To

The Fellows Nutritionists/Scientists/Housewives & Others,

Dear All,

In response to our old version of the Dietary Guidelines for Indians (DGI) uploaded on NIN website and also on the website of Solutions Exchange of FAO, New Delhi, we received a tremendous response from all the fellow nutritionists/ scientists/ housewives and others working in the field of nutrition. We have gone through their comments thoroughly and included the relevant and scientific based information in the updated version. The information given in the updated version of DGI matches with the information provided in the revised recommended dietary allowances which was released to the public by NIN/ICMR in 2011.

On behalf of the Chairman of the Dietary Guidelines Committee, Dr. Kamala Krishnaswamy and Co-Chairman of the Committee and the Director of the National Institute of Nutrition, Dr. B. Sesikeran, I thank all those who contributed to make this updated version possible. Further, we would like to thank all the contributors to update the chapters in the new version of Dietary Guidelines. We are now uploading the updated version and request you all to go through it and give your views within 15 days from the date of the uploading on our website. Your views are valuable to us to finalize the document and release the same as a part of ICMR Centenary celebrations.

(Dr. D. Raghunatha Rao)
Scientist 'E'- Deputy Director
Member & Convener
Dietary Guidelines Committee
Ph: 98487 55981
Email: drr_rao@yahoo.com

DIETARY GUIDELINES FOR INDIANS

A Manual

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Dr. Vasanthi S and Dr. Vijayalakshmi K, in the
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FOREWORD by Dr. C. Gopalan

It is now more than a decade since this valuable publication was first prepared. It was compiled by a team of experienced nutrition scientists at the National Institute of Nutrition, Hyderabad, under the leadership of Dr. Kamala Krishnaswamy. It has received wide appreciation from the general public as well as from students of nutrition, medicine, home science, nursing and allied subjects, and has been reprinted several times. It has also been widely disseminated through outreach activities undertaken by the National Institute of Nutrition, in the form of lectures, exhibitions and distribution of materials in various local languages.

In the intervening years, there have been notable socio-economic changes in India. It was thought necessary to update the guidelines in the light of new developments and fresh information.

The most notable change has been in the overall economic scenario in the country, with a robust growth rate. There have also been some important government initiatives in the fields of health and nutrition and poverty alleviation, including the launching of MGNREGA and overhauling of the ICDS. Globalisation has resulted in the opening of multinational fast food chains in Indian cities, including the smaller cities. Lifestyles and dietary patterns that had started giving early warning signals towards the end of the previous century, when these guidelines were first published, are continuing to follow a trend that promotes obesity and the attendant non communicable diseases.

The improvement in the overall economy at the macro level and concomitant improvements in purchasing power (though unevenly distributed) among households have not led to the expected levels of improvement in the nutritional status of Indians. The latest findings of the National Family Health Survey, NFHS-3 showed virtually no improvement in parameters as compared to NFHS-2, and recent surveys by the National Nutrition Monitoring Bureau have thrown more light on the growing problem of the 'double nutrition burden' of undernutrition and overnutrition. These data should serve as a wake-up call to nutritionists and policy makers. There is very obviously an 'awareness and information deficit', even among the more affluent sections of the population, about good dietary practices and their linkage with good health. This deficit should be narrowed and eliminated by harnessing all traditional as well as modern technological vehicles of communication.

This updated version of DGI from India's premier nutrition institute, National Institute of Nutrition, should serve as a valuable source of concise, accurate and accessible information, both for members of the general public and those who are involved in dissemination of nutrition and health education.

PREFACE

The first edition of 'Dietary Guidelines' was published in 1998, and since then tremendous changes have taken place in India. The economic transition has changed the way people live. Changing lifestyles of people both in rural and urban areas are seen to transform the very structure of our society at a rapid pace today. The shift from traditional to 'modern' foods, changing cooking practices, increased intake of processed and ready-to-eat foods, intensive marketing of junk foods and 'health' beverages have affected people's perception of foods as well as their dietary behaviour. Irrational preference for energy-dense foods and those with high sugar and salt content pose a serious health risk to the people, especially children. The increasing number of overweight and obese people in the community and the resulting burden of chronic non-communicable diseases necessitates systematic nutrition educational interventions on a massive scale. There is a need for adoption of healthy dietary guidelines along with strong emphasis on regular physical exercise.

Today, the multiple sources of health and nutrition related information tend to create unnecessary confusion among people. This book makes an attempt to inform us on matters of everyday nutrition in a user friendly manner and thus, aims to influence our dietary behaviour. These guidelines deal with nutritional requirements of people during all stages of their life, right from infancy to old age.

We earnestly hope that readers will enjoy reading the book and benefit from it and also spread the valuable information among those around them.

INTRODUCTION

Nutrition is a basic human need and a prerequisite to a healthy life. A proper diet is essential from the very early stages of life for proper growth, development and to remain active. Food consumption, which largely depends on production and distribution, determines health and nutrition of the population. The recommended dietary allowances (RDA) are nutrient-centred and technical in nature. Apart from supplying nutrients, foods provide a host of other components (non-nutrient phytochemicals) which have a positive impact on health. Since people consume food, it is essential to advocate nutrition in terms of foods, rather than nutrients. Emphasis has, therefore, been shifted from a nutrient orientation to the food based approach for attaining optimal nutrition. Dietary guidelines are a translation of scientific knowledge on nutrients into specific dietary advice. They represent the recommended dietary allowances of nutrients in terms of diets that should be consumed by the population. The guidelines promote the concept of nutritionally adequate diets and healthy lifestyles from the time of conception to old age.

Formulation of dietary goals and specific guidelines would ensure nutritional adequacy of populations. The dietary guidelines could be directly applied for general population or specific physiological or high risk groups to derive health benefits. They may also be used by medical and health personnel, nutritionists and dietitians. The guidelines are consistent with the goals set in national policies on Agriculture, Health and Nutrition.

The dietary guidelines ought to be practical, dynamic and flexible, based on the prevailing situation. Their utility is influenced by the extent to which they reflect the social, economic, agricultural and other environmental factors. The guidelines can be considered as an integral component of the country's comprehensive plan to reach the goals specified in the National Nutrition Policy.

The major food issues of concern are insufficient/ imbalanced intake of foods/nutrients. The common nutritional problems of public health importance in India are low birth weight, protein energy malnutrition in children, chronic energy deficiency in adults, micronutrient malnutrition and diet related non-communicable diseases. However, diseases at the either end of the spectrum of

malnutrition (under-and over-nutrition) are important. Recent evidences indicate that undernutrition *in utero* may set the pace for diet related chronic diseases in later life. Population explosion, demographic changes, rapid urbanization and alterations in traditional habits contribute to the development of certain unhealthy dietary practices and physical inactivity, resulting in diet-related chronic diseases.

The dietary guidelines emphasize promotion of health and prevention of disease, of all age groups with special focus on vulnerable segments of the population such as infants, children and adolescents, pregnant and lactating women and the elderly. Other related factors, which need consideration are physical activity, health care, safe water supply and socio-economic development, all of which strongly influence nutrition and health.

In this document, food-related approaches, both in qualitative and quantitative terms, have been incorporated. Emphasis is on positive recommendations which can maximize protective effects through use of a variety of foods in tune with traditional habits. The higher goals set with respect to certain food items such as pulses, milk and vegetables/fruits are intended to encourage appropriate policy decisions. Suitable messages for each of these guidelines have been highlighted.

A variety of foods, which are available and are within the reach of the common man, can be selected to formulate nutritionally adequate diets. While there are only four accepted basic food groups, in India, there are a variety of food preparations and culinary practices. Different cereals/millets are used as staple food, apart from a variety of cereal/millet/pulse combinations in different regions of India. The cooking oils and fat used are of several kinds. The proposed guidelines help to formulate health promoting recipes and diets which are region-and culture-specific. It is difficult to compute standard portion sizes, common to all regions of India. Nevertheless, attempts are made to give portion sizes and exchanges.

Translation of knowledge into action calls for the co-ordinated efforts of several government and non-government organizations. The fifteen guidelines prescribed, herein, stress on adequacy of intake of foods from all food groups for maintenance of optimal health. Effective IEC strategies and other large scale educational campaigns should be launched to encourage people to follow the dietary guidelines. Such efforts should be integrated with the existing national nutrition and health programmes.

CURRENT DIET AND NUTRITION SCENARIO

Health and nutrition are the most important contributory factors for human resource development in the country. India has been classified by the World Bank as a country with a low income economy, with per capita GNP of US $ 950[1]. It ranks 160th in terms of human development among 209 countries. Among the Indian population, about 28% in the rural and 26% in the urban areas are estimated to be below the poverty line[2], which is defined as the expenditure needed to obtain, on an average, 2400 Kcal per capita per day in the rural areas and 2100 Kcal in urban areas. Long-term malnutrition (under and over) leads to stunting and wasting, non-communicable chronic diet related disorders, increased morbidity and mortality and reduced physical work output. It is a great economic loss to the country and undermines development.

Common Nutrition Problems

Protein Energy Malnutrition (PEM), micronutrient deficiencies such as vitamin A deficiency(VAD) , Iron Deficiency Anemia (IDA), Iodine Deficiency Disorders(IDD) and vitamin B-complex deficiencies are the nutrition problems frequently encountered, particularly among the rural poor and urban slum communities.

Undernutrition starts as early as conception. Because of extensive maternal undernutrition (underweight, poor weight gain during pregnancy, nutritional anaemia and vitamin deficiencies), about 22% of the infants are born with low birth-weight (<2500 g)[3], as compared to less than 10% in the developed countries. Both clinical and sub-clinical undernutrition are widely prevalent even during early childhood and adolescence. Though the prevalence of florid forms of severe PEM like kwashiorkor and marasmus among preschool children is <1 %, countrywide surveys indicate that about 43% of <5 year children suffer from sub-clinical undernutrition such as underweight (weight for age < median – 2SD of WHO child growth standards) about 48% are stunted (height for age < median – 2SD) and about 20% are wasted (weight for height < median – 2SD) which indicates that undernutrition is of long duration[3]. The studies have shown that there is a steep increase in the prevalence of underweight among young children, from about 27% around 6 months of age to a high of about 45% at 24 months of age[4]. This is attributable to faulty infant and young child feeding practices prevailing in the community.

Persistent undernutrition throughout the growing phase of childhood leads to short stature in adults. About 33% of adult men and 36% of the women have a Body Mass Index (BMI) (Weight in kg/Height in meter^2) below 18.5, which indicates Chronic Energy Deficiency or CED (Table1)[4]. In the case of vitamin A deficiency, 1-2% of preschool children show the signs of Bitot's spots and night blindness. Vitamin A deficiency also increases the risk of disease and death.

Table 1

Particulars		Prevalence
Infants and Preschool children (%)		
Low birth weight		22
# Kwashiorkor/Marasmus		<1
# Bitot's spots		<1-2
Iron deficiency anaemia (6 -59 months)		70.0
# Underweight (weight for age)* (<5 years)		42.6
# Stunting (height for age)* (<5 years)		48.7
# Wasting (weight for height)*		19.0
Childhood Overweight/ Obesity		6-30
Adults (%)		
Chronic Energy Deficiency *(BMI <18.5) among*		
# Rural Adults	*Men*	33.2
	Women	36.0
# Tribal Adults	*Men*	40.0
	Women	49.0
Anaemia (%)		
# Women (NPNL)		75.2
# Pregnant women		74.6
Iodine deficiency disorders (IDD)		
Goitre (millions)		54
Cretinism (millions)		2.2
Still births due to IDD (includes neo natal deaths)		90,000
Prevalence of chronic diseases *Over weight/obesity[4] (BMI>25) (%)*		
# Rural Adults	*Men*	7.8
	Women	10.9
# Tribal Adults	*Men*	3.2
	Women	2.4
Urban Adults	*Men*	36.0
	Women	40.0
Hypertension		
Urban		16.5
# Rural		25.0
Men		25.0
Women		24.0
# Tribal		24.0
Men		25.0
Women		23.0
Diabetes Mellitus *(%) (year 2006)*		
Urban		16.0
# Rural		5.0
Coronary Heart Disease[9] *(%)*		
Urban		7-9
# Rural		3-5
Cancer incidence Rate[10] *(Per 100,000)*		
Men		113
Women		123

*<Median -2SD of WHO Child Growth Standards
NNMB surveys

Among children between the ages of 6 and 59 months, a majority (70%)[3] are anemic. Nearly three fourth (75%) of women in India are anemic, with the prevalence of moderate to severe anemia being highest (50%) among pregnant women[5]. It is estimated that nutritional anemia contributes to about 24%[6] of maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults and learning ability in children.

Iodine deficiency disorders (IDD) are very common among large sections of population in several parts of the country. About 167 million are estimated to be living in IDD endemic areas. Iodine deficiency causes goiter (enlargement of thyroid gland in the neck), neonatal hypothyroidism, cretinism among new borns, mental retardation, delayed motor development, stunting, deaf-mutism and neuromuscular disorders. The most important consequence of iodine deficiency in mothers is cretinism in which the children suffer from mental and growth retardation since birth. About 90,000 still-births and neonatal deaths occur every year due to maternal iodine deficiency. Around 54 million persons are estimated to have goiter, 2.2 million have cretinism and 6.6 million suffer from mild psycho-motor handicaps[7].

India is passing through the phase of economic transition and while the problem of undernutrition continues to be a major problem, prevalence of overnutrition is emerging as a significant problem, especially in the urban areas. The prevalence of overweight/ obesity was higher among the women (10.9%) compared to men (7.8%) in rural areas[4]. The prevalence of Diabetes Mellitus[8] and Coronary Heart Disease (CHD)[9] is also higher in urban areas as compared to their rural counterparts. The incidence rate of cancer is comparatively higher among women (123) compared to men (113 for 100 thousands)[10].

Food availability and consumption

The overall production of food grains (cereals/millets/pulses) recorded a significant increase from about 108 million tones in 1970-71 to a little over 230 million tones during 2007-2008[11,12]. Though the production of cereals and millets appears to be adequate, production of pulses, the source of protein for the rural poor, actually shows a decline. Total Production of vegetables is about 30% less than the demand of 100 million tones[13]. The total production of milk during 2006-2007 was about 100.9 million tonnes, corresponding to about 245 g per caput per day, which is lower than the world average of 285 g per day[14] (Table 2). Though the per capita availability of various foods stuffs is comparable to RDA, the distribution of foods, both within the community and the family, may be unfavorable to some vulnerable groups due to low income and purchasing power. In view of the high cost of milk, a large proportion of the Indian population subsists on diets consisting mostly of plant foods with low nutrient bio-availability.

