

# NUTRITIONAL ASPECTS OF FOOD & FOOD HABITS

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K. SIVAPALAN

Department of Physiology,  
University of Jaffna,  
Sri Lanka.

## Introduction:

Do we eat to live or live to eat? People give different answers depending on their experiences, state of health and the extent to which they care for their life and food. The real answer to the above question lies somewhere between the two extremes. The science that explores and tries to explain the relationship between human beings and their food is nutrition. This includes psychological factors, physiological factors, biochemical processes and socio - economic factors. It is not possible to go into all these aspects in depth within the time available and therefore attempt has been made to discuss the most important aspects and their contribution to good nutrition.

## Acceptability of Food:

The food, in the first place, should taste good and its consistency, appearance and flavour should be inviting. The preference to these differ from person to person depending on the experience in infancy and childhood, the types of foods given by their mother and the

feelings associated with it. These experiences generate certain attitudes and preferences or hatred towards food items. One important factor that determines the acceptability is the social status enjoyed by the food item. Some examples: People are proud to say they had soup but they do not want to say 'koozh' - both are essentially the same; Oranges are preferred even though they are expensive when compared to lime; No body wants to consume 'Old Rice' (Palam soru) even though they like the taste of it. These preferences, attitudes and practices can be changed by human being, the highly intellectual animal, by reasoning and need. People tend to follow the dietary pattern of socially respected people and therefore, any change in dietary habit should start at the top of the society.

## Control of Food Intake:

When do we eat food and what stops eating? Two centres in the brain, in hypothalamus, have been identified which regulate food

intake. Stimulation of one area causes excess eating and this is known as Appetite Centre and the other area causes stoppage of eating and called Satiety Centre. The natural stimuli that influence these centres can be divided into two categories - regulatory and non-regulatory factors.

Some non-regulatory factors (these stimulate eating even when not hungry).

- (a) smell or sight of preferred food;
- (b) company - get together or social events; and
- (c) boredom - nothing else to do.

Some regulatory factors:

- (a) reduced blood glucose level; and
- (b) increased free fatty acids in blood.

The regulatory factors indicate reduction in the nutrients which supply energy for body functioning and stored fat being mobilised for energy supply. They generate the feeling of hunger and stimulate the person to seek and eat food. But the feeling of hunger can be suppressed or potentiated by mood changes such as depression or joy and the flavour of the food. The mechanism that brings about satiety at the end of a meal is still a matter for investigation; filling of stomach certainly contributes to satiety.

The physiological regulation of food intake seems to be dependent on the energy needs and growth of the body, on a long term basis. This regulation ensures reasonable body weight and composition according to the age. But it fails when the diet is not properly balanced with required nutrients, the supply is limited and the systems are cheated by artificial flavouring agents.

### Growth and Repair:

The food we eat should be suitable for growth and repair. Growth is co-ordinated increase in size of the parts of the body which occurs until about 18-20 years of age. The main nutrient that is deposited in the body is protein. The fat content in the structure also increases along with storage of fat. In addition, content of minerals such as iron in blood and calcium in bones also increases. There is also proportional increase of water content and other electrolytes such as sodium, potassium and chloride.

Growth ceases after this age and any change in weight afterwards is mainly due to change in stored fat. There may be little lateral growth and deposition of protein if the person takes regular exercise which stimulates thickening of muscles.

Repair of the tissues occur whenever there is damage to tissues.

Even when there is no tissue damage, the structural molecules are constantly replaced by new molecules. This process of turnover continues till the person dies. All complex molecules are broken down in the intracellular digestive system, the lysosome. The digested products are used again to synthesize new complex structures. A small amount of obligatory loss will have to be replaced by the diet.

### Energy Supply:

The food we eat should provide sufficient energy for several internal processes and also any external work done. Major portion of the food is used to provide energy. All types of nutrients, carbohydrates, fats and proteins contain energy trapped in the chemical bonds which can be utilized by the body. Vitamins act as co-enzymes in the controlled oxidative and other biochemical reactions.

All tissues of the body are equipped well with enzymes that oxidise carbohydrates. Many tissues also have enzymes to oxidise fats and to a lesser extent to oxidise protein. In general, body mechanisms keep protein oxidation to a minimum and spare it for growth and repair.

The brain can oxidise only glucose and it should be present in the blood all the time. If the blood glucose goes below a certain level,

hypoglycemia occurs and the brain ceases to function and death ensues. The body mechanisms that maintain supply of glucose to brain are reasonably efficient.

Oxidation of carbohydrates is, in general, advantageous over fat because carbohydrates provide more energy with less oxygen and the only end products are carbon dioxide and water. Further, several tissues can metabolize glucose even in the absence of oxygen for a short while to tide over emergency situations. This anaerobic oxidation is not possible with fat and protein. When fat is oxidised there is a tendency to produce acidic substances and in extreme situations cause dangerous acidosis. Oxidation of proteins provide additional metabolites from sulphur and nitrogen contained in the protein.

Since the oxidative processes continue indefinitely, there should be constant supply of substrates and when the requirement of energy increases, for example, to run away from dangerous situation or to perform muscular work, there should be increased supply of substrates. There are energy stores in the body to meet this requirement.

Very small amounts of carbohydrates are stored in the body. They are in the form of glycogen in liver and skeletal muscles. The stores

can last only for 24 hours if the person is just relaxing. The carbohydrate store is built up soon after meals and used later in the day. In other words glycogen acts as a buffer to prevent rise or fall in blood glucose level. If no glucose is supplied from food, liver generates glucose from glycerol and several amino acids to maintain the blood glucose level which is essential for brain.

There is a lot of fat stored under the skin and certain other areas of the body, collectively known as adipose tissue. There is also fat in each cell as a part of the structure which is different from the store fat in adipose tissue. The latter is the main energy store of the body. All excess foods - carbohydrates, fat or protein - are converted to storage fat in adipose tissue. At times of deficiency of energy supply, the storage fat is released and used by many tissues leaving glucose to be used by the brain. These metabolic shifts are effected through the endocrine system. This does not warrant storing unlimited amounts of fat because excess fat in the body is known as obesity which is associated with several diseases such as diabetes, hypertension, myocardial infarction and cerebro-vascular accidents (stroke). In addition, the increased weight causes diseases of the hip and knee joints:

The fat in adipose tissue also acts as a thermal barrier between the

body which is at 37°C and the environment which is at a lower temperature. There is some evidence to suggest that there are physiological mechanisms to maintain the amount of adipose tissue fat. When it is reduced the person eats more and when it is increased the person eats less. People become obese when there is breakdown in this mechanism.

The largest amount of energy stored in the body is found in proteins. But it is not regarded as energy store because almost all of it is incorporated into structure. The protein is broken down to generate energy when other substrates are not available but this is associated with loss of body structure.

Therefore, regular supply of energy through regular meals is good for health. The energy stores should be kept for unavoidable situations of shortage. This means that we should start the day with good break-fast and end the day with light or heavy dinner depending on the need.

### Role of Food in Gastro Intestinal Function

The food we eat should be digested, absorbed and the unabsorbed matter should be excreted. The food is generally processed before eating to increase acceptability and digestibility. The food processing has advanced so much that it has

become harmful to the gastro-intestinal tract and to the body itself. Modern man in rich societies have been described as being "fat, toothless and constipated".

The mouth is equipped with saliva, tongue and teeth for mastication. Most of the foods we eat today are highly processed and low in fibre that we only have to swallow. Like all tissues of the body, teeth remain harder and healthier only if used regularly. Otherwise it weakens and becomes susceptible to diseases. Either we should give work to teeth or remove them.

The stomach is designed to accept large amounts of foods in a short time and release slowly. The capacity of the stomach is suited for naturally occurring food items. When highly refined energy rich substances are eaten total energy intake could be much more than the need.

The small intestine is adapted to digest and absorb nutrients. The mechanisms are very efficient. When we eat highly refined and easily digestible or even digested food the efficient mechanism floods the tissues with a lot of nutrients within a short time. This is too much for the systems and certainly to the pancreas which secretes insulin to maintain blood glucose level. This can be harmful because eating large amounts of refined sugar will ex-

haust the pancreas and lead to diabetes mellitus.

If natural foods with lot of unabsorbable fibre is eaten then the digestion and absorption will proceed at a moderate pace and it will be easy for the tissues to handle the nutrients coming in. Further, the slow process will supply till the next meal, and reduce the work of storage systems.

The large intestine is designed to excrete unabsorbed material. It stores these products until a certain volume builds up and then excrete. Micro organisms have colonised and they are there whether we like it or not. The important thing is that regular emptying of large intestine is necessary to keep the bacteria under control. Otherwise their toxins may bring harmful effects. This necessitates the presence of considerable amounts of unabsorbable material in the diet. These dietary fibres help to evacuate the large intestine regularly, keep the stool soft and make defecation easy.

It has been shown that high content of dietary fibre in the food reduces the incidents of intestinal polyps, cancer, diverticular disease and haemorrhoids. The only disadvantage of the dietary fibres is flatulence which is a social embarrassment. Let us accept it as a sign of good health. This is far better than constipation.

### Composition of the Ideal Diet:

It becomes clear from the above discussion why nutritionists from all over the world recommend, in terms of energy content, 60 - 65% carbohydrate, 15 - 20% protein and small amounts of fat in the food eaten over the day. Further the diet should contain sufficient vitamins, minerals, dietary fibre and water. These are found in adequate amounts in our traditional diet.

### Carbohydrates:

Cereals (rice, wheat, corn etc.) and millets (kurakkān, sarmai, varahu etc.) provide large amounts of carbohydrates as starch and small amounts of protein. The significance of protein will be discussed later. These are practically free of fat. One or the other is consumed in considerable amounts daily. Yams and tubers (manioc, palmyrah root, rasavalli and sirukilangu) provide carbohydrates with virtually no protein or fat. These are consumed as one of the meals; as curry to eat along with the food prepared of cereals or millets; and as short-eats in the evenings.

Potato and sweet potato contain large amounts of starch and little protein. Potato is not worth mentioning because it is only a flavouring agent considering the availability and its price. The place of potato in the West as a meal and snack can be taken over by the sweet-

potato which is better than potato in nutritional terms.

Further, several unripen fruits can be used as a source of starch. These include jack, bread-fruit, ash-plantain, mango etc. Of these, jack has been used to prepare a variety of tasty meals. It is also cooked as a curry as the other unripen fruits.

Foods of animal origin are generally poor sources of carbohydrate and we do not consume animal products as main meal.

A special mention should be made about the indiscriminate use of sugar, especially for children, as a flavouring agent. Even though we need a lot of carbohydrates, they should be eaten as complex starch except when a person is sick and is unable to digest starchy foods. As mentioned earlier, this causes rapid rise of blood glucose level and leads to unhealthy conditions. Further, children may eat only a small amount of nourishing food containing protein and vitamins because sugar fulfils the energy requirements and brings about satiety. Substances like sweets and toffees are said to contain milk but only a very small amount; the main constituent is sugar. These, in addition to spoiling nutritional intake, spoil the teeth as well. Sugar is good as a drug and like all drugs it is dangerous in excess amounts.

### Fat :

Our body requires a wide variety of fatty substances most of which can be synthesized in the body from simple fats, carbohydrates and protein. Some can only be synthesized from essential fatty acids which should be provided in the diet. The essential fatty acids have double bonds in the molecule and are not saturated with hydrogen. Linoleic, alpha linoleic and arachidonic acids comprise the essential fatty acids. Supply of any of these (about 3-4 gm / day) will fulfil the need. Fatty substances are also needed for absorption of fat soluble vitamins.

The essential fatty acids are found in very small amounts in animal fats but considerable amounts are found in the tissues as structural fat. Large amounts are found in fish liver oils. Cheap sources are seeds such as sesame (gingeli), soya, ground nuts and sun - flower. All vegetable oils do not contain essential fatty acids. Coconut oil, palm oil and other commercially available cooking oils contain only saturated fatty acids.

Consumption of large amounts of saturated fats have been shown to be associated with deposition of fatty substances in arteries leading to a condition known as Atheroma. Atheroma is the cause of dreaded illnesses such as myocardial infarction and stroke. Consumption of large amounts of saturated fat also

predisposes to obesity, diabetes mellitus and hypertension. This is the reason for the advice to reduce the intake of fatty substances such as meat and coconut. Egg and milk have saturated and unsaturated fatty acids and moderate use is advocated. The above discussion does not warrant consumption of unlimited amounts of unsaturated fats. Excess amounts of essential fatty acids are toxic to the tissues and therefore, only moderate amounts should be consumed.

### Proteins :

Proteins are complex structures synthesized from 20 different amino acids. The body can synthesize the carbon skeleton of 11 amino acids and complete the process by transfer of amine group from other amino acids. The rest have to be provided in the diet as such and they are known as essential amino acids.

Protein in the food is broken down to amino acids by the digestive enzymes and the amino acids are absorbed. In the body, amino acids are used to synthesize various proteins. The body proteins can be classified into three main categories: fixed cell protein indispensable for cellular activity; dispensable structural protein which can be used for energy production; and labile reserve protein readily available for body needs. Any healthy person should

maintain the first two categories and use only the third. Even though labile protein is believed to exist, its store has not been identified: the probable site is liver. This can only function as an amino acid buffer for a day. This means that amino acids need not be supplied at every meal but sufficient amounts must be present in the day's meal.

The daily diet should provide sufficient amino acids and the nine essential amino acids at the amounts needed by the body. Even if one of the essential amino acids is deficient in the diet, the protein cannot be utilized fully. This determines the quality of the protein. A good quality protein contains the essential amino acids in the ratios that the body requires. An average adult needs about 0.6 gm. good quality protein per day per kilogramme of body weight, and growing children need about 1-1.5 gm. per kilogramme per day. If the quality is low, then the person should consume larger amounts of protein. An adult weighing 60 kg. needs 36 gm. of good quality protein every day.

Fish or lean meat (fat free meat) contain about 20% good quality protein. If an adult is to get all his protein from these sources, that person must consume about 180-200 gm. meat or fish daily. If this is extended all members in a family, the cost would be terrifying. Fur-

ther, milk and egg, even though they give good quality protein, they should be consumed in large amounts to provide the needed protein. Because of the associated poor quality fat, there is a lot of discussion as to the value of animal protein in the diet. The value of skim milk (fat - free milk) is not doubted. A home made fat free milk product is the 'mour'. Lot of people appear to be afraid of it as being acidic. The fact is, the pH of stomach is always acidic (2 - 4) and secretion of Hydrochloric acid will be less if acidic substances are consumed. Curd, even though it contains the fat, is more digestible than milk and very good for children. Consumption of these should be actively promoted. There is no doubt about the value of marine products. Still, their cost limits them as good sources of protein.

The plant proteins are said to be of low quality because of the presence of essential amino acids at varying amounts. If we combine different plant proteins we can get good quality protein. Most Important of such combination is the rice and pulses. Rice has about 6-10% protein and its biological value is low because of deficiency of one amino acid (lysine). This amino acid is found in excess amounts in pulses and therefore, pulses supplement rice protein. If we eat large amount of rice with small amount of



pulses daily, which is not very expensive, we can get good quality protein. This beneficial effect probably has been observed by our ancestors who have devised several foods, all combinations of rice and pulses. Some examples are rice and paruppu, thosai, idly, mothakam and several flour preparations. Kurakkan contains about 10 - 11% good quality protein. Wheat protein is of poor quality and pulses do not supplement it.

#### Vitamins :

Vitamin A is necessary for several functions of the body, the most obvious is vision. It is stored in the liver of several animals and it is not possible to consume sufficient amount of animal livers daily. Milk and egg are also good sources. Their intake too is limited. This vitamin can be found as its precursor carotene, in several plant products. The chlorophyll found in the leaves contains this along with iron. This is why *dark green leaves* are good sources of vitamin A. Yellow coloured vegetable such as carrot, pumpkin and sweet potato also provide carotene. Several fruits such as mango, papaya and papaya also are good sources of carotene. It is worth noting that lightly coloured cabbage and red coloured beet-root give neither carotene nor iron and they cannot be considered as nutritious substances. It is a shame to discard

more nutritious leaves of carrot, beet-root and several others and to consume less nutritious tubers.

Vitamin B is a name given to a group of water soluble substances. They act as co-enzymes in several biochemical reactions of the body. Most of these are found in the outer layers of rice which are carefully avoided consuming. Rice mills reduced the work at the house in husking the paddy. But they also polish rice to a high degree removing almost all B vitamins. This is avoided by boiling or soaking paddy before milling - a process known as par boiling. Water diffuses towards the centre of the grain, taking the soluble vitamins with it. When the par boiled rice is polished the bran goes away but the vitamins remain. We cook raw rice and par-boiled rice. We wash them several times before cooking. The washing is a necessary procedure if we use imported rice which is rotten during storage and transport or has several chemicals added to prevent the damage. The sad thing is that the vitamins are washed away. The par-boiled rice keeps considerable amount even after washing. But while cooking we remove the supernatant water, kanji, which is a mixture of vitamin B and starch. The kanji is also discarded. As a result we eat poor quality rice (and swallow B-complex tablets). The kanji can be converted into a deli-

cious drink by adding salt, coconut milk, curd or mour. The wheat flour that we consume also has lost all its B vitamins as the central 70% only is given to us; this gives pure starch and some proteins only.

Several seeds make good sources of B vitamins. Their vitamin content increases while germination. This makes soaking the seeds before cooking a valuable practice.

Vitamin C is also necessary for several functions. Deficiency of vitamin C is demonstrated by easily damaged capillaries leading to minute haemorrhages, especially in gums. Its action as reducing agent in the body is very important. It helps in the intestine in absorption of

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Fe by preventing it being oxidised

+++  
to Fe The vitamin is found in fresh fruits and vegetables. This vitamin is found in fresh fruits and vegetables. This vitamin is lost by two different mechanisms. Considerable amount of lost by the heat of cooking. The most important is lost by enzyme activity. Plant tissues contain an enzyme, ascorbic acid oxidase, which is not active as long as the cells are intact. When damaged by drying, bruising, cutting or steeping in water, the enzyme is liberated and oxidises the vitamin. To avoid loss, fruits should be cut and eaten immediately and the vegetables

should be cooked as soon as they are cut.

Other vitamins are not discussed as they are widely available and do not cause considerable problem in our context.

### Minerals:

Human body needs several minerals, some in large amounts and others in traces. Only three of these - sodium, iron and calcium - need special mention.

Sodium is the common salt, found as sodium chloride. It is contained in considerable amounts in all animal and plant tissues: In the body, it is the main solute in the tissue fluid. When deficient, body fluid volume reduces and the person faces several problems. Usually people become deficient following serious illnesses which is not discussed here. The nutritional concern is the opposite, that is consumption in excess amounts. Salt is added to food while cooking for flavour and to preserve, especially dry fish. There are theories which suggest increased amounts of salt leads to hypertension; this has not been proved beyond doubt. The general recommendation is that it is good if people at risk reduce salt intake.

Iron is an important mineral as it is essential for synthesis of haemoglobin, the red pigment of blood, which transports oxygen. It is also

necessary as a component of important enzymes. The main dietary source is dark green leaves. There are more than 30 varieties of edible leaves. But people do not consume in large amounts probably because preparation is time consuming. Another possible reason is that they are found in fens and bushes that they are available free of charge and this lowers their status to animal feed. The value of dark green leaves in providing iron, pro-vitamin A, vitamin C, other vitamins and dietary fibre should be recognized and they must be actively promoted in home gardens. It is a shame to see iron deficiency anaemia in our "green country". Pulses also provide considerable amounts of iron. Large quantities should be eaten to meet the requirements as the absorption of iron in the intestine is not efficient. Only about 5 - 10% of iron consumed is absorbed.

Calcium is another mineral which is essential for life. It is the main component of bone. Calcium is also important as a regulator and mediator of several biological processes in the cells. The plasma calcium level should be maintained, as it is usually done by the body mechanisms, within a narrow limit. More or less can be dangerous to life. When dietary intake is poor, calcium is removed from bones and teeth leaving weak bones and teeth. The

daily requirement of calcium of growing children is larger (500 - 700 mg/day) than adults (400 - 500 mg/day): As only 20 - 30% of dietary calcium is absorbed the food should have considerable amounts of calcium. Fishes which can be consumed with bone are the best sources of calcium. Even if the bone is discarded fish is a good source. Milk and milk products, pulses, dark green leaves and un-boiled water also are good sources for calcium.

#### **Fibre :**

As mentioned earlier, unabsorbed dietary fibres are necessary for intestinal functions. It is found in outer layers of seeds and whole unrefined foods such as fruits and vegetables. Leafy vegetables are specially good sources. Cabbage, in addition to being tasty, is useful only to give dietary fibre. Kurakkan and under-milled rice also provide considerable amounts of fibre. Vegetables and fruits are very important in the daily diet to provide dietary fibre.

#### **Water:**

Water is the most important substance in the body. About 60 - 70% of the body is water. The water content should be maintained precisely and several physiological mechanisms regulate it. Water is essential as a base for all biochemical reactions. It is lost from the

body by several ways: water difuses through the skin and evaporates; water vapour is lost in the breathing air; at times sweating occurs to facilitate loss of excess heat in the body; some in the faeces; and considerable amounts in urine. The amount of water lost in the urine can be controlled upto a limit. All these losses are obligatory and cannot be prevented, especially in a hot country like ours. Failure to consume sufficient water, therefore, leads to several health problems. The blood volume decreases leading to feeling of weakness and sometimes fainting; headache occurs. Urine volume reduces and causes burning sensation and leads to urinary tract infection; causes stone formation in urinary tract. The stool becomes hard and dry. This causes injury to anus while passing and leads to painful defaecation and haemorrhoids.

Even though plain water is good enough, people make it nutritious by adding several substances to it. Fruit juices, palmyrah sap (not fermented), mour, milk, young coconut and rice kanji were popular beverages at one time. These are very nourishing and do no harm to us.

Today we have learnt to consume tea and coffee which give little milk which is not worth mentioning, sugar which is a health hazard and

caffeine which is a chemical. This chemical is said to be useful as a stimulant. The fact is, by being a stimulant, it habituates the systems and after some days of regular consumption, tea or coffee is required to perform the normal function. It is better not to get habituated and let the systems function on their own which are already efficient.

Another dangerous beverage is alcoholic drink. Alcohol is a high energy compound which by satisfying the energy needs, reduces the nutrient intake. Some people may argue that toddy is nutritious because of the presence of the yeast. The fact is that alive yeast survives the digestive enzymes and the vitamins are not available. Even as a source of energy alcohol is very expensive on two accounts; one is that it is highly priced; and other is that it is obtained as a result of fermentation of carbohydrates which by themselves are good as nutrients; during fermentation, considerable amounts of energy is released and only remainder is in the alcohol. Further, its toxic effects to liver, brain and mind are well known. The only harmless use of alcohol is as an antiseptic to kill bacteria on the skin.

#### **Recommendation:**

A passage from the magazine 'World Health' is worth noting at this point:

“With every day that passes we have more and more data to show that there is a diet that is ideal for us all, that is, a diet which keeps our bodies functioning healthily and protects us against chronic diseases and premature aging. It is also clear that we are not merely descended from the primates but that we continue to have the stomach and intestines of hunter gatherers and, no doubt, also similar cells and tissues. What we need is a reasonable daily diet plenty of vegetables and fruit and small amount of animal products and high-energy food stuffs. We now know that to live better, longer and more healthily, there is no need to kill so many animals or to grow so much grain for fodder, or to destroy wood lands in order to introduce grazing. The good news for the health of all living beings on the planet is that it is possible for us all to eat in harmony with nature. But will we all understand this before the end of the millennium?”

We, as a people, have lived over several thousands of years and have developed several dietary habits by trial and error. Our ancestors have been healthy and hearty on foods grown in this land. These foods are

good and nourishing even when we look at them with the scientific knowledge. During the course of the past decades we seem to have learnt unhealthy food habits due to food shortages of the second world war and events leading thereon. It is time for us to search and study the old food items, their cultivation methods, ways of cooking and popularising them again. A problem one can imagine about the locally available millets is the work involved in husking. Varahu, Sarmai and Kurakkan keep well in storing because of the heavy layers of husk. Even though they make delicious meals and snacks, people do not use them because of the work involved. Engineers should invent mills which can deal with them and make them easily available as good quality flour. Then the ways of preparing food items from millets should be recorded from the few old people who may still be living with the knowledge of the preparations. These methods should be studied and modified to suit the people of today. This will make available a wide variety of good food and snacks, full of nutrients.

The variety is the key of fulfilment of nutrient needs as well as the pleasure and satisfaction of good food.

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