)Fried food

Management of intolerance

To avoid food intolerance, a person need to change his/her diet or leave that particular food, then he/she shall consult a doctor for proper guidance and management.

FOOD MYTHS

- **1 Eggs are bad for heart:** It is well known that eggs contain a substantial amount of cholesterol in their yolks. However, they are not bad at all for health if people eat one egg a day.
- **Carbohydrates make a person fat:** It is myth that the intake of carbohydrates makes a person fat. It is very much clear from many studies that there is nothing

inherently fattening about carbohydrates. But eating too many calories may lead to fatness.

- **Starvation is proper way to loose weight:** Starvation can lead to harmful effects. Body needs food at proper intervals. Eating right is more important than not eating.
- **A high protein diet is ideal for everyone:** A high protein is good and must be taken in long run. It needs to be supplemented with a regular training. Most of the body builders take plenty of protein to build their muscles but it can lead to increase in the levels of cholesterol.
- **Drinking water while eating meals is bad:** This myth has been passed down from generations to generations. But it is wrong. Water intake certainly will not damage digestive process.
- **Having milk after eating fish cause health problem:** Drinking milk just after eating fish will make that person sick is just a myth. There is no scientific reason why a person cannot have milk and fish together.