Table 2. Food availability (per caput/g/day)

Food Group	Year							RDA	
	1990	2000	2001	2002	2003	2004	2006/07	Per CU	Per caput*
Cereals	431.5	422.7	386.2	458.7	408.5	426.9	412.1	460	400
Pulses	41.1	31.8	30.0	35.4	29.1	35.8	32.5	40.0	35
Milk	176	220	225	230	231	232	245	150	131
Vegetables	-	-	-	-	-	-	210	60	52
Oils	17.8	26.0	27.9	23.6	NA	NA	NA	20	17
Meat	12.6	13.7	14.0	14.2	NA	NA	NA	-	-
Eggs no.s / head / annum	25	36	38	39	40	41	-	-	-

**0.87 CU (Consumption Unit) per caput . Source: Ref Nos. 2,15,16,17,18 & 19*

National Nutrition Monitoring Bureau (NNMB) surveys[4] indicate that the daily intake of foods including cereals and millets (345g) in Indian households is lower than the Recommended Dietary Allowances or RDA (Table 3). The average consumption of pulses and legumes like green gram, bengal gram and black gram, which are important poor man's source of protein was about 31% lower (24g) than the RDA of 35g per CU/day. Consumption of green leafy vegetables (<14g) and other vegetables (43 g), which are rich sources of micronutrients like betacarotene, folate, calcium, riboflavin and iron, was grossly inadequate. Intake of visible fat was about 71% of the RDA.

Table 3. Food Consumption (g/day

	Intake		RDA*
	CU	Per Caput	Per Caput
Cereals/millets	396	345	400
Pulses	28	24	35
Milk	82	71	131
Vegetables	49	43	52
Oils	14	12	17

** These values are obtained by multiplying the RDA values per CU by 0.87*
Source: National Nutrition Monitoring Bureau, 2006.

The proportion of households with energy inadequacy was about 70%, while that with protein inadequacy was about 27%. Thus, in the cereal/millet-based Indian dietaries, the primary bottleneck is energy inadequacy and not protein, as was earlier believed. This dietary energy gap can be easily overcome by the poor by increasing the quantities of habitually eaten foods.

On the other side of the spectrum of malnutrition, diet-related non- communicable diseases are commonly seen. With increasing urbanization, energy-rich diets containing higher amount of fat and sugar, which also provide less dietary fibre and complex carbohydrates, are being frequently consumed, particularly by high-income groups. In addition, the urban population is tending to be more sedentary with little physical activity. Consumption of alcohol, providing empty calories, and tobacco is also common. Hence, prevalence of disorders like obesity, heart disease, hypertension (high blood pressure) and diabetes, is on the increase.

Determinants of Malnutrition

Widespread malnutrition is largely a result of dietary inadequacy and unhealthy lifestyles. Other contributing factors are poor purchasing power, faulty feeding habits, large family size, frequent infections, poor health care, inadequate sanitation and low agricultural production. Population living in the backward and drought-prone rural areas and urban slums, and those belonging to the socially backward groups like scheduled castes and tribal communities are highly susceptible to undernutrition. Similarly, landless labourers and destitutes are also at a higher risk.

The most rational, sustainable and long-term solution to the problem of malnutrition is ensuring availability, access and consumption of adequate amounts of foods. Dietary guidelines help to achieve the objective of providing optimal nutrition to the population.

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DIETARY GOALS

1. Maintenance of a state of positive health and optimal performance in populations at large by maintaining ideal body weight.

2. Ensurement of adequate nutritional status for pregnant women and lactating mothers.

3. Improvement of birth weights and promotion of growth of infants, children and adolescents to achieve their full genetic potential.

4. Achievement of adequacy in all nutrients and prevention of deficiency diseases.

5. Prevention of chronic diet-related disorders.

6. Maintenance of the health of the elderly and increase the life expectancy.

DIETARY GUIDELINES

1. Eat variety of foods to ensue a balanced diet
2. Ensure provision of extra food and healthcare to pregnant and lactating women.
3. Promote exclusive breastfeeding for six months and encourage breastfeeding till two years.
4. Feed home based semi solid foods to the infant after six months.
5. Ensure adequate and appropriate diets for children and adolescents both in health and sickness.
6. Eat plenty of vegetables and fruits.
7. Ensure moderate use of edible oils and animal foods and very less use of ghee/ butter/ vanaspati.
8. Overeating should be avoided to prevent overweight and obesity.
9. Exercise regularly and be physically active to maintain ideal body weight.
10. Use salt in moderation/ Restrict salt intake to minimum.
11. Ensure the use of safe and clean foods.
12. Practice right cooking methods and healthy eating habits.
13. Drink plenty of water and take beverages in moderation.
14. Minimize the use of processed foods rich in salt, sugar and fats.
15. Include micronutrient rich foods in the diets of elderly people to enable them to be fit and active.

1. A NUTRITIONALLY ADEQUATE DIET SHOULD BE CONSUMED THROUGH A WISE CHOICE FROM A VARIETY OF FOODS

- Nutrition is a basic prerequisite to sustain life.
- Variety in food is not only the spice of life but also the essence of nutrition and health.
- A diet consisting of foods from several food groups provides all the required nutrients in proper amounts.
- Cereals, millets and pulses are major sources of most nutrients.
- Milk which provides good quality proteins and calcium must be an essential item of the diet, particularly for infants, children and women.
- Oils and nuts are calorie-rich foods, and are useful for increasing the energy density.
- Inclusion of eggs, flesh foods and fish enhances the quality of diet. However, vegetarians can derive almost all the nutrients from diets consisting of cereals, pulses, vegetables, fruits and milk-based diets.
- Vegetables and fruits provide protective substances such as vitamins/ minerals/ phytonutrients.
- Diversified diets with a judicious choice from a variety food groups provide the necessary nutrients.

Why do we need nutritionally adequate food ?

Nutrients that we obtain through food have vital effects on physical growth and development, maintenance of normal body function, physical activity and health. Nutritious food is, thus needed to sustain life and activity. Our diet must provide all essential nutrients in the required amounts. Requirements of essential nutrients vary with age, gender, physiological status and physical activity. Dietary intakes lower or higher than the body requirements can lead to under-nutrition (deficiency diseases) or over-nutrition (diseases of affluence) respectively. Eating too little food during the vulnerable periods of life such as infancy, childhood, adolescence, pregnancy and lactation and eating too much at any age can lead to harmful consequences. An adequate diet, providing all nutrients, is needed throughout our lives. The nutrients must be obtained through a judicious choice and combination of a variety of foodstuffs from different food groups (Figure 1).

Fig. 1 Food Pyramid

Carbohydrates, fats and proteins are macronutrients, which are needed in large amounts. Vitamins and minerals constitute the micronutrients and are required in small amounts. These nutrients are necessary for physiological and biochemical processes by which the human body acquires, assimilates and utilizes food to maintain health and activity.

Carbohydrates

Carbohydrates are either simple or complex, and are major sources of energy in all human diets. They provide energy of 4 Kcal/g. The simple carbohydrates, glucose and fructose, are found in fruits, vegetables and honey, sucrose in sugar and lactose in milk, while the complex polysaccharides are starches in cereals, millets, pulses and root vegetables and glycogen in animal foods. The other complex carbohydrates which are resistant to digestion in the human digestive tract are cellulose in vegetables and whole grains, and gums and pectins in vegetables, fruits and cereals, which constitute the dietary fibre component. In India, 70-80% of total dietary calories are derived from carbohydrates present in plant foods such as cereals, millets and pulses.

Dietary fibre delays and retards absorption of carbohydrates and fats and increases the satiety value. Diets rich in fibre reduce glucose and lipids in blood and increase the bulk of the stools. Diets rich in complex carbohydrates are healthier than low-fibre diets based on refined and processed foods.

Proteins

Proteins are primary structural and functional components of every living cell. Almost half the protein in our body is in the form of muscle and the rest of it is in bone, cartilage and skin. Proteins are complex molecules composed of different amino acids. Certain amino acids which are termed “essential”, have to be obtained from proteins in the diet since they are not synthesized in the human body. Other non-essential amino acids can be synthesized in the body to build proteins. Proteins perform a wide range of functions and also provide energy (4 Kcal/g).

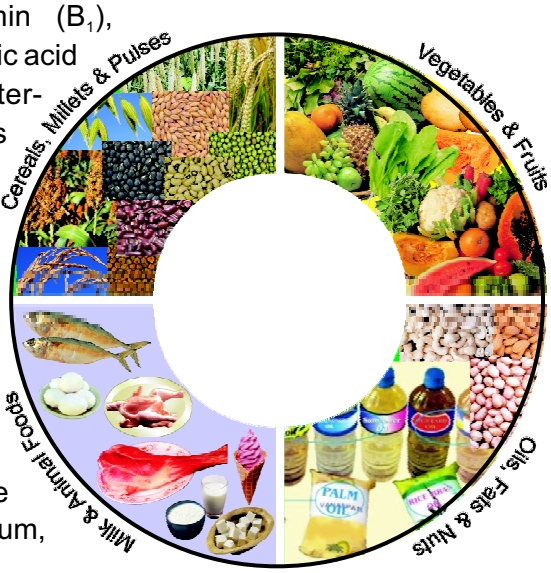
Protein requirements vary with age, physiological status and stress. More proteins are required by growing infants and children, pregnant women and individuals during infections and illness or stress. Animal foods like milk, meat, fish and eggs and plant foods such as pulses and legumes are rich sources of proteins. Animal proteins are of high quality as they provide all the essential amino acids in right proportions, while plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a combination of cereals, millets and pulses provides most of the amino acids, which complement each other to provide better quality proteins.

Fats

Oils and fats such as butter, ghee and vanaspathi constitute dietary visible fats. Fats are a concentrated source of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Dietary fats are derived from two sources viz. the invisible fat present in plant and animal foods; and the visible or added fats and oils (cooking oil) (Refer chapter 7). Fats serve as a vehicle for fat-soluble vitamins like vitamins A, D, E and K and carotenes and promote their absorption. They are also sources of essential polyunsaturated fatty acids. It is necessary to have adequate and good quality fat in the diet with sufficient polyunsaturated fatty acids in proper proportions for meeting the requirements of essential fatty acids (Refer chapter 7). The type and quantity of fat in the daily diet influence the level of cholesterol and triglycerides in the blood. Diets should include adequate amounts of fat particularly in the case of infants and children, to provide concentrated energy since their energy needs per kg body weight are nearly twice those of adults. Adults need to be cautioned to restrict intake of saturated fat (butter, ghee and hydrogenated fats) and cholesterol (red meat, eggs, organ meat). Excess of these substances could lead to obesity, diabetes, cardiovascular disease and cancer.

Vitamins and minerals

Vitamins are chemical compounds required by the body in small amounts. They must be present in the diet as they cannot be synthesized in the body. Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. They are either water-soluble or fat-soluble. Vitamins A, D, E and K are fat-soluble, while vitamin C, and the B-complex vitamins such as thiamin (B_1), riboflavin (B_2), niacin, pyridoxine (B_6), folic acid and cyanocobalamin (B_{12}) are water-soluble. Pro-vitamin like beta-carotene is converted to vitamin A in the body. Fat-soluble vitamins can be stored in the body while water-soluble vitamins are not and get easily excreted in urine. Vitamins B-complex and C are heat labile vitamins and are easily destroyed by heat, air or during drying, cooking and food processing.



Minerals are inorganic elements found in body fluids and tissues. The important macro minerals are sodium,

potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are microminerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood- clotting processes. Approximate Calorific Value of Nuts, Salads and Fruits are given in annexure 1.

What is a balanced diet ?

A balanced diet is one which provides all the nutrients in required amounts and proper proportions. It can easily be achieved through a blend of the four basic food groups. The quantities of foods needed to meet the nutrient requirements vary with age, gender, physiological status and physical activity. A balanced diet should provide around 50-60% of total calories from carbohydrates, preferably from complex carbo-hydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat.

In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human body from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also afford protection against oxidant damage. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants. Balanced Diet for Adults - Sedentary/Moderate/Heavy Activity is given in annexure 2.

What are food groups ?

Foods are conventionally grouped as :

1.Cereals, millets and pulses
2.Vegetables and fruits
3.Milk and milk products, egg, meat and fish
4.Oils & fats and nuts & oilseeds

However, foods may also be classified according to their functions (Table 4).

What are nutrient requirements and recommended dietary allowances (RDA)?

Requirements are the quantities of nutrients that healthy individuals must obtain from food to meet their physiological needs. The recommended dietary allowances (RDAs) are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population. The recommended level depends upon the bioavailability of nutrients from a given diet. The term bioavailability indicates what is absorbed and utilized by the body. In addition, RDA includes a margin of safety, to cover variation between individuals, dietary traditions and practices. The RDAs are suggested for physiological groups such as infants, pre-schoolers, children,

adolescents, pregnant women, lactating mothers, and adult men and women, taking into account their physical activity. In fact, RDAs are suggested averages/day. However, in practice, fluctuations in intake may occur depending on the food availability and demands of the body. But, the average requirements need to be satisfied over a period of time (Annexure-3).

The diet that one consumes must provide adequate calories, proteins and micronutrients to achieve maximum growth potential. There may be situations where adequate amounts of nutrients may not be available through diet alone. In such high risk situations where specific nutrients are lacking, foods fortified with the limiting nutrient(s), such as iodized salt, double fortified salt with iron and iodine are necessary.

Table – 4 Classification of foods based on function

MAJOR NUTRIENTS		OTHER NUTRIENTS
ENERGY RICH FOODS	**Carbohydrates & fats**	
	Whole grain cereals, millets	Protein, fibre, minerals, calcium, iron & B-complex vitamins
	Vegetable oils, ghee, butter	Fat soluble vitamins, essential fatty acids
	Nuts and oilseeds	Proteins, vitamins, minerals
	Sugars	Nil
BODY BUILDING FOODS	**Proteins**	
	Pulses, nuts and oilseeds	B-complex vitamins, invisible fat, fibre
	Milk and Milk products	Calcium, vitamin A, riboflavin, vitamin B_{12}
	Meat, fish, poultry	B-complex vitamins, iron, iodine, fat
PROTECTIVE FOODS	**Vitamins and Minerals**	
	Green leafy vegetables	Antioxidants, fibre and other carotenoids
	Other vegetables and fruits	Fibre, sugar and antioxidants
	Eggs, milk and milk products and flesh foods	Protein and fat

POINTS TO PONDER

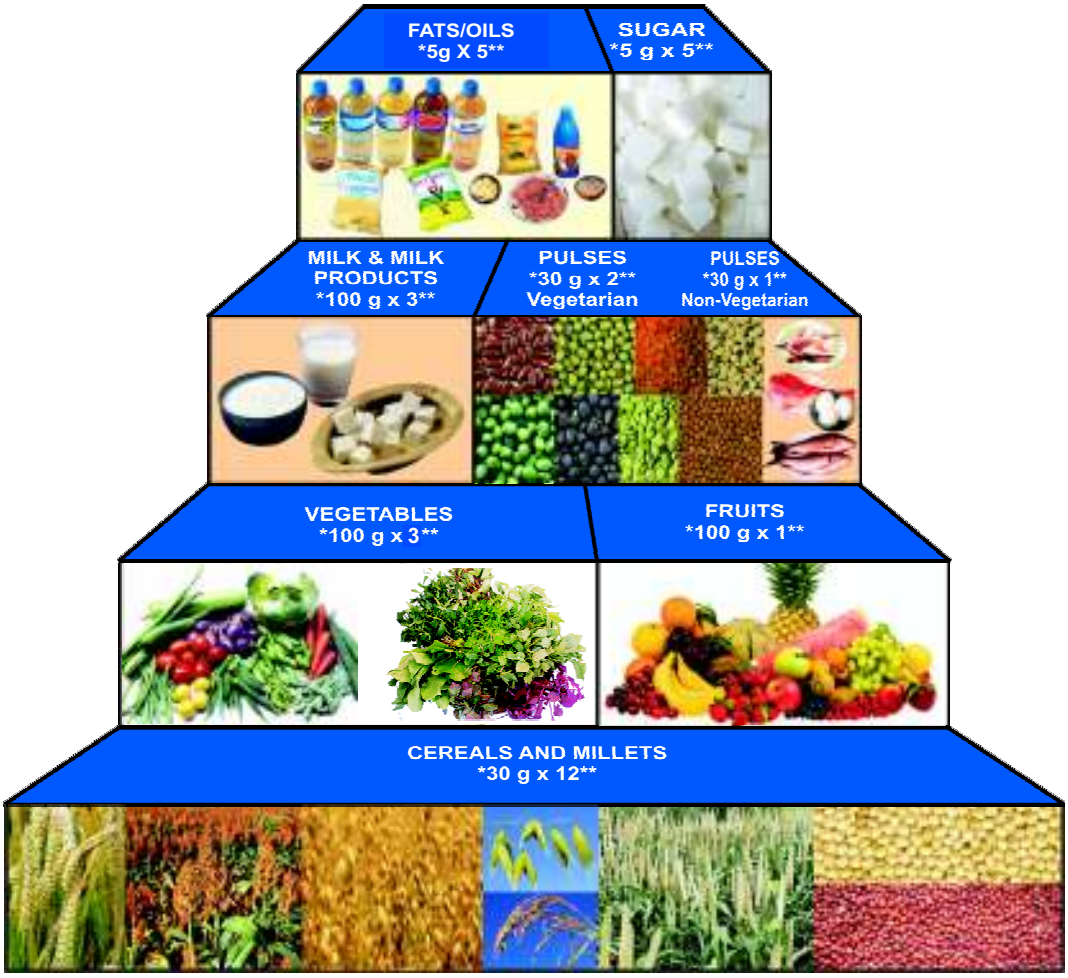
- ❖ **Choose a variety of foods in amounts appropriate for age, gender, physiological status and physical activity**
- ❖ **Use a combination of whole grains, grams and greens. Include jaggery or sugar and cooking oils to bridge the calorie or energy gap.**
- ❖ **Prefer fresh locally available vegetables and fruits in plenty.**
- ❖ **Include in the diets, foods of animal origin such as milk, eggs and meat, particularly for pregnant and lactating women and children.**
- ❖ **Adults should choose low-fat, protein-rich foods such as lean meat, fish, pulses and low-fat milk.**
- ❖ **Develop healthy eating habits and exercise regularly and move as much as you can.**

Figure 2

IMPORTANCE OF DIET DURING DIFFERENT STAGES OF LIFE

Figure 3

BALANCED DIET FOR ADULT MAN (SEDENTARY)

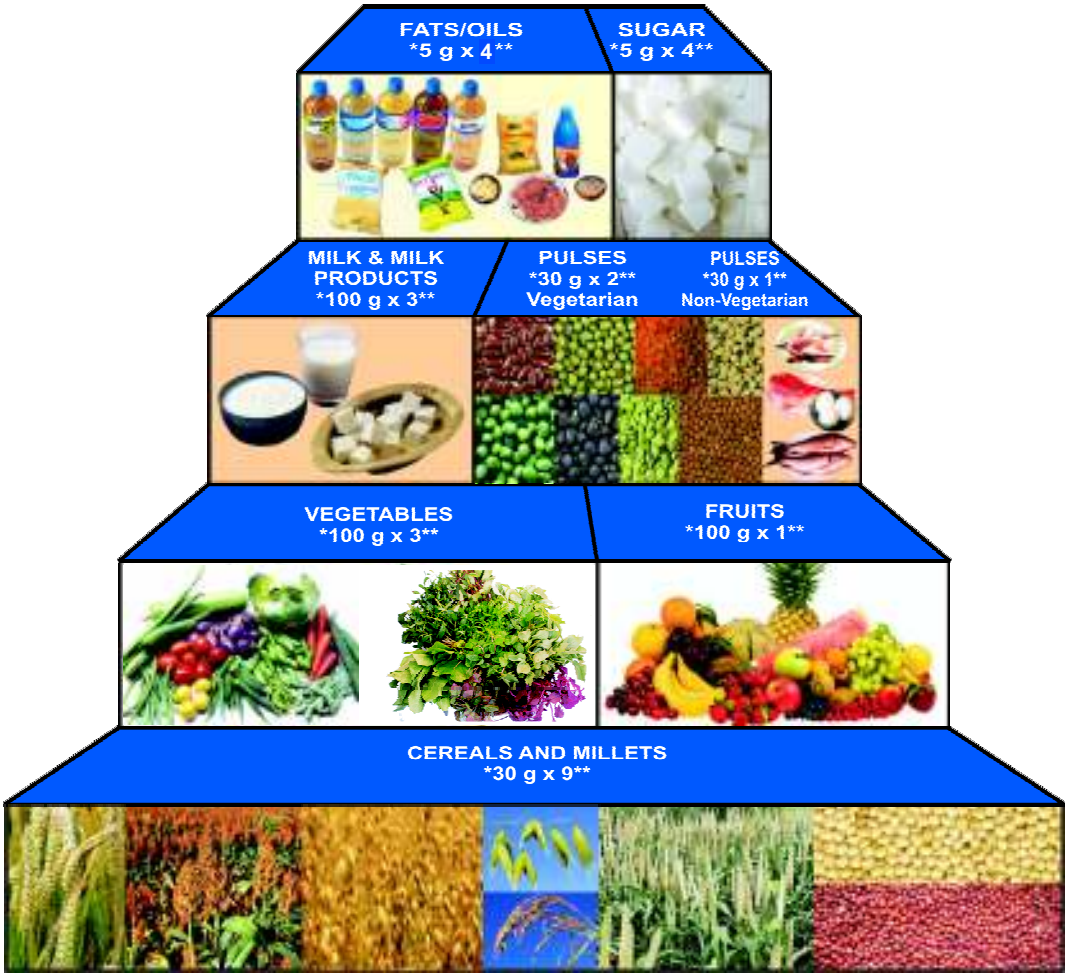


* Portion Size. ** No. of Portions

Elderly man: Reduce 3 portions of cereals and millets and add an extra serving of fruit

Figure 4

BALANCED DIET FOR ADULT WOMAN (SEDENTARY)



* Portion Size. ** No. of Portions

Extra Portions:

Pregnant women : Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2.

Lactating women : Cereals-1, Pulses-2, Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2

Between 6-12 months of lactation, diet intake should be gradually brought back to normal.

Elderly women : Fruit-1, reduce cereals and millets-2.

2. ADDITIONAL FOOD AND EXTRA CARE ARE REQUIRED DURING PREGNANCY AND LACTATION

- Pregnancy is physiologically and nutritionally a highly demanding period. Extra food is required to meet the requirements of the foetus.
- A woman prepares herself to meet the nutritional demands by increasing her own body fat deposits during pregnancy.
- A lactating mother requires extra food to secrete adequate quantity/ quality of milk and to safe guard her own health.

Why additional diet is required during pregnancy and lactation ?

Pregnancy is a demanding physiological state. In India, it is observed that diets of women from the low socioeconomic groups are essentially similar during pre-pregnant, pregnant and lactating periods. Consequently, there is widespread maternal malnutrition leading to high prevalence of low birth weight infants and very high maternal mortality. Additional foods are required to improve pregnancy weight gain and birth weight of infants, Pre-pregnant BMI, maternal age and rate of pregnancy weight gain must be considered in tailoring the calorie recommendation to the pregnant women.

What are the nutrients that require special attention ?

The daily diet of a woman should contain an additional 350 calories, 0.5 g of protein during first trimester and 6.9 g during second trimester and 22.7 g during third trimester of pregnancy. Some micronutrients are specially required in extra amounts during these physiological periods. Folic acid, taken throughout the pregnancy, reduces the risk of congenital malformations and increases the birth weight. The mother as well as the growing foetus need iron to meet the high demands of erythropoiesis (RBC formation). Calcium is essential, both during pregnancy and lactation, for proper formation of bones and teeth of the offspring, for secretion of breast-milk rich in calcium and to prevent osteoporosis in the mother. Similarly, iodine intake ensures proper mental health of the growing foetus and infant. Vitamin A is required during lactation to

improve child survival. Besides these, nutrients like vitamins B_{12} and C need to be taken by the lactating mother.

How can the pregnant and lactating women meet these nutritional demands?

The pregnant/lactating woman should eat a wide variety of foods to make sure that her own nutritional needs as well as those of her growing foetus are met. There is no particular need to modify the usual dietary pattern. However, the quantity and frequency of usage of the different foods should be increased. She can derive maximum amount of energy (about 60%) from rice, wheat and millets. Cooking oil is a concentrated source of both energy and polyunsaturated fatty acids. Good quality protein is derived from milk, fish, meat, poultry and eggs. However, a proper combination of cereals, pulses and nuts also provides adequate proteins. Mineral and vitamin requirements are met by consuming a variety of seasonal vegetables particularly green leafy vegetables, milk and fresh fruits. Bioavailability of iron can be improved by using fermented and sprouted grams and foods rich in vitamin C such as citrus fruits. Milk is the best source of biologically available calcium. Though it is possible to meet the requirements for most of the nutrients through a balanced diet, pregnant/lactating women are advised to take daily supplements of iron, folic acid, vitamin B_{12} and calcium (Annexure 3).

What additional care is required ?

Adequate intake of a nutritious diet is reflected in optimal weight gain during pregnancy (10 kg) by the expectant woman. She should choose foods rich in fibre (around 25 g/1000 kcal) like whole grain cereals, pulses and vegetables, to avoid constipation. She should take plenty of fluids including 8-12 glasses of water per day. Salt intake should not be restricted even to prevent pregnancy-induced hypertension and pre-eclampsia. Excess intake of beverages containing caffeine like coffee and tea adversely affect foetal growth and, hence, should be avoided.

In addition to satisfying these dietary requisites, a pregnant woman should undergo periodic health check-up for weight gain, blood pressure, anaemia and receive tetanus toxoid immunization. She requires enough physical exercise with adequate rest for 2-3 hrs during the day. Pregnant and lactating women should not indiscriminately take any drugs without medical advice, as some of them could be harmful to the foetus/baby. Smoking and tobacco chewing and consumption of alcohol should be avoided. Wrong food beliefs and taboos should be discouraged.

The most important food safety problem is microbial food borne illness and its prevention during pregnancy is one of the important public health measure. Avoiding contaminated foods is important protective measure against food borne illness.

POINTS TO PONDER

- ❖ Eat more food during pregnancy.
- ❖ Eat more whole grains, sprouted grams and fermented foods.
- ❖ Take milk/meat/eggs in adequate amounts.
- ❖ Eat plenty of vegetables and fruits.
- ❖ Avoid superstitions and food taboos.
- ❖ Do not use alcohol and tobacco. Take medicines only when prescribed.
- ❖ Take iron, folate and calcium supplements regularly, after 14-16 weeks of pregnancy and continue the same during lactation

EAT FOLATE-RICH FOODS

- Folic acid is essential for the synthesis of haemoglobin.
- Folic acid deficiency leads to macrocytic anaemia.
- Pregnant women need more of folic acid.
- Folic acid supplements increase birth weight and reduce congenital anomalies.
- Green leafy vegetables, legumes, nuts and liver are good sources of folic acid.
- 500 μg folic acid supplementation is advised preconceptionally and through out pregnancy for women with history of congenital anomalies (neural tube defects, cleft palate)

EAT IRON-RICH FOODS

- Iron is needed for haemoglobin synthesis, mental function and body defence.
- Deficiency of iron leads to anaemia.
- Iron deficiency is common particularly in women of reproductive age and in children.
- Iron deficiency during pregnancy increases maternal mortality and low birth weight in infants.
- In children, it increases susceptibility to infection and impairs learning ability.
- Plant foods like green leafy vegetables, legumes and dried fruits contain iron.
- Iron is also obtained through meat, fish and poultry products.
- Iron bio-availability is poor from plant foods but is good from animal foods.
- Fruits rich in vitamin C like gooseberries (amla), guava and citrus fruits improve iron absorption from plant foods.
- Beverages like tea bind dietary iron and make it unavailable. Hence, they should be avoided before, during or soon after a meal.
- Iron intake from diets is around 18 mg as against 35 mg RDA. An iron supplement (60 mg elemental iron, 100 mg folic acid) is recommended for 100 days during pregnancy from 16th week onwards to meet the demand of pregnancy.

3. EXCLUSIVE BREAST-FEEDING SHOULD BE PRACTISED AT LEAST FOR 6 MONTHS; BREAST-FEEDING CAN BE CONTINUED UPTO TWO YEARS

- Breast-milk is the most natural and perfect food for normal growth and healthy development of infants.
- Colostrum is rich in nutrients and anti-infective factors and should be fed to infants.
- Breast-feeding reduces risk of infections.
- It establishes mother-infant contact and promotes mother-child bonding.
- It prolongs birth interval by fertility control (delayed return of menstruation).
- Breast-feeding helps in retraction of the uterus.
- Incidence of breast cancer is lower in mothers who breast feed their children.
- Breast feeding is associated with better cognitive development of children and may provide some long-term health benefits.

Why breast-feed the infant ?

Breast-milk contains all essential nutrients needed for the infant; it provides the best nutrition and protects the infant from infections. Breast-milk is a natural food and is more easily digested and absorbed by the infant as compared to formula milk prepared from other sources. Colostrum, which is the milk secreted during the first 3-4 days after child birth, is rich in proteins, minerals, vitamins especially vitamin A and antibodies. In addition, it has a laxative effect as well. Breast-feeding helps in reducing fertility and facilitates spacing of children. Lactation provides emotional satisfaction to the mother and the infant. Recent evidence suggests that human milk may confer some long term benefits such as lower risk of certain autoimmune diseases, inflammatory bowel disease, obesity and related disorders and probably some cancers. Therefore, breast milk is the best milk for the newborn and growing infant.

What are the advantages of breast-milk ?

In addition to providing nutrients, breast-milk has several special components such as growth factors, enzymes, hormones and anti-infective factors. The amount of milk secreted increases gradually in the first few days after delivery, reaching the peak during the second month, at which level it is maintained until about 6 months of

age. An average Indian woman secretes about 750 ml of milk per day during the first 6 months and 600 ml/day subsequently upto one year. Many essential components are in concentrated amounts in colostrum as compared to mature milk, compensating for the low output during early lactation.

Breast-milk provides good quality proteins, fat, vitamins, calcium, iron and other minerals even beyond four months. In fact, quality of some of the nutrients can be improved by supplementing the diet of the mother with nutrients. Growth performance of majority of the breast-fed infants is satisfactory upto 6 months of age. Breast feeding is associated with better cognitive development possibly due to the high content of docosahexaeonic acid (DHA) which plays an important role in brain development.

When to start breast feeding and how long to continue ?

Mother-infant contact should be established as early as possible (immediately after birth) by permitting the infant to suck at the breast. Mothers can breast-feed from as early as 30 minutes after delivery. Colostrum should be made available to the infant immediately after birth. Feeding honey, glucose, water or dilute milk formula before lactation should be avoided and the infant should be allowed to suck, which helps in establishing lactation. Colostrum should not be discarded, as is sometimes practised.

Breast-feeding in India is common among the rural and urban poor, being less so among the urban middle and upper classes. The poorer groups continue breast-feeding for longer duration than the educated upper and middle income groups. The economically advantaged or the working mother, tends to discontinue breast-feeding early. A baby should be exclusively breast-fed only upto 6 months and complementary foods should be introduced thereafter. Breast-feeding can be continued as long as possible, even upto 2 years. Demand feeding helps in maintaining lactation for a longer time. If babies are quiet or sleep for 2 hours after a feed and show adequate weight gain, feeding may be assumed as adequate. Breast-fed infants do not need additional water. Feeding water reduces the breast milk intake and increases the risk of diarrhoea and should, therefore, be avoided. Giving additional water is unnecessary even in hot climate.

What are the effects of maternal malnutrition on breast-milk ?

Composition of breast-milk depends to some extent on maternal nutrition. In general, even the undernourished mothers can successfully breast-feed. But in the case of severe malnutrition, both the quality and quantity of breast-milk may be affected. Protein content of breast-milk appears to be much less affected as compared to fat in malnutrition. Concentration of water-soluble vitamins as well as fat soluble vitamin A (beta-carotene) are influenced by the quality of the maternal diet. Supplementation of vitamins A and B-complex to lactating mothers increases the levels of these vitamins in breast-milk. Zinc and iron from breast-milk are better absorbed than from other food sources. Trace element composition of breast-milk, however, is not affected by the mother's nutritional status.

How does breast-milk protect against infection ?

Diseases and death among breast-fed infants are much lower than those among formula-fed infants. Breast-feeding protects against diarrhoea and upper respiratory tract infections. The bifidus factor in breast-milk promotes the natural gut flora. The gut flora and the low pH of breast-milk inhibit the growth of pathogens. Breast-milk has immunoglobulins (IgA), lactoferrin, lactoperoxidase and complements which protect the infant from several infections. Antibodies to *E-coli* and some viruses are found in breast milk, which protect the gut mucosa. Breast-feeding also protects infants from vulnerability to allergic reactions.

What ensures an adequate supply of breast-milk ?

It is necessary that the woman is emotionally prepared during pregnancy for breast-feeding and is encouraged to eat a well-balanced diet. Anxiety and emotional upset must be avoided and adequate rest should be ensured. It is necessary to prepare the breast, particularly the nipple, for breast-feeding. Mother should initiate breast-feeding as early as possible after delivery and feed the child on demand. Milk production of the mother is determined by the infant's demand. Frequent sucking by the baby and complete emptying of breast are important for sustaining adequate breast milk output. A working mother can express her breast milk and store it hygienically upto 8 hrs. This can be fed to her infant by the caretaker.

Are drugs secreted in breast-milk ?

Since drugs (antibiotics, caffeine, hormones and alcohol) are secreted into the breast-milk and could prove harmful to the breast-fed infant, caution should be exercised by the lactating mother while taking medicines.

Should HIV positive women breast feed their babies?

HIV may be transmitted from mother to infant through breast milk. However, women living in the resource poor settings in developing countries may not have access to safe, hygienic and affordable replacement feeding options. Considering the important role of breast milk in child growth and development, following recommendations have been proposed by National AIDS Control Organization (NACO). When replacement feeding is not acceptable, feasible, affordable, sustainable and safe (AFASS), exclusive breastfeeding is recommended during the first months of life. Every effort should be made to promote exclusive breast-feeding for up to four months in the case of HIV positive mothers followed by weaning, and complete stoppage of breast feeding at six months in order to restrict transmission through breast feeding. However, such mothers will be informed about the risk of transmission of HIV through breast milk and its consequences. In addition, based on the principle of informed choice, HIV infected women should be counseled about the risk of HIV transmission through breast milk and the risks and benefits of each feeding method, with specific guidance in selecting the option most likely to be suitable for their situation. In any case, mixed feeding i.e. breast feeding along with other feeds should be strictly discouraged as it increases the risk of HIV transmission.

POINTS TO PONDER

- **Start breast-feeding within an hour after delivery and do not discard colostrum.**
- **Breast-feed exclusively (not even water) for a minimum of six months if the growth of the infant is adequate.**
- **Continue breast-feeding in addition to nutrient-rich complementary foods (weaning foods), preferably upto 2 years.**
- **Breast-feed the infant frequently and on demand to establish and maintain good milk supply.**
- **Take a nutritionally adequate diet both during pregnancy and lactation.**
- **Avoid tobacco (smoking and chewing), alcohol and drugs during lactation.**
- **Ensure active family support for breast-feeding.**

.4. FOOD SUPPLEMENTS SHOULD BE INTRODUCED FOR INFANTS BY SIX MONTHS

- Breast-milk alone is not adequate for the infant beyond 6 months of age.
- Introduction of food supplements (semi-solid complementary foods) along with breast-feeding is necessary for infants after 6 months of age.
- Provision of adequate and appropriate supplements to young children prevents malnutrition.
- Hygienic practices should be observed while preparing and feeding the complementary food to the child; otherwise, it will lead to diarrhoea.

It is well accepted that breast milk is the best food for an infant. Fortunately, in India, most rural mothers are able to breast-feed their children for prolonged periods. In fact, this is a boon to Indian children as otherwise the prevalence of under-nutrition among them would have been much higher. However, often, children are solely breast-fed even beyond the age of one year in the belief that breast-milk alone is adequate for the child until he/she is able to pick up food and eat. This practice results in under-nutrition among young children. Working mothers, on the other hand, are unable to breast-feed their children for longer periods, as they go to work outside.

What are supplements?

Foods that are regularly fed to the infant, in addition to breast-milk, providing sufficient nutrients are known as supplementary or complementary foods. These could be liquids like milk or semi-solids like *'kheer'* in the case of infants, or solid preparations like rice etc., in the case of children over the age of one year.

Why use supplements and when?

At birth, mother's milk alone is adequate for the infant. Requirements of all the nutrients progressively increase with the infant's growth. Simultaneously, the breast-milk secretion in the mother comes down with time. Thus, infants are deprived of adequate nutrients due to the dual factors of increased nutrient requirements and decreased availability of breast-milk. Usually, these changes occur at about 6 months of age. Hence, promotion of optimal growth in infants, calls for introduction of adequate food supplements in addition to continued breast feeding, from the age of 6 months onwards.

Can home-made recipes be nutritious supplements?

Low-cost food supplements can be prepared at home from commonly used ingredients such as cereals (wheat, rice, *ragi*, jowar, bajra, etc.); pulses (grams/dhals), nuts and oilseeds (groundnut, sesame, etc.), oils (groundnut oil, sesame oil etc.) and sugar and jaggery. Such supplements are easily digested by all infants, including those with severe malnutrition. The impression that only the commercially available supplementary foods are nutritious is not correct. Some examples of low cost complementary foods are given on page 33.

What are the principles in preparing complementary food supplements?

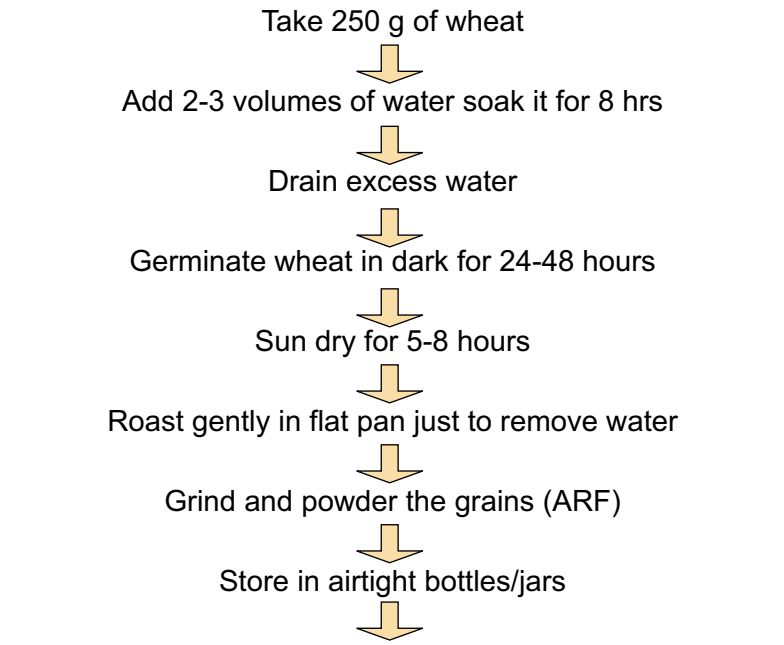
Weaning foods based on cereal-pulse-nut and sugar/jaggery combinations will provide good quality protein, adequate calories and other protective nutrients. Since infants cannot consume bulky complementary food, in sufficient quantities, energy-rich foods like fats and sugars should be included in such preparations. Infants can also be fed green leafy vegetables (GLVs), which are rich, yet inexpensive**,** sources of vitamins and minerals. However, greens should be well cleaned before cooking lest the infants develop loose motions. Dietary fibre in green leafy vegetables can, by itself, promote the bowel movements leading to loose motions in infants. Since GLVs are rich in dietary fibre, it is advisable to initially feed only the juice of the GLVs after cooking them properly. Infants should be introduced to different vegetables and fruits gradually. It should, however, be remembered that these dietary articles should be thoroughly cooked and mashed before feeding. In families which can afford them, egg yolk and meat soup can be introduced. At about one year of age, the child should share the family diet.

Amylase-rich foods

Flours of germinated cereals, which are rich in the enzyme alpha-amylase, constitute Amylase-Rich Foods (ARFs). Even small amounts of this type of foods liquefy and reduce the bulk of the cereal-based diet. Thus, ARFs help in increasing the energy density of weaning gruels and in reducing its bulk as well.

Mothers can add ARF to increase the digestibility of the low-cost weaning foods prepared at home. Preparation of ARF is very simple and can be done by mothers at home.

PREPARATION OF AMYLASE RICH FOOD (ARF)



How to feed a young infant?

Infants cannot eat large quantities of food in one sitting at a given time. So, they should be fed small quantities at frequent intervals (3-4 times a day). Also, the food should be of semi-solid consistency for easy swallowing. When such semi-solid foods are offered initially, the infant tends to spit it out. This should not be mistaken as dislike for that food. The fact is that the young infant cannot achieve full coordination needed for the act of swallowing, and, hence, brings out the food by movements of its tongue. Physiological maturity of swallowing the semi-solid food develops when the food is regularly given every day.

What are the hygienic practices to be adopted?

It is important to ensure that hygienic practices are scrupulously followed. All the dietary ingredients should be thoroughly cleaned. Vegetables should be washed well to remove contaminants/parasites/pesticides before cutting. Vegetables should preferably be steam-cooked to reduce cooking losses. At the time of preparation and feeding of the recipes, mother should observe proper personal hygiene and the utensils used for cooking should be thoroughly washed or sterilized, wherever

possible. A number of pre-cooked and ready-to-eat foods can be prepared for use as complementary foods (Refer page 33). Such foods should be stored in clean bottles or tins. As feeding is likely to be time consuming, the cup or the plate from which the recipe is being fed to the infant should be kept covered to protect it from flies. Most often, diarrhoea is caused by unhygienic practices adopted by mothers. The weaning foods which are properly cleaned and well-cooked are safe even for young infants.

POINTS TO PONDER

- Breast-milk alone is not enough for infants after 6 months of age.
- Complementary food should be given after 6 months of age, in addition to breast-feeding.
- Do not delay complementary feeding.
- Feed low-cost home-made complementary foods.
- Feed complementary food on demand 3-4 times a day.
- Provide fruits and well cooked vegetables.
- Observe hygienic practices while preparing and feeding the complementary food.
- Read nutrition label on baby foods carefully.

What should be done if breast-milk is not adequate?

- If breast-feeding fails, the infant needs to be fed animal milk or commercial infant formula.
- Milk should be boiled before being fed to the baby.
- To start with, milk may be diluted with an equal volume of water.
- Full strength milk may be started from 4 weeks of age.
- Infants fed animal milk should receive supplements of iron and vitamin C.
- About 120-180 ml of milk should be fed with one teaspoon of sugar per feed, 6-8 times over the day.
- While reconstituting the infant formula, the instructions given on the label should be strictly followed.
- The feeds should be prepared and given using a sterile cup, spoon, bottles and nipples, taking utmost care.
- Overfeeding should be avoided in artificially-fed infants to prevent obesity.
- Low-cost home-made complementary foods should be preferred.

COMPLEMENTARY FOODS

1. Kichidi

Rice	...	35 g
Green gram dhal	...	10 g
Leafy vegetables	...	2 t. sp
Fat	...	2 t. sp
Cumin (jeera)		

***Method*:** Clean rice and dhal and cook them in water with salt till the grains are soft and water is absorbed. Leafy vegetables can be added when the cereal/pulse is 3/4th done. Cumin is fried in fat and added towards the end.

2. Malted Ragi Porridge

Malted Ragi	...	30 g
Roasted Groundnut	...	15 g
Jaggery	...	20 g

***Method*:** Malted ragi, roasted groundnuts and jaggery are powdered. Sufficient water is added and cooked.

3. Wheat Payasam

Wheat	...	30 g
Roasted Bengal gram flour	...	15 g
Roasted & crushed Groundnut	...	5 g
Sugar	...	15 g

***Method*:** Roast whole wheat and powder. Add roasted Bengal gram flour, groundnut and sugar. Cook with sufficient water.

4. Kheer

Vermicelli/Rice	...	30 g
Milk	...	100 ml.
Water	...	As required
Jaggery	...	20 g

***Method*:** Boil rice/vermicelli in water till half done. Add milk and bring to boil. Add jaggery and cook well.

Note:
1. All these recipes provide approximately 250 Kcals. and 5 g proteins and amounts given are for 2 servings.
2. Recipes Nos.2 and 3 can be prepared and stored in airtight containers to be used whenever required.
3. Non-vegetarian foods such as soft boiled egg, minced meat may be introduced at the age of 6 months.

5. ADEQUATE AND APPROPRIATE DIET SHOULD BE TAKEN BY CHILDREN AND ADOLESCENTS BOTH IN HEALTH AND DISEASE

- A nutritionally adequate diet is essential for optimal growth and development.
- Appropriate diet and physical activity during childhood is essential for optimum body composition, BMI and to reduce the risk of diet-related chronic diseases in later life and prevent vitamin deficiency.
- Common infections and malnutrition contribute significantly to child morbidity and mortality.
- A child needs to eat more during and after episodes of infections to maintain good nutritional status.

Why do children and adolescents require more food?

Childhood and adolescence are periods of continuous growth and development. An infant grows rapidly, doubling its birth weight by 5 months and tripling it by 1 year of age. During the second year, the child increases not only in height by 7-8 cm but also gains 4 times of its birth weight. During the pre-adolescent period the child grows, on an average, 6-7 cm in height and 1.5 to 3 kg in weight every year and simultaneously development and maturation of various tissues and organs take place (Table 5).

Adolescent period (teenage) is spread almost over a decade. It is characterized by rapid increase in height and weight, hormonal changes, sexual maturation and wide swings in emotion. Adolescent growth spurt starts at about 10-12 years in girls and two years later in boys. The annual peak rates for height and weight are 9-10 cm and 8-10 kg. Development of critical bone mass is essential during this period as this forms the ground for maintaining mineral integrity of the bone in later life. The pattern and proportion of various body components like body water, muscle mass, bone and fat increase during the entire childhood and adolescence to reach adult values by about 18 years. Adolescent girls are at greater physiological stress than boys because of menstruation. Their nutritional needs are of particular importance as they have to prepare for motherhood. All these rapid anabolic changes require more nutrients per unit body weight.

Growing children and adolescents particularly require more calcium. Though recommended dietary allowances for calcium are about 600-800 mg/d only, it is desirable to give higher quantities of calcium for adolescents to achieve high peak bone mass.

Young children below the age of 5 years should be given less bulky foods, rich in energy and protein such as legumes, pulses, nuts, edible oil/ghee, sugar, milk and eggs. Vegetables including green leafy vegetables and locally available seasonal fruits should be part of their daily menu. Snacks make a useful contribution to the nutrient requirements, particularly in older children and adolescents. Frequent changes in the menu are often liked by children.

Older children and adolescents should consume plenty of milk to fulfill the high calcium requirements. Cooking oils/ghee (25-50g) should be consumed. Over-indulgence in fats may be avoided. Excessive salt intake should be avoided particularly by children having a family history of hypertension. Adolescence is the vulnerable stage for developing wrong food habits as well as bad habits like smoking, chewing tobacco or drinking alcohol. These should be avoided. In addition to consumption of a nutritious well balanced diet, appropriate lifestyle practices and involvement in physical activity such as games/sports should be encouraged among children and adolescents. Balanced diet for children and adolescents are given in annexure 4 and adolescent growth standards are given in annexure 5.

How do infections in children lead to malnutrition?

Common childhood infections like diarrhoea, measles and pneumonia occur in association with malnutrition and contribute to about 70% of mortality. Appropriate feeding during infection is essential, which demands a lot of patience from the mother.

During periods of infection, children tend to eat less due to reduced appetite. Many children vomit frequently. Nutrients are also lost in urine and faeces. The unhealthy practice of restricting diet, including breast-feeding, by the mother during any sickness could further aggravate the problem. Hence, extra care is needed in feeding the child appropriately during and after illness to prevent subsequent nutritional deficiencies.

How should a child be fed during illness?

Breast-feeds are often well accepted and tolerated even by sick children and should be continued except in severe gastroenteritis associated with shock. For older children, consuming an adult diet, soft cooked food may be offered at frequent intervals. The quantity of the feeds may be increased, after the illness has subsided, till the original weight is regained.

What should be done during diarrhoea?

Diarrhoea is a common childhood disease which leads to dehydration and sometimes death. The child requires prompt correction of fluid and electrolyte loss using oral rehydration solution (ORS) along with appropriate/adequate feeding.

ORS can be prepared by adding a pinch of salt (between thumb and index finger) and a teaspoon of sugar to a glass of potable water. Home-made fluids such as rice *kanji* or buttermilk with salt can also be used. During infections, children should frequently be given small quantities of fluids by mouth, including plain water. During diarrhoea, feeding should be continued, though this goes against the popular practice. Breast-milk promotes sodium and water transport across the gut and, thus, prevents dehydration and weight loss, in addition to providing other nutrients.

The diet of 1-2 year old children with diarrhoea should provide energy of about 1000 Kcal/day. Calorie-rich, semi-solid, soft diets may be prepared from a variety of cereals and pulses. Sprouted grains are easily digestible and provide good nutrition. Fat and sugar help in reducing the bulk of the diets and make them energy dense. Milk may be mixed with cereal diet to avoid lactose malabsorption. If milk is not tolerated, it may be replaced by an equal volume of curd/yogurt/soymilk. Mashed vegetables may be incorporated in the diet. Feeding becomes easier after the infection subsides. About 6-8 feeds should be given during the day so that the extra food (120-140 Kcal/kg) may be consumed by the child without any difficulty.

How important is the problem of lactose intolerance?

Deficiency of the enzyme lactase leads to lactose intolerance. During acute or chronic diarrhoea, lactose intolerance is a mild and transient problem. This problem can be overcome by reducing the quantity of milk taken at a time or taking milk along with a cereal-pulse meal. There is no need to stop milk in acute diarrhoea. In chronic diarrhoea, some children may develop lactose intolerance. In such children, milk may be stopped temporarily. A diet based on cereals and pulses or chicken and egg white allows the gut to recover and milk can then be slowly introduced. Adequate feeding during and after diarrhoea prevents malnutrition.

POINTS TO PONDER

- **Take extra care in feeding a young child and include soft cooked vegetables and seasonal fruits.**
- **Give plenty of milk and milk products to children and adolescents.**
- **Promote physical activity and appropriate lifestyle practices**
- **Discourage overeating as well as indiscriminate dieting.**

EAT CALCIUM-RICH FOODS

- Calcium is needed for growth and bone development.
- Children require more calcium
- Calcium prevents osteoporosis (thinning of bones).
- Milk, curds and nuts are rich sources of bio-available calcium (Ragi and GLV are also good dietary sources of calcium).
- Regular exercise reduces calcium loss from bones.
- Exposure to sunlight maintains vitamin D status which helps in calcium absorption

DURING ILLNESS

- Never starve the child.
- Feed energy-rich cereal-pulse diets with milk and mashed vegetables.
- Feed small quantities at frequent intervals.
- Continue breast-feeding.
- Give plenty of fluids during illness.
- Use oral rehydration solution to prevent and correct dehydration during diarrhoeal episodes.

Table 5
WHO New Growth Standards
Standard Deviation (SD) Classification: Weight for Age

Boys				AGE Months	Girls			
<-3SD	- 3SD to - 2SD	- 2SD to - 1SD	- 1SD to ≥ MEDIAN		<-3SD	- 3SD to - 2SD	- 2SD to - 1SD	- 1SD to ≥ MEDIAN
2.1	2.5	2.9	3.3	0	2.0	2.4	2.8	3.2
2.9	3.4	3.9	4.5	1	2.7	3.2	3.6	4.2
3.8	4.3	4.9	5.6	2	3.4	3.9	4.5	5.1
4.4	5.0	5.7	6.4	3	4.0	4.5	5.2	5.8
4.9	5.6	6.2	7.0	4	4.4	5.0	5.7	6.4
5.3	6.0	6.7	7.5	5	4.8	5.4	6.1	6.9
5.7	6.4	7.1	7.9	6	5.1	5.7	6.5	7.3
5.9	6.7	7.4	8.3	7	5.3	6.0	6.8	7.6
6.2	6.9	7.7	8.6	8	5.6	6.3	7.0	7.9
6.4	7.1	8.0	8.9	9	5.8	6.5	7.3	8.2
6.6	7.4	8.2	9.2	10	5.9	6.7	7.5	8.5
6.8	7.6	8.4	9.4	11	6.1	6.9	7.7	8.7
6.9	7.7	8.6	9.6	12	6.3	7.0	7.9	8.9
7.1	7.9	8.8	9.9	13	6.4	7.2	8.1	9.2
7.2	8.1	9.0	10.1	14	6.6	7.4	8.3	9.4
7.4	8.3	9.2	10.3	15	6.7	7.6	8.5	9.6
7.5	8.4	9.4	10.5	16	6.9	7.7	8.7	9.8
7.7	8.6	9.6	10.7	17	7.0	7.9	8.9	10.0
7.8	8.8	9.8	10.9	18	7.2	8.1	9.1	10.2
8.0	8.9	10.0	11.1	19	7.3	8.2	9.2	10.4
8.1	9.1	10.1	11.3	20	7.5	8.4	9.4	10.6
8.2	9.2	10.3	11.5	21	7.6	8.6	9.6	10.9
8.4	9.4	10.5	11.8	22	7.8	8.7	9.8	11.1
8.5	9.5	10.7	12.0	23	7.9	8.9	10.0	11.3
8.6	9.7	10.8	12.2	24	8.1	9.0	10.2	11.5
8.8	9.8	11.0	12.4	25	8.2	9.2	10.3	11.7
8.9	10.0	11.2	12.5	26	8.4	9.4	10.5	11.9
9.0	10.1	11.3	12.7	27	8.5	9.5	10.7	12.1
9.1	10.2	11.5	12.9	28	8.6	9.7	10.9	12.3
9.2	10.4	11.7	13.1	29	8.8	9.8	11.1	12.5
9.4	10.5	11.8	13.3	30	8.9	10.0	11.2	12.7
9.5	10.7	12.0	13.5	31	9.0	10.1	11.4	12.9
9.6	10.8	12.1	13.7	32	9.1	10.3	11.6	13.1
9.7	10.9	12.3	13.8	33	9.3	10.4	11.7	13.3
9.8	11.0	12.4	14.0	34	9.4	10.5	11.9	13.5
9.9	11.2	12.6	14.2	35	9.5	10.7	12.0	13.7
10.0	11.3	12.7	14.3	36	9.6	10.8	12.2	13.9

Boys				AGE Months	Girls			
<-3SD	- 3SD to - 2SD	- 2SD to - 1SD	- 1SD to ≥ MEDIAN		<-3SD	- 3SD to - 2SD	- 2SD to - 1SD	- 1SD to ≥ MEDIAN
10.1	11.4	12.9	14.5	37	9.7	10.9	12.4	14.0
10.2	11.5	13.0	14.7	38	9.8	11.1	12.5	14.2
10.3	11.6	13.1	14.8	39	9.9	11.2	12.7	14.4
10.4	11.8	13.3	15.0	40	10.1	11.3	12.8	14.6
10.5	11.9	13.4	15.2	41	10.2	11.5	13.0	14.8
10.6	12.0	13.6	15.3	42	10.3	11.6	13.1	15.0
10.7	12.1	13.7	15.5	43	10.4	11.7	13.3	15.2
10.8	12.2	13.8	15.7	44	10.5	11.8	13.4	15.3
10.9	12.4	14.0	15.8	45	10.6	12.0	13.6	15.5
11.0	12.5	14.1	16.0	46	10.7	12.1	13.7	15.7
11.1	12.6	14.3	16.2	47	10.8	12.2	13.9	15.9
11.2	12.7	14.4	16.3	48	10.9	12.3	14.0	16.1
11.3	12.8	14.5	16.5	49	11.0	12.4	14.2	16.3
11.4	12.9	14.7	16.7	50	11.1	12.6	14.3	16.4
11.5	13.1	14.8	16.8	51	11.2	12.7	14.5	16.6
11.6	13.3	15.0	17.0	52	11.3	12.8	14.6	16.8
11.7	13.3	15.1	17.2	53	11.4	12.9	14.8	17.0
11.8	13.4	15.2	17.3	54	11.5	13.0	14.9	17.2
11.9	13.5	15.4	17.5	55	11.6	13.2	15.1	17.3
12.0	13.6	15.5	17.7	56	11.7	13.3	15.2	17.5
12.1	13.7	15.6	17.8	57	11.8	13.4	15.3	17.7
12.2	13.8	15.8	18.0	58	11.9	13.5	15.5	17.9
12.3	14.0	15.9	18.2	59	12.0	13.6	15.6	18.0
12.4	14.1	16.0	18.3	60	12.1	13.7	15.8	18.2

Source: WHO child growth standards length/height for age weight for age, weight for length/height and body mass index for age. Methods and development. WHO, Geneva 2006

6. GREEN LEAFY VEGETABLES, OTHER VEGETABLES AND FRUITS SHOULD BE USED IN PLENTY

- Normal diet, to be wholesome and tasty, should include fresh vegetables and fruits, which are store houses of micronutrients
- Vegetables/fruits are rich sources of micronutrients.
- Fruits and vegetables also provide phytonutrients and fibre which are of vital health significance
- They help in prevention of micronutrient malnutrition and certain chronic diseases such as cardiovascular diseases, cataract and cancer.
- Fresh fruits are nutritionally superior to fruit juices.

Why should we eat vegetables/fruits ?

Fresh Vegetables and fruits are rich sources of micronutrients and macronutrients (Annexure 2). The micronutrients present are minerals (like iron and calcium) and vitamins (like vitamin C, folic acid, B complex vitamins and carotenoids) whereas, the macronutrients present are complex carbohydrates/ fibre. They contain abundant amounts of iron, calcium, vitamin C, folic acid, carotenoids (precursors of vitamin A) and phytochemicals. Some vegetables and fruits provide very low calories (Annexure 6), whereas some others such as potato, sweet potato, tapioca and yam as well as fruits like banana are rich in starch which provide energy in good amount. Therefore, vegetables and fruits can be used to increase or decrease calories in our diet.

What functions do these nutrients and special factors in vegetables/fruits perform in our body?

Iron

Iron is an essential element necessary for the formation of haemoglobin, the red pigment present in the red cells of blood. Haemoglobin plays an important role in the transport of oxygen to the tissues. Reduction in haemoglobin in blood leads to anaemia, a condition characterised by paleness and easy fatigue and increased susceptibility to infections. Iron is available in plenty in green leafy vegetables. But the absorption of iron is limited. Vitamin C rich foods must be consumed daily to improve iron absorption.

Vitamin A

This fat-soluble vitamin is necessary for clear vision in dim light, and for maintaining the integrity of epithelial tissues. In vitamin A deficiency, the white of the eye (conjunctiva) loses its lustre and becomes dry. In severe vitamin A deficiency, the black area of the eye (cornea) gets necrosed, leading to irreversible blindness in young children. Vitamin A also has a role in maintaining resistance of the body to common infections. Carotenoids are plentiful in fruits and vegetables that are green or deep yellow/orange in colour, such as green leafy vegetables, carrots, tomatoes, sweet potatoes, papaya, mango etc.

Vitamin C

Vitamin C is an essential nutrient required for healthy bones and teeth. It also promotes iron absorption. Vitamin C deficiency is characterised by weakness, bleeding gums and defective bone growth. Vitamin C is abundantly available in fresh amla, citrus fruits, guava, banana and certain vegetables such as tomatoes. However, it is very susceptible to destruction by atmospheric oxidation. It is for this reason that when vegetables become dry and stale or cut and exposed to air most of the vitamin C originally present in destroyed.

Folic acid

Folic acid is a haemopoietic vitamin essential for multiplication and maturation of red cells in our body. It's deficiency leads to megaloblastic anaemias. Folic acid intake during pregnancy protects the foetus from developing certain congenital defects. It also promotes the birth weight of infants. Folic acid deficiency increases homocysteine levels in blood, thereby increasing the risk for heart disease. Green leafy vegetables, legumes, nuts and liver are good sources of folates.

Calories

Many of the vegetables and fruits have low calories (Annexure 7). Large intake of low calorie vegetables and fruits can help in reducing calories in diet and help in obesity management. On the other hand vegetables like colocasia, potato, tapioca, yam, sweet potato and fruits like banana, avocado pear (215 Kcal) and mahua (111 Kcal) have more than 100 kcal per 100gram (Annexure 7).

Phytonutrients

Vegetables provide phytochemicals and considerable health significance to the human body. Among these, dietary fibre, antioxidants, and other bio-active constituents require special mention. These special factors are required for delaying

ageing and preventing the processes which lead to diseases such as cataract, cardio-vascular diseases, diabetes and cancer.

Dietary Fibre

Dietary fibre delays the intestinal transit of the food consumed. Dietary fibre is important for proper bowel function, to reduce chronic constipation, diverticular disease, haemorrhoids coronary heart diseases, diabetes and obesity. They also reduce plasma cholesterol. The protective role of dietary fibre against colon cancer has long been recognised.

Antioxidants

In the recent past, the role of vegetables and fruits as sources of antioxidants has been receiving considerable attention. Antioxidants restrict the damage that reactive oxygen free radicals can cause to the cell and cellular components. They are of primary biological value in giving protection from certain diseases. Some of the diseases that have their origin in deleterious free radical reactions are atherosclerosis, cancer, inflammatory joint diseases, asthma, diabetes etc. Raw and fresh vegetables like green leafy vegetables, carrots, fresh fruits including citrus and tomatoes have been identified as good sources of antioxidants (free radical-scavengers). The nutrients vitamin C and carotenoids that are present in these vegetables are also potential antioxidants. Different coloured vegetable provide different antioxidants like orange coloured provides β-carotene, red provide lycopene, deep red provides betalines, blue and purple provide anthocynins.

How much should we consume?

The Expert Committee of the Indian Council of Medical Research, taking into consideration the nutrient requirements, has recommended that every individual should consume at least 300 g of vegetables (GLV : 50 g; Other vegetables : 200 g; Roots & Tubers : 50 g) in a day. In addition, fresh fruits (100 g), should be consumed regularly. Since requirements of iron and folic acid are higher for pregnant women they should consume 100g of leafy vegetables daily. High calorie vegetables and fruits to be restricted for over weight/ obese subjects.

Which vegetables and fruits should be consumed ?

We should consume fresh, locally available and preferably seasonal vegetables and fruits. They have more micronutrients and are tasty. However, no single fruit or vegetable provides all the nutrients you need. The key lies in eating a variety of them and with different colours. Include commonly consumed leafy greens, tomatoes and other vegetables, apart from those which are yellow, orange, red, deep red, purple coloured citrus fruits, being vitamin C-rich enrich the diets significantly. Along with these, try selecting some new vegetables and fruits to your meals.

How to prevent cooking losses ?

Vitamins are lost during washing of cut vegetables and cooking of foodstuffs. However, proper methods of cooking can substantially reduce these losses (Annexure 8). Nutrient loss is high when the vegetables are washed after cutting or when they are cut into small pieces for cooking. Consumption of properly washed raw and fresh vegetables is always beneficial.

How do we get these foods?

Green leafy vegetables (GLVs), other vegetables and fruits are easily available. Most vegetables, particularly GLVs are inexpensive. In fact, these foods can be grown in the backyard with very little effort and cost. Even in lean seasons like summer, they can be grown using water and waste from kitchen.

How to accommodate more servings of vegetables and fruits in a day?

To get the maximum nutritional benefits from fruits and vegetables, it is important to find ways to eat more servings of vegetables and fruits per day. Few tips are given below to include more fruits and vegetables in the diets.

POINTS TO PONDER

- **Include green leafy vegetables in daily diet.**
- **Eat as much of other vegetables as possible daily.**
- **Eat vegetables/ fruits in all your meals in various forms (curry, soups, mixed with curd, added to pulse preparations and rice)**
- **Consume raw and fresh vegetables as salads.**
- **Grow the family's requirements of vegetables in the kitchen garden if possible.**
- **Green leafy vegetables, when properly cleaned and cooked, are safe even for infants.**
- **Let different varieties of vegetables and fruits add colour to your plate and vitality to your life.**
- **Beta carotene rich foods like dark green, yellow and orange colored vegetables and fruits (GLVs, carrots, papaya and mangoes) protect from vitamin A deficiency.**

7. COOKING OILS AND ANIMAL FOODS SHOULD BE USED IN MODERATION AND VANASPATI/ GHEE/ BUTTER SHOULD BE USED SPARINGLY

- ★ Fats/oils have high energy value and induce satiety.
- ★ Fats provide energy, essential fatty acids and promote absorption of fat-soluble vitamins.
- ★ Fats are precursors of biologically-active compounds in the body.
- ★ Diets that provide excess of calories, fats and cholesterol elevate blood lipids (cholesterol and triglycerides) and promote blood clotting.
- ★ Excessive fat in the diet increases the risk of obesity, heart disease, stroke and cancer.
- ★ Ill effects of excess dietary fats are initiated early in life.

Why do we need fats?

Cooking oils (liquid) and solid fats together are referred to as fats. Fats contribute to texture, flavour and taste and increase the palatability of the diet. Fats are essential for meeting some of the nutritional needs like essential fatty acids (linoleic n-6 and α-linolenic n-3) and serve as rich sources of energy. Therefore, fats should be consumed, in moderation. However, for the growth of young children high-calorific diets are required. This is achieved by inclusion of adequate amounts of fat (1gm fat = 9Kcals) in their diets as they cannot consume large quantities of bulky cereal - pulse based diets.

Fats also promote the absorption of the four fat-soluble vitamins (A,D,E and K), impart a feeling of fullness and satisfaction and thus, delay the onset of hunger.

Along with proteins, fats constitute major components of body fluids and cell membranes. The two essential fatty acids namely, linoleic (n-6) and α-linolenic acid (n-3) (important dietary polyunsaturated fatty acids) are metabolized at various sites in the body to generate a group of biologically-active compounds, which perform several important physiological functions.

What are the sources of fat ?

Dietary fats can be derived from plant and animal sources. Fats that are used as such at the table or during cooking (vegetable oils, vanaspati, butter and ghee)

are termed as “visible” fats. Fats that are present as an integral components of various foods are referred to as “invisible” fat. Fats, in processed and ready to eat foods are known as hidden fats. Cereals contain only 2-3% of invisible fat. However, their contribution to overall fat intake is significant as they contribute to bulk of our Indian diets. The small amounts of invisible fat present in various foods add up to a substantial level in our daily diet (about 15 g in rural population and 30g among urban middle-income and high-income groups). Most animal foods provide high amounts of invisible fat.

How much visible fat do we need ?

The total fat (visible + invisible) in the diet should provide between 15-30% of total calories. The visible fat intake in the diets can go upto 50g/person/day based on the level of physical activity and physiological status. Adults with sedentary lifestyle should consume about 25 g of visible fat, while individuals involved in hard physical work require 30-40g of visible fat. Visible fat intake should be increased during pregnancy and lactation to 30g. The higher fat and EFA requirements during pregnancy and lactation are to meet the requirements of foetus and young infants, in view of their crucial role in physical and neuronal growth and development. Diets of young children and adolescents should contain about 30-50g/day. However, ingestion of too much fat is not conducive to good health.

What are the chemical components of fat ?

Fatty acids: All fats in foods provide mixtures of three types of fatty acids, which are the “building blocks” of fats. Fatty acids are the primary constituents of all dietary fats. Based on their chemical nature, the fatty acids are broadly grouped as saturated, monounsaturated and polyunsaturated. There are several fatty acids in each group. Fats from coconut oil, *vanaspati*, animal fats (ghee and butter) and animal foods like milk, milk products and meat provide saturated fatty acids. The short and medium chain saturated fatty acids present in ghee, butter and coconut oil

are easily digested and absorbed and are therefore, good for infants and young children. However, high intake of saturated fatty acids increases atherogenic risk and their intake should be limited in adults. Oils from sources such as palm, groundnut, cottonseed, sesame and olive are rich in monounsaturated fattyacids as compared to other oils. Linoleic (n-6) and α-linolenic (n-3) acids are the simple PUFA which are present only in plant foods (Table 6). All vegetable oils (except coconut) are good sources of linoleic(n-6) acid. Soyabean, rapeseed and mustard oils are the only vegetable oils which contribute significant proportion of α-linolenic (n-3) acid. Legumes/pulses mustard and fenugreek seeds and green leafy vegetables are also good sources of α-linolenic (n-3) acid (Table 7). On the other hand, fish and fish oils provide long chain n-3 fatty acids which are biologically more - active than α-linolenic (n-3) acid present in plant foods.

Table - 6
Major Types of Fatty Acids in Fats and Oils

<table>
<tr><th>SATURATED</th><th>MONO-UNSATURATED</th><th colspan="3">POLYUNSATURATED</th></tr>
<tr><td rowspan="4">Coconut
Palm kernel
Ghee/butter
Vanaspati</td><td rowspan="4">Red palm oil
Palmolein
Groundnut
Ricebran
Sesame</td><td colspan="2">LINOLEIC (n-6)</td><td>α –LINOLENIC (n-3)</td></tr>
<tr><td>Low</td><td>Red palm oil
Palmolein</td><td rowspan="3">Rapeseed, Mustard
Soyabean</td></tr>
<tr><td>Moderate</td><td>Groundnut, Ricebran
Sesame</td></tr>
<tr><td>High</td><td>Safflower,Sunflower
Cottonseed, Corn,
Soyabean</td></tr>
</table>

Dietary fats also contain minor components such as tocopherols, tocotrienols, sterols etc. The natural flavour of fats/oils is largely due to these minor components. Since most of the minor components are antioxidants, they prevent fats from going rancid. Tocotrienols in palm oil, lignans in sesame oil and oryzanol and tocotrienols in rice-bran oil reduce blood cholesterol. Refining of oils, though does not alter their fatty acid composition, modifies the composition of minor components; for example, carotenes are lost during refining of crude palm oil.

***Cholesterol*:** Cholesterol is present only in foods of animal origin such as milk, meat, shrimp and prawn, but not in plant foods. Vegetable oils do not contain cholesterol. Egg yolk, and organ meats such as liver, kidney and brain contain very high amounts of cholesterol. Cholesterol is found in all body cells and plays a key role in the formation of brain, nerve tissue and is a pre-cursor for some hormones and vitamin D. It is synthesized in the body and hence it is not an essential dietary component.

Table – 7
Quantities of foods required to furnish 0.1 g ALA

Foods	Gram
Cereal/Millet	
Wheat & Pearl millet (bajra)	70
Pulses	
Blackgram (kala chana), kidney beans (rajmah) & cowpea (lobia)	20
Other pulses	60
Vegetables	
Green leafy	60
Other Vegetables	400
Fruits	400
Spices	
Fenugreek seed (methi)	5
Mustard (sarson)	1
Unconventional	
Flaxseed (alsi)	0.5
Perilla seeds (Bhanjira)	0.3

Higher dietary cholesterol increases blood cholesterol. The blood cholesterol-elevating effect of dietary saturated fats increases, when cholesterol consumption is high. Therefore, cholesterol intake should be maintained below 200 mg/day. One can reduce both saturated fat and cholesterol intake by limiting the consumption of high-fat animal foods like butter, ghee, meat, egg and organ meats and consuming low fat (skimmed) milk instead of whole milk. However, consumption of eggs (3 eggs/ week) is recommended in view of several nutritional advantages.

What are the physiological/health implications of different fats/fatty acids ?

Saturated fatty acids are known to increase serum total and LDL cholesterol levels, reduce insulin sensitivity and enhance thrombogenicity and increase CVD risk. Therefore, SFA intake should not exceed 8-10% of total energy. Milk consumption should be encouraged as it provides calcium for bone health. However, consumption of butter and cheese should be limited. PUFAs are essential components of cell membranes. While n-6 PUFAs are predominant in all cells, the nerve tissue has high levels of long chain n-3 PUFA. An appropriate balance of the these two classes of PUFAs, namely, linoleic and α-linolenic acids in the diets is essential for the functioning of vascular, immune, nervous and renal systems and for early human development. Further, PUFAs reduce total and HDL cholesterol influence peripheral glucose utilization, insulin action and decrease adiposity and

hence are anti-atherogenic. The lipid lowering and other physiological effects of individual members of the PUFAs vary widely. As compared to linoleic acid, α-linolenic (n-3) acid is more beneficial for prevention of inflammation and accumulation of fatty material in blood vessels (altheroscleros) and clotting of blood (thrombosis). The long chain n-3 PUFA of fish oils have greater antialherogenic, antithrombotic and anti-inflammatory effects than α-linolenic (n-3) acid of plant foods. It is important to consume more ALA and long chain n-3 PUFA.

The intake of PUFA should be 8-10% of energy intake. The remaining 8-10% of fat calories can be derived from mono-unsaturated fatty acids, which also help in maintaining plasma cholesterol. Excessive use of highly unsaturated fats should be avoided. Further, to get a good proportion of all the classes of fatty acids, it is advisable to consume more than one type of vegetable oils.

Fats/ lipids (triglycerides, cholesterol and phospholipids) are transported in blood in combination with proteins in the form of 'lipoproteins'. The low density lipoproteins (LDL) transport cholesterol from liver to various tissues. High blood levels of LDL cholesterol ('bad' cholesterol) result in accumulation of lipids in the cells (atherogenic effect). High density lipoproteins (HDL) ('good' cholesterol) scavenge excess cholesterol from the tissues to the liver for degradation, and are therefore, anti-atherogenic.

Choice of cooking oils

In view of the above, an ideal quality fat for good health is one which maintains a balance so as to give a ratio of polyunsaturated/ saturated (PUFA/SFA) of 0.8-1.0, and linoleic/ α-linolenic (n-6/n-3) of 5-10 in the total diet. For ensuring this appropriate balance of fatty acids in cereal-based diets, it is necessary to increase the α-linolenic acid intake and reduce the quantity of linoleic acid obtained from the cooking oil. Hence, the choice of cooking oil should be as follows:

Groundnut/Seasame/Rice bran + Mustard	Sunflower / Safflower + Palmolein / Olive
Groundnut/Seasame/Rice bran + Canola	Safflower / Sunflower + Groundnut /Seasame/ Rice bran
Groundnut/Seasame/Rice bran + Soyabean	
Palmolein + Soyabean	
Safflower/ Sunflower + Palmolein + Mustard	

Use of more than one source of fat/oil has the added advantage of providing a variety of minor components in the diet. An additional way of increasing α-linolenic (n-3) acid intake is to ensure regular consumption of foods rich in α-linolenic (n-3) acid (Table 6). Non-vegetarians have an advantage of eating fish, which provides preformed long chain n-3 PUFA. Ideally, part of visible fat and/or invisible fat from animal foods may be substituted by whole nuts and legumes with good proportion of α-linolenic (n-3) acid, which are also good sources of protein, fiber, vitamins and minerals (ALA content of foods is given in annexure 9).

The plant oils in addition contain certain useful substances such as lignans (sesame oil), sterols, tocopherols (vitamin E) oryzanole (rice bran oil), carotenoids - all of which reduce cholesterol and repair oxidant damage due to ageing, inflamation which occur in chronic diseases.

What about *vanaspati*?

Vanaspati is prepared by hydrogenation of vegetable oils. During hydrogenation, the liquid oils become solid because the mono- and polyunsaturated fatty acids are converted, into saturated fatty acids and isomers called *trans* fatty acids. *Vanaspati* is used as a substitute for ghee in cooking medium and the preparation of bakery products, sweets and snack foods. Since saturated fats are resistant to oxidation, foods prepared in *vanaspati* keep fresh for a longer period. Current evidence indicates that saturated fatty acids and a high intake of trans fatty acids may increase the risk of heart disease. Therefore, it is essential to limit the intake of *vanaspati*. The intake of trans fatty acids should not exceed 2% of energy intake.

POINTS TO PONDER

- **Take just enough fat.**
- **Substitute part of visible fat and invisible fat from animal foods with whole nuts.**
- **Moderate the use of animal foods containing high fat, SFA and cholesterol.**
- **Limit the use of ghee, butter and especially vanaspati as a cooking oil.**
- **Choose low- fat dairy foods in place of regular whole fat.**
- **Eat foods rich in α-linolenic (n-3) acid like legumes, green leafy vegetables, fenugreek and mustard seeds.**
- **Eat fish more frequently (at least 100-200g fish/week prefer it over meat and poultry and limit/avoid organ meats (liver, kidney, brain etc)).**
- **Egg has several important nutrients but is high in cholesterol. Limit the consumption to 3 eggs/week. However, egg white may be consumed in good amounts.**
- **Minimize consumption of premixed ready- to- eat fast foods, bakery foods and processed foods prepared in hydrogenated fat.**
- **Use of re-heated fats and oils should be avoided.**
- **Consume variety of foods and maintain moderation to get good proportions of all fatty acids and derive optimal health benefits.**

8. OVER EATING SHOULD BE AVOIDED TO PREVENT OVERWEIGHT AND OBESITY

- A dramatic increase in the prevalence of overweight and obesity among all the age groups has occurred in last 2-3 decades.
- About 30-50% of adult Indians are either overweight or obese.
- Overweight and obese individuals are at a enhanced risk of co-morbidities including type2 diabetes, fatty liver disease, gallstones, high blood cholesterol and triglycerides, orthopedic disorders (arthritis), hypertension and other cardiovascular diseases, certain cancers and psycho-social problems.
- The imbalance between the energy intake and energy out put leads to excess accumulation of fat in various parts of the body.

What is desirable or ideal body weight or body mass index?

There is no clear definition of a desirable or ideal body weight. Ideal body weights are taken as the weight for height of insured persons with a long life span. Desirable body weights are weight for height of young adults at their best physical performance. A much simpler and more acceptable measure is the ratio of weight and height, which estimates total body mass and correlates highly with the amount of body fat. The most commonly used ratio is the body mass index or BMI. It is computed by dividing the weight in kilograms by the square of the height in meters [BMI = weight (kg) ÷ Height (M) 2]. The ideal ranges of weights for a given height are as provided by WHO (annexure 5), which is useful for categorizing persons as normal (ideal), undernourished and overweight or obese.

What is obesity?

Definition of obesity is based on the degree of excess fat. Normal (ideal) BMI ranges between 18.5 and 25. An average BMI of a population should be between 21 or 22. BMI less than 18.5 denotes chronic undernutrition while 25-30, is considered overweight and above 30 indicates obesity. Ideally, individuals should maintain BMI between 21 and 22 and should never exceed 25. More than a general accumulation, the distribution of fat around the abdomen (male type obesity) is now considered to be more harmful than fat around the hips (female type obesity).

There is increasing evidence suggesting that the cut-off values for defining obesity used in the Western countries cannot be readily applied to Asians, who often have smaller body frames than Caucasians. Studies have also been suggesting that

a BMI of 23 kg/m^2 and 27 kg/m^2 as the cut-off values to define overweight and obesity respectively for Asian Indians.

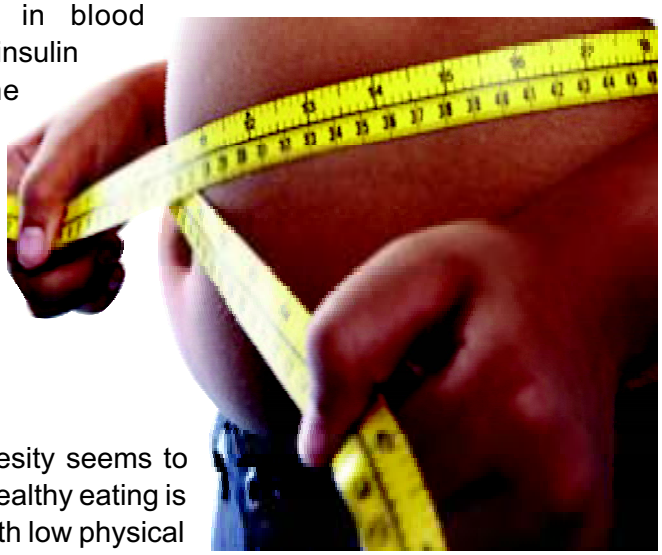
The definition of overweight and obesity for Children and Adolescent is different. Because children and adolescent are in growth transition, age of maturation is different for boys and girls, and growth velocity is different from age to age and gender. Therefore, to capture these variations in the definition of overweight and obesity BMI age and sex specific centiles are used. If the BMI is <5th centile is undernutrition, and ≥5th and <85th centiles, normal, and if it is ≥85th and <95th centile indicates overweight more than 95th centile is considered as obesity.

Central obesity

The waist circumference and waist to hip ratios are useful for estimation of central obesity. Several studies have shown that the central obesity was directly correlated with chronic degenerative diseases, especially, metabolic syndrome. A ratio of more than 0.9 among men and more than 0.8 in women is associated with increased risk of several chronic diseases in Asian Indians. The waist circumference cut off levels for Asian Indians are 80 cm for women and 90 cm for men.

Why should we avoid obesity?

There are several health consequences of obesity. Excessive body weight increases the risk of heart disease, hypertension, diabetes, gallstones, a few cancers and arthritis. Obesity invariably predisposes to reduced levels of high density lipoproteins ('good' cholesterol) and to increased levels of low density lipoproteins ('bad' cholesterol), and triglycerides, besides an abnormal increase in glucose and insulin levels in blood following an oral glucose load (insulin resistance). Considering the increasing prevalence of coronary artery disease, hypertension and diabetes in urban India, it is important to maintain desirable body weight for height and avoid obesity.



What causes obesity ?

The tendency of family obesity seems to be inherited. Eating junk or unhealthy eating is one of the important causes, with low physical

activity being a main contributor. Complex behavioural and psychological factors influence the eating pattern. In addition, metabolic errors in energy utilization may favour fat accumulation. Insulin is an important modifier of energy and fat metabolism favouring fat deposition. Low and high birth weight (<2500 g and > 3500 g), obesity during childhood and adolescence are likely to result in obesity in adults. It is necessary to maintain a desirable body weight by consuming just enough calories or adjust physical activity to maintain energy balance (intake = output). Body weights must, therefore, be checked and monitored periodically.

Several studies have suggested that hours spent in watching television is strongly associated with weight gain in childhood and adolescents, although whether this is due to the concomitant sedentary behaviour, or a tendency to consume snack foods while watching television, or the effects on dietary behaviour of the advertising of energy-dense foods during television programmes, is not clear. There have been no trials of the effects of removing local fast food outlets, or the provision of safe cycling schemes for children, in terms of reducing the prevalence or risk of obesity.

The school is only one of the many environments, in which children may be exposed to 'obesogens', to the external influences that encourage weight gain. Family customs and practices will have a strong influence on a child's food preferences and activity patterns, and as the child grows older he or she may experience social pressure from peers to purchase certain foods, or to undertake sedentary activities. Beyond these local influences, food advertising and labelling policies, road transport and a range of other factors will also contribute to the list of potential obesogens.

Adults usually tend to gain weight between the ages of 25-50 years. In women, obesity develops just around pregnancy and after menopause. Over-feeding during infancy, childhood and adolescence predisposes to overweight/obesity during adulthood. Physical activity and the basal metabolic rate (BMR) decrease with age and, hence, fat accumulation increases as age advances if energy intake is not suitably regulated.

How to reduce body weight?

There is no single dietary regimen for weight reduction; it has to be individualized. Weight losing regimens should be gradual. Weight reduction diets should contain at least 1000 Kcal/day and provide all nutrient requirements, except excess energy. Loss of half a kilogram per week is generally considered safe. Extreme approaches should be avoided and use of drugs may be dangerous. In children, obesity should be controlled by increasing physical activity rather than

restricting food intake. Modifications in dietary habits have to be incorporated into one's lifestyle along with adequate exercise to keep the body weight within the normal limits.

As fat contains more than twice the calories (9Kcal) per gram of either protein(4Kcal) or carbohydrate(4Kcal), weight reducing diets should limit the fat intake. Refined sugars and alcohol provide empty calories(7Kcal) and should be avoided. Plant foods that provide complex carbohydrates and fibre may be preferred as they reduce blood glucose, cholesterol and triglycerides. Weight-reducing diets must be rich in proteins and low in carbohydrates and fats. Consumption of plenty of fruits and vegetables would not only result in satiety but could also help to maintain adequate micronutrient intake. Frequent fasting/semi-fasting (cyclic weight reduction) followed by adequate or excess food consumption will also aggravate the problem of weight gain. All reducing regimens should be monitored by a doctor and a dietitian. Sample meal plan for adult man/woman are given in annexure 10a & 10b.

POINTS TO PONDER

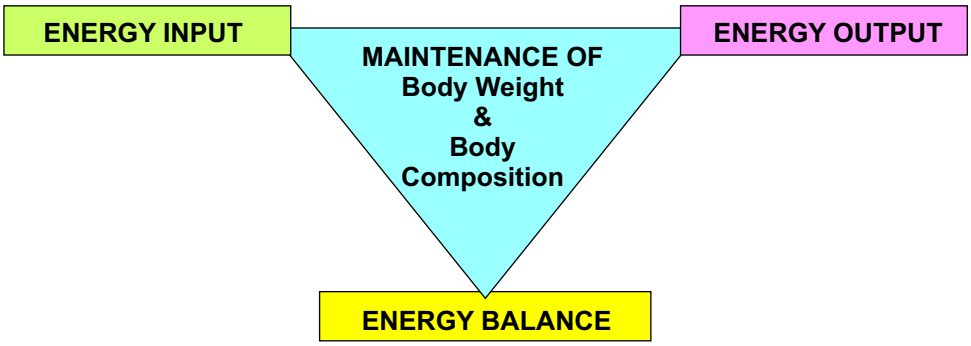
- ✯ Slow and steady reduction in body weight is advised.
- ✯ Severe fasting may lead to health hazards.
- ✯ Achieve energy balance and appropriate weight for height
- ✯ Encourage physical activity
- ✯ Eat small meals regularly at frequent intervals.
- ✯ Cut down on sugar, salt, fatty foods and alcohol.
- ✯ Promote complex carbohydrates and fibre rich diets
- ✯ Increase consumption of fruits and vegetables, legumes, whole grains and nuts.
- ✯ Limit energy intake from total fat and shift fat consumption from saturated to unsaturated
- ✯ Eliminate the use of trans-fatty acids rich *vanaspati in* foods (bakery products and sweets).
- ✯ Use low- fat milk.

TIPS FOR GOOD HEALTH

- Exercise regularly.
- Avoid smoking, chewing of tobacco and tobacco products (Khaini, Zarda, Paan masala) and consumption of alcohol.
- Check regularly for blood sugar, lipids and blood pressure after the age of 30 years at least every 6 months.
- Avoid self medication.
- Adopt stress management techniques (Yoga and Meditation).

9. BE PHYSICALLY ACTIVE TO MAINTAIN DESIRABLE BODY WEIGHT

- Physical activity of moderate intensity has been recommended for health and well-being since the time of Hippocrates (460–370 BC).
- Physical activity is essential to maintain ideal body weight by burning excess calories and is of vital significance for health and prevention of diseases.
- Consistent epidemiological evidences identify that physical activity is a major modifiable risk factor in reduction of non-communicable chronic diseases.
- Physical activity is essential for the reduction of morbidity and mortality due to several chronic diseases and may reduce the risk of falls and injuries in the elderly.
- Public awareness of the benefits of physical activity to improve health is a major public health challenge.
- Exercise is a prescriptive medicine.
- Move your body as much as you can



How much of physical exercise is needed?

It is recommended to carry out at least 45 minutes of physical activity of moderate-intensity for at least 5 days in a week. This amount of physical activity may reduce the risk of some chronic diseases. To lose weight, experts recommend that at least 60 minutes of moderate- to vigorous-intensity physical activity be taken on

most days of the week. In addition, one should follow a nutritious eating plan and consume fewer calories. Therefore, it is essential to remember that the body weight is affected by the balance of "calories-consumed" and "calories-burned." Those, who are on low calorie diets for body weight reduction should have moderate to vigorous intensity physical activities at least for 60-90 minutes daily. Physical activity is essential for successful long-term weight management and will depend on current BMI and health condition (Annexure 11).

Levels of Physical Activity:

There are two basic levels of physical activity.

***Moderate*:** This includes walking briskly (about 3½ miles per hour), climbing, gardening/yard work, dancing, walking short distances for fetching milk and vegetables, bicycling (less than 10 miles per hour), and weight training (a general light workout), yogasanas and pranayama, playing with children.

***Vigorous*:** Examples are running/jogging (5 miles per hour), bicycling (more than 10 miles per hour), swimming (freestyle laps), aerobics, brisk walking (4½ miles per hour), weight lifting (vigorous effort), competitive sports, and heavy yard work, such as digging, cutting wood.

The approximate energy costs of various physical activities in different intensities for a 60-kg person are given in annexure-11.

If a physical activity does not increase the heart rate, it is not intense enough to be counted in the category of "45 minutes of exercise a day". Activities that do not increase the heart rate include walking at a casual pace, grocery shopping, and doing light household chores.

Types of physical activities

These activities are very beneficial to health.

Aerobic Activities:

These speed your heart rate and breathing while improving heart and lung fitness. Examples: brisk walking, jogging and swimming.

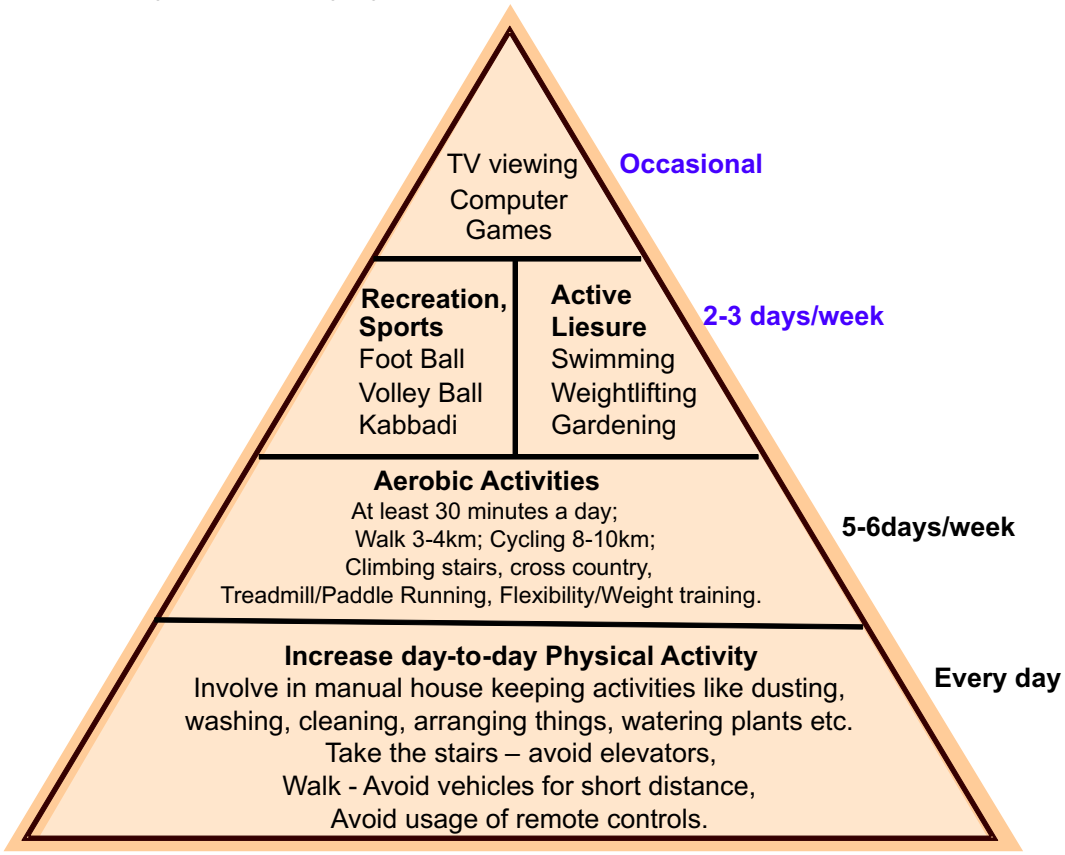
Resistance, Strength Building, and Weight-Bearing Activities:

These help build and maintain bones and muscles by working them against gravity. Lifting weights, carrying a child, and walking are a few examples.

Balance and Stretching Activities:

Dancing, gentle stretching, yoga, martial arts, and Tai chi reduce risk of injuries by improving physical stability and flexibility.

General Physical Activity Pyramid



Health Benefits of Physical Activity

- Controls body weight and composition.
- Reduces the risk of chronic diseases, such as Type-2 diabetes, high blood pressure, heart disease, osteoporosis, arthritis and some cancers.
- Increases the level of HDL (good cholesterol).
- Builds strong muscles, bones and joints.
- Improves flexibility.
- Wards off depression.
- Improves mood, sense of well-being and self esteem.

Regard movement as an opportunity not an inconvenience

Children and teenagers need at least 60 minutes of physical activity every day. In the case of pregnant women 30 minutes or more of moderate-intensity physical activity every day is recommended. However, it should be undertaken in consultation with her physician. Like all adults, geriatric population would also be benefitted considerably by physical activity, which will help in the reduction of functional impairment and improve lean body mass.

Before Beginning an Exercise Program: Most adults do not need a doctor's check-up before exercising at a moderate level. Exceptions include people with heart disease, high blood pressure, diabetes, asthma, osteoporosis and obesity. Men over 40 and women over 50 should see their doctor or health care provider before starting a vigorous physical activity program.

POINTS TO PONDER

- A minimum 30-45 minutes brisk walk/physical activity of modern intensity improves overall health.
- Include 'warm-up' and 'cool- down' periods, before and after exercise regimen.
- Forty five minutes per day of moderate intensity physical activity provides many health benefits.

10. SALT SHOULD BE USED IN MODERATION

- Sodium is the major electrolyte in the extra-cellular fluid.
- Sodium plays an important role in nerve conduction and fluid balance in the body.
- Maintenance of sodium balance depends on kidney function.
- High intake of salt (sodium chloride) is associated with high blood pressure and stomach cancer.
- All foods contain sodium. Sodium requirements can be met with moderate salt intake.
- Sodium intake needs to be balanced by potassium intake.

Salt is an essential ingredient of food and enhances its taste and flavour. From time immemorial, it has been used as a preservative. All food substances contain sodium, but added salt (sodium 40%, chloride 60%) is the major source of sodium in our diet. Sodium is primarily involved in the maintenance of water balance and equilibrium. It also plays an important role in electro-physiological functions of the cell. Humans have powerful in-built mechanisms for maintaining blood pressure even on minimal sodium intake.

Sodium is rapidly absorbed from the gastrointestinal tract and a positive balance is achieved on intakes just above minimal requirements. Sodium requirements depend on its losses through urine, faeces and sweat. The sweat loss varies according to climatic conditions. High ambient temperatures and vigorous physical exercise increase sodium loss through sweat. Even after 6 hours of hard physical labour, which may generate 3 litres of sweat, the requirement of sodium chloride may not be more than 8 g/day.

Sources of sodium

Sodium content in natural diets, in general, will be about 300-400 mg a day. Cereals, pulses, vegetables, milk, animal and sea foods are the major sources of sodium. Indian data indicate that daily salt consumption ranges from less than 5 g to 30 g in different States with almost 40% of families consuming about 10 g. Since

the taste for salt is an acquired habit, salt consumption should be restricted from an early age.

Preserved foods such as pickles, sun dried foods such as papads and sauces/ ketchups, and canned foods contribute to higher intakes of salt.

What are the health problems associated with excessive salt/sodium intake?

There is a strong association between salt intake and blood pressure. Prevalence of hypertension is low in populations consuming less than 3 g salt per day. The usual increase in blood pressure with age is also not seen with such intakes. The amount of salt consumed is reflected in urinary sodium. Drastic restriction of dietary salt decreases the risk of hypertension. However, this effect is not uniform as only 20-30% of population are salt sensitive. Potassium-rich foods such as fresh vegetables and fruits decrease blood pressure. In fact, it is the ratio of sodium to potassium in the diet which is important. Salt intakes higher than 8 g have been identified as a risk factor for hypertension.

Besides increasing blood pressure, excessive salt may also affect stomach mucosa and result in atrophic gastritis and gastric cancer.

Higher sodium intake leads to greater calcium excretion which may result in reduction in bone density. Existing evidence reveals a deleterious impact of high salt intake on blood vessels, blood pressure, bones and gastrointestinal tract. Salt intake in our population generally exceeds the requirement. It should not be more than 6 g per day. In India, salt has been identified as a vehicle for food fortification since it is the only commodity which is universally consumed.

POINTS TO PONDER

- Restrict the intake of added salt from an early age.
- Develop a taste for foods/diets low in salt.
- Restrict intake of preserved and processed foods like papads, pickles, sauces, ketchup, salted biscuits, chips, cheese and salted fish.
- Eat plenty of vegetables and fruits to provide adequate potassium.
- Use always iodized salt.

EAT ENOUGH IODINE-CONTAINING FOODS/USE ONLY IODIZED SALT

- Iodine is required for formation of thyroid hormones.
- Thyroid hormones are necessary for growth and development.
- Iodine deficiency leads to goitre (enlargement of thyroid gland)
- Lack of iodine in the water and diet is the main cause of iodine deficiency disorders.
- Iodine deficiency during pregnancy results in still births, abortions and cretinism.
- Use of iodized salt ensures adequate iodine intake.

11. FOODS CONSUMED SHOULD BE SAFE AND CLEAN

- ✦ Safe and good-quality food is essential for maintaining good health
- ✦ Naturally-occurring toxins, environmental contaminants and adulterants in foods constitute a health hazard.
- ✦ Consumption of unsafe foods can lead to food-borne diseases.

What makes food unsafe ?

Microbes (bacteria and moulds) and their products are responsible for food spoilage. Natural enzymes present in food also lead to its deterioration. Besides, insects and rodents, adulterants, natural toxins and various chemical residues beyond permissible levels, make the food unwholesome. In addition to moisture and environmental conditions like temperature, storage time also influence the quality of the food.

How do we select safe food?

Selection of the right food is the first step to ensure safe and good quality diet. Food items purchased from reliable sources having a high turnover ensure their freshness. Some foods carry certification mark assuring good quality. For example AGMARK for honey and ghee; FPO (Fruit Products Order) for fruit and vegetable products (jams, squashes, etc); ISI (Bureau of Indian Standards) for food colours and essences.

Food grains purchased should be free from foreign matter and infestation (rodent excreta and insect remains). They should be of uniform size and should not be shrivelled, shrunken and mouldy. Foodstuffs should be free from artificial colours. There is a risk of adulteration when fats/oils are purchased loose from unsealed containers. Therefore, it is always safer to purchase reputed brand products in sealed sachets/containers. It is necessary to buy pasteurized milk in sachets from a reputed dairy or a reliable vendor to avoid the risk of adulteration and contamination. Milk products such as butter, ghee and *khoa* should also be purchased from reliable sources. Whole spices, uniform in colour, size and shape should be preferred. Since powdered spices are more likely to be adulterated, always buy certified products. Fruits and vegetables that show patches, mechanical damage and bruises, or are wilted and decayed with visible evidence of insects and moulds, should be avoided. Eggs should be fresh and free from cracks. Meat or poultry must be examined for characteristic colour, odour and texture, and should be purchased fresh or frozen.

Freshness of fresh-water fish is indicated by a stiff body, bright, clear and bulging eyes, reddish gills, tight scales and absence of stale odour or discolouration. Fresh fish will not show any pitting on finger pressure.

What are the best practices of storage ?

Agricultural commodities should be dried adequately and protected from moisture in a safe storage structure (eg. tin with a tight lid) to prevent damage from moulds. Microbes like bacteria and mould produce toxins (eg. aflatoxins). Rodent attacks, and the presence of insects and microbes, not only reduce the availability of nutrients but render the foods harmful. Frequent and careful disinfestation of the storage premises using pesticides like aluminium phosphide is essential. Some traditional household practices such as application of edible oils to grains, placing dried neem leaves in storage bins etc., are known to prevent infestations.

Why do foodborne diseases occur?

Foodborne infections and toxicities are common particularly with consumption of susceptible foods such as milk products like *khoa*, meat, poultry and even cooked foods like rice. Improper processing, handling and cooking, and keeping cooked foods in warm conditions for several hours before eating, promote bacterial growth and toxin production.

How should perishable foods be handled ?

Perishable foods like milk, meat, vegetables and cooked foods, are prone to spoilage due to microbes. These foods should be stored under refrigeration, preferably at a temperature of 10°C or less, which retards multiplication of microorganisms. However, even refrigerated foods, if stored for long, can get spoiled. Cross contamination can be avoided by keeping cooked and raw food separately.

In case food which is cooked has to be stored for some time, it should be kept either hot (more than 60°C) or be cooled quickly (below 10°C). Most micro-organisms multiply at temperatures between 10 and 60°C. Refrigerated cooked food should be heated before consumption. However, repeated heating may be avoided.

What about personal hygiene ?

Food handlers should observe good personal hygiene to maintain food safety. They should be free from obvious signs of illness, wounds and sores. Traditionally in India, cooked food is touched by the hands while preparing, serving and eating. Use of spoons and ladles should be encouraged to avoid contamination. Hands should

be washed thoroughly before starting the preparation of food and after every interruption. Household pets like cats and dogs often harbour dangerous pathogens. They should be kept away from places where food is cooked, stored or served.

What are the common adulterants ?

Foods may be adulterated with non-food material or inferior quality product. Spoilt, stale or poor quality food is made attractive and fresh by adding harmful colours or other chemicals. Frequently adulterated food items are milk and milk products, cereals, pulses and their products, edible oils and spices. The different classes of adulterants include non-permitted colours like metanil yellow; non-edible oils like castor oil; cheaper agricultural produce like various starches in milk powder; extraneous matter like husk, sand and sawdust; and metal contaminants like aluminum or iron filings. Consumption of adulterated foods could lead to disease outbreaks of epidemic proportions. Buying from a reliable and reputed source, careful checking of foods before purchase and insisting on certified brands will all minimize the risk of food adulteration.

How to minimize effects of pesticide residues ?

Pesticides, used during cultivation of crops, can remain as residues in foodstuffs, especially vegetables and fruits. Exposure of the population to pesticide residues may be harmful and can be minimized by washing the foodstuffs thoroughly in running water or by peeling. Cooking and other processes can also reduce such residues (Annexure 12). Insect control operations such as disinfestation in the kitchen by spraying pesticides is another source of contamination. Utmost care should be taken to ensure that eatables are well covered and protected from exposure to such harmful agents.

POINTS TO PONDER

- ✧ **Buy food items from reliable sources after careful examination.**
- ✧ **Wash vegetables and fruits thoroughly before use.**
- ✧ **Store the raw and cooked food properly and prevent microbial, rodent and insect invasion.**
- ✧ **Refrigerate perishable food items till consumption.**
- ✧ **Maintain good personal hygiene and keep the cooking and food storage areas clean and safe.**

12. HEALTHY AND POSITIVE FOOD CONCEPTS AND COOKING PRACTICES SHOULD BE ADOPTED

- Cultