

Malnutrition and associated disorders: A review

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Abstract

In developing countries, the population suffers from malnutrition. In developing countries, the population is more and production is less. So, scarcity of food occurs. Another factor is poverty. In developing countries, more population has less option of service/jobs which create poverty. Due to poverty, less food is available for population which creates malnutrition. Malnutrition, affects the future generation and work efficiency. On the other hand, Deficiency of any one constituent in the food might lead to specific disorders, diseases and abnormalities in humans Impairment of health due to improper intake of food or any one constituent result in the effect recognized as malnutrition. Malnutrition is a term which covers problems of both under nutrition and over nutrition. Considering these entire facts present topic disclose the malnutrition and their associated diseases.

Key words: Malnutrition, food, diseases, associated disorders.

1. Introduction

All the human beings require food for three main purposes such as for growth and synthesis of body substances, as a fuel to supply energy and materials for maintenance and for movements and muscle contraction. Thus food may be defined as 'any substance, that when taken into the body will furnish energy and material for the structure and repair of tissues'. The chemical substances present in the food are called nutrients and the use of the nutrients by an organism for harvesting energy, building body substances for growth and development and providing protection from diseases is called nutrition. In other words, nutrition is the process in which certain components of food are obtained and used by the body. The process includes Digestion, Absorption, Transportation and Cell metabolism. Thus nutrients provide the metabolic energy and the raw materials for growth, repair of tissues, production of gametes and protection from diseases. Nutrients can be divided into six major classes – Carbohydrates, Proteins, Lipids, Vitamins, Minerals, Water.

Carbohydrates, proteins and lipids are the major organic nutrients and are broken down by enzymes into their individual components during digestion. Many of these subunits are broken down further to supply energy. Others are used as building blocks for macromolecules. Carbohydrates, proteins, lipids and water are required in fairly substantial quantities, whereas vitamins and minerals and water are taken into the body without being digested. These ingredients fulfill the caloric requirements, providing building materials of the tissues; control the metabolic activity of the body tissues and water balance. Every constituent has its own importance and no one can be considered to be less important. Deficiency of any one constituent might lead to specific disorders, diseases and abnormalities in humans Impairment of health due to improper intake of food or any one constituent results in the effect recognized as malnutrition. Malnutrition is a term which covers problems of both under nutrition and over nutrition.

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Body requires a definite amount of each constituent in the diet for normal body function. A diet containing an adequate mixture of these constituents as required by the body is known as balanced diet. The composition of such diets varies considerably according to different ages, sex under different physiological conditions and different trades.

The daily requirement of various constituents for individuals of various age groups are mentioned in the given table

Suggested intakes of dietary fat

Subjects	Fat (energy %)	Essential fatty acids (energy %)
Adults, man and women	20	3
Pregnant women	20	4.5
Lactating mother	20	6
Infants	20	6
Young children	25	5-6

2. Malnutrition

The term is used to refer to a number of diseases, each with a specific cause related to one or more nutrients (for eg. protein, iodine or calcium) and each characterized by cellular imbalance between the supply of nutrients and energy on one hand, and the body's demand for them to ensure growth, maintenance and specific functions. Malnutrition may be due to inadequate food absorption or inadequate food intake (inadequate supply, increased requirements).

The diagnosis of malnutrition is not always apparent as in severe case. It depends on an accurate dietary history, evaluation of height, weight, head, circumference, past rates of growth, measurement of midarm and spleenful thickness and other tests.

Malnutrition in its many forms persists in virtually all countries of the world in spite of a general improvement in food supplies and health conditions and the increased availability of education and social services. Here is a brief account of various constituents whose deficiency in the human body may be the cause of malnutrition.

3. Malnutrition due to the lack of carbohydrates

Carbohydrates should provide about 72 % of the total caloric requirements of the body and these acts as one of the principal fuel of the body. For moderately active person, 350 to 500 g dietary carbohydrate is found to be adequate. For the persons doing heavy muscular exercise, the carbohydrate requirement is further increased and may reach to 800 g per day.

Carbohydrate, fat and protein metabolisms are closely interlinked and these are interring convertible. In these cases when the caloric intake of the carbohydrate is low, some of the fats and proteins are converted to compensate blood sugar level. This is specially done to prevent the brain dysfunctioning since brain functioning is totally dependent upon the blood glucose level. However, when the carbohydrate supply in the diet is in excessive amount than required by the body, the excess is converted into fats and proteins which are stored. Most of the non essential amino acids are synthesized from the carbohydrates. The non metabolizable carbohydrates such as cellulose, hemicellulose, mucilage's, lignins, agar agar and gums which form large portion of the diet are not entirely without any benefit.

3.1 Nutritional significance of indigestible fiber

The indigestible fibre like cellulose, lignins and other cell wall polysaccharides like hemicellulose, mucilages, rectins and gums have recently been found to exert much influence in the body. Low fibre diets for long periods have been found to be associated with cancer of colon, ischaemic heart

disease and diabetes mellitus. The fibre content in the diet has been found to improve glucose tolerance of the diabetes patients. The diabetic blood sugar was found to be reduced because of decreased digestion and absorption of carbohydrates in the presence of fibre. Increase in the fibre content in the diet adversely affects the digestion as well as absorption of proteins. Faecal nitrogen loss is increased. The serum cholesterol level is found to be reduced by high fibre diet as it prevents cholesterol absorption. Faecal bile acid excretion is increased. The absorption of calcium, magnesium and phosphate is decreased by high fibre diet. By increasing faecal bulk, constipation is prevented by high fibre diet as it increases peristalsis.

4. Malnutrition due to the lack of lipids

The optimum amount of fat to be including in the diet is not known with certainty.

4.1 Requirements

In the diet of adults, about 20 % energy may usefully be derived from fats. Out of this, about 9 –10 % caloric intake may be from invisible fat of the diet i.e. cereals and legumes and 10 % may be from visible fat which is added. Out of these whole 20 % fat energy 3 – 6 % energy must come from essential fatty acids i.e. Linoleic acid, Linolenic acid, Arachidonic acid.

Deficiency of essential fatty acids is known to occur in infants and young children and causes Phrynoderma (Follicular hyper keratoris). Consumption of high fat diet, poor in essential fatty acids when associated with other stresses is often associated with increased risk of ischaemic heart disease (IHD). Lecithins prevent development of fatty liver. Nutritional cirrhosis of liver has been reported to occur in the deficiency of dietary choline (present in lecithins) large amounts of fat in the diet tend to lower the rate of digestion of carbohydrates and proteins. This leads to a feeling of sctiety for longer periods. Rancid fats should not be taken because of their toxic effect in the body as well as their property of destroying other foods. Ordinarily excess fat intake should be avoid because this increases adiposity, hyper cholesteromia and ketosis which all are undesirable.

Excess cholesterol gets deposited in the walls of the arteries making them thick. Such a deposition leads to loss of elasticity and heart failure. Besides this excess cholesterol can form biliary stones which can lead to obstructive jaundice and fat indigestion.

4.2 Function

Lipids play an important role in the diet by helping in the absorption of fat soluble vitamins namely, vitamin A, D, E and K. lipids are important source of energy in the diet of the hard workers such as wrestlers, coalminers, and loggers whose caloric requirement are of the order of 5000 to 6000 K Cals per day.

5. Malnutrition due to the lack of proteins

Proteins form a very important constituent of diet because of their dual value such as these build the body tissues and can burn in the body supplying energy.

In the presence of adequate amounts of carbohydrates and fats, proteins are saved from burning and can be utilized for the building of the tissues.

5.1 Requirements

The question of requirement of protein in the diet had been controversial. In the nineteenth century, Voit on the basis of protein intake in the Germans recommended an allowance of 188 g proteins per day. But, Chittenden (1904) on the basis of nitrogen balance studies in the individuals of different trades recommended a daily allowance of 45 to 53 grams of proteins. Actual experimentation in this field led to the conclusion that in view of deriving essential fatty acids in the adequate amount, 45 to 53 g protein intake was not sufficient.

In 1984 Nutrition advisory committee of Indian Council of Medical Research has made revised recommendation regarding proteins in the diet. Protein requirement different physiological conditions vary. During growth period, pregnancy and lactation, protein requirement is increased. Recent observations have shown that in persons doing severe muscular exercise as a routine. Protein requirement is highly increased on account of extensive muscular tear and its replacement

by the newer proteins.

The second important aspect of protein requirement is the type of proteins should be taken in the diet. A protein containing a greater number and proportion of the essential amino acids is considered to be a superior protein. For human beings, there are 8 acids which are considered to be essential for lysine, tryptophan, phenylalanine, Methionine, threonine, leucine, isoleucine and valine. Histidine should be considered an essential amino acid for the growth of infants.

5.2 Sources

The proteins of animal origin such as from eggs, milk, kidney and liver are biologically most superior and contain higher percentage of the essential amino acid. The proteins of meat, poultry, fish and shell come next to them in quality. The proteins of soybeans and yeast are also of equally good quality. The proteins of cereals and other legumes are generally poor in quality. The proteins of kidney are highly digestible. Cooking increases the digestibility of proteins.

Since, every protein does not contain all the essential amino acids in the desired amounts, hence it is advisable to take mixed proteins in the diet so that the deficiency of one amino acid in a protein may be compensated by the another protein.

5.3 Deficiency symptoms

Deficiency of adequate proteins in the diet has been found to cause a decrease.

5.4 Kwashiorkor

It is a serious problem in underdeveloped or tropical countries especially in children from infancy to about 5 years of age.

Symptoms

Vary from lethargy, apathy, irritability to inadequate growth, loss of muscular mass, secondary immunodeficiency and edema. Renal function is decreased; the liver and heart may enlarge. Dermatitis is common; the hair is sparse, thin and depigmented. Infections, vomiting and diarrhea are common. There are signs of vitamin and mineral deficiencies; delayed bone growth. Mental changes may occur, followed by stupor, coma and death. Characteristic changes occur in blood. These include low serum proteins, low blood urea anaemia.

5.5 Marasmus

It is another nutritional deficiency state. This state develops due to generalized deficiency of food intake in terms of calories and proteins.

Although marasmus is commonly associated with inadequate food intake, it may also be the result of starvation secondary to diseases such as Cystic fibrosis, Celiac disease or infections, Malabsorption and Severe diarrhea

Clinically, there is a failure to gain weight followed by weight loss and finally emaciation. Fat is lost last from the cheeks. The abdomen may be flat or distended. There is muscle atrophy and hypotonia. The BMR is reduced. The infant may be constipated or have the "starvation type" of diarrhoea with mucus.

6. Malnutrition due to lack of water

Water constitutes about 70% of the total body weight. Loss of about 10% of the body water causes illness and loss of about 20% body water may cause death.

At least 3 litre water is required per day by the body. About one litre water is administered directly whereas about two litre is derived in the body as a result of oxidation of various food stuffs and from water of the food itself. In summer season, there occurs excessive loss of body water by the way of perspiration and hence additional intake of water is recommended as desired.

Loss of body water occurs in addition to perspiration by way of urine, faeces and expired air. Reabsorption of water in the renal tubules is controlled by antidiuretic hormone (ADH). Deficiency of this hormone causes excessive loss of water through urine. Loss of water through kidney is accompanied by loss of electrolytes such as Na and K. The condition of severe water loss from the

body is known as dehydration. In such cases, there occurs about 10% loss of the body weight and it must be replaced by giving water along with salt orally. In cases where oral administration of water does not prove to be very successful (as in vomiting or diarrhoea), parenteral administration is recommended.

The importance of water in the body is due to its solvent action. Most of the biological substances are found to be dissolved in water.

6.1 Functions

It helps in the transport of food, gases, excretory products, minerals and also the hormones to their destinations. It also helps in the electrolyte and temperature balance of body.

7. Malnutrition due to the lack of vitamins

Vitamins are organic compounds whose traces are vitally essential for proper use of macronutrients (carbohydrates, fats and proteins) in cell metabolism and hence, for proper growth and function. Deficiency of vitamins disturbs metabolism and brings about discarded condition. That is why, vitamins are commonly called "growth factors" and diseases caused by their deficiency are called "deficiency diseases".

Early scientists knew that some human disorders or diseases were related with deficiency of certain substances in food, yet our proper knowledge of vitamins is a gift of only of the 20th century. The credit was of discovering century. The credit of discovering vitamins goes to N.I. Lunin (1881) who asserted that presence of these under known compounds in food is essential for health. Eizkman (1897) confirmed Lumin assertions. Hopkins and Func (1912) propounded a "vitamin theory" stating that deficiency diseases are due to deficiency of some or the other vitamins in food.

The term vitamin was first used by Funk and study of vitamins known as vitaminology. Vitamins are organic compounds which are needed in extremely small quantities in the diet and are essential for the normal functioning of an organism. These are synthesized mostly by plants and certain intestinal bacteria. Hence, animals obtain most of these in traces (= micronutrients) from their food. Vitamins are not generally stored in the body. Their useless excess is readily excreted out with urine. That is why, their regular, rather daily, supply to the body from food is essential.

7.1 Classification

Vitamins are generally classified as Fat soluble vitamins and Water soluble vitamins

8. Malnutrition due to the lack of minerals

Apart from organic chemicals such as C, H, O and N human body needs inorganic chemical elements called minerals for a wide range of functions. These elements are present in the form of ions. Minerals help to maintain the volume of water necessary to life processes in the body. They help to draw chemical substances into and out of cells and they keep the blood and tissue fluid from becoming either too acidic or too alkaline depending on their necessity and amount for normal functioning of metabolisms. These are divided into macro elements (required in amount more than 1 gm) and microelements (required in trace amount less than 1 gm). Deficiency of any of these is called metabolic disorders.

9. Risk of malnutrition

The risk of malnutrition is increased by

- **Increased requirements-** It is more difficult to meet nutritional needs during periods of increased requirements.
- **Restricted range of foods-** A diet based on the narrow range of foods is more likely to lack nutrients.
- **Reduction in availability of food-** Famine is an extreme example.
- **Income-** Lack of money makes it difficult to purchase an adequate diet.
- **Other substances in food-** Very high intakes of some substances reduce the absorption of some nutrients from food.

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- **Medical conditions-** Some may affect food intake or the absorption of nutrients from foods. Some medicines affect appetite.
- **Psychological problems-** Some may affect food intake.
- **Unusual dietary habits-** These may lead to over nutrition

10. Preventing malnutrition

Some types of malnutrition are easy to prevent. One strategy is to fortify commonly eaten foods. Education programmes can help to increase understanding about how to choose a good diet from foods that are available. Improving access to a good diet is more difficult and governments may develop policies to try to resolve this.

11. Countries with populations at risk inadequate nutrition

Poverty is the root cause of malnutrition. Between 1990 and 1992 approximately 841 million people in the developing nations did not have access to enough food for healthy living.

1. The health consequences of inadequate nutrition are enormous. According to one estimate malnutrition contributed roughly 12% of all deaths in 1990.
2. Mountainous areas are often deficient in iodine; deficient regions are the Himalayas, Andes, European Alps and mountains of China.
3. Areas with arid, infertile land or heavy rainfall and humidity may be deficient in vitamin A.
4. Africa, the Andean region of South America and many parts of Asia are at risk from not only protein energy malnutrition but also from various mineral deficiencies because of both poverty and environmental factors.
5. Iron deficiency is the most common micronutrient disorder. In developing countries, 40% of non-pregnant women and 50% of pregnant women are anaemic and 3.6 billion people suffer from iron deficiencies.
6. In India 88% of pregnant women are anaemic. Iron deficiencies also reduce physical productivity and affect a child capacity to learn.
7. Globally, some 42 million children under age 6 have mild to moderate vitamin A deficiency. In its severe form, vitamin A deficiency can cause blindness.
8. Iodine deficiency is the world's leading single cause of preventable brain damage and mental retardation.
9. The combination of malnutrition and infectious disease can be particularly pernicious. Protein energy malnutrition can impair immune system, leaving malnourished children less able to battle common diseases such as measles, diarrhoea, respiratory infections, tuberculosis, pertussis and malaria.
10. Malnutrition can also heighten the adverse impacts of toxic substances. Deficiency of protein and some minerals can significantly influence the absorption of lead and cadmium into the body.
11. The consequences of food and nutrition shortfalls are enormous. Africa and South East Asia confront problems of both malnutrition and such diseases as – diarrhoea, malaria and measles- a combination that is likely to increase the toll that either problem would take alone. In rapid industrialization cities with high levels of malnutrition as well as disease and growing industrial pollution, residents may confront a triple burden of malnutrition, infection and toxic pollution.

12. A UNICEF report on malnutrition

Malnutrition is an enormous problem throughout the world. Although it is often a result of poverty, frequently it is also results from environmental problems. Such problems can, for example, impair a family's capacity to produce food as a result of land degradation, water salinity, over-irrigation, soil erosion, droughts, and flooding. These conditions may lead to widespread malnutrition. Malnutrition can take a serious toll on human health. In fact, it is estimated that malnutrition from all causes was responsible for twelve percent of all deaths worldwide in 1990.

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There are many sorts of deficiencies resulting from malnutrition. These include iron, iodine, and vitamin A deficiencies, as well as the specific protein-energy malnutrition. Soil characteristics can play a large part in the food of a region. Mountainous regions are known for iodine deficiencies; areas with weather extremes, such as arid, infertile, or wet, humid land, can be deficient in vitamin A; and many parts of Africa, South America and Asia suffer from protein-energy malnutrition, as well as all three deficiency types, due to various environmental conditions.

Each deficiency causes its own range of health problems. Iron deficiencies are known as anemia. This can cause hemorrhaging in instances such as childbirth, as well as physical productivity reductions. They can also undermine children's learning capacity. Vitamin A deficiencies can cause loss of eyesight, ranging from deterioration night vision to complete blindness. Many persons blinded die within the following year. Lack of iodine is a leading worldwide cause of brain damage and mental retardation. Iodine deficiencies can also lead to iodine deficiency disorders and goiter, or enlargement of the thyroid gland. In pregnant women, this deficiency can cause brain damage in the developing fetus.

Protein-energy malnutrition can do harm to the immune system, making it difficult for affected children to combat potentially damaging diseases, such as tuberculosis and malaria. Such diseases can worsen the deficiencies. Malnutrition can also heighten the effect of toxic chemical on humans, and various deficiencies can influence the body's absorption of substances such as lead, leading to more dangerous health hazards.

13. Conclusion

So actually the phenomenon of malnutrition is related to imbalance between the supply of nutrients and energy on one hand and the body's demand on the other hand. We know that body is basically depended on the carbohydrates so primarily symptoms are not related to the carbohydrate imbalance because on requirement the fats and proteins can fulfill the requirement of carbohydrates by the process of gluconeogenesis. But the proteins and fats deficiency cannot be balanced by the help of carbohydrate, so this malnutrition is basically related to carbohydrate up to some extent.

Other than these three basic compounds, water, vitamins and minerals also plays important role in malnutrition.

Now a days due to increase in population of developing countries like India, China, Nepal, Pakistan, Afghanistan, Bangladesh, the requirement of proper and balanced diet is going on increase, but due to the lack of technologies and educational and welfare programmes are not able to fulfill the requirement.

Now we are in 21st century and want to make us developed by 2020 according to Dr. A.P.J. Kalam then, how can this be possible?

It is possible only by the inspiration of population towards educational and social activities and knowledge of proper nutrient supply.

Today malnutrition is persisting in all countries of the world. So there is a need of proper improvement in food production as well as supply and better medical facilities.

We hope that in future we can surely remove this evil from our country and finally from the world by adopting various important measures which include improved technologies, through social and educational programmes and by providing better and advanced medical facilities.

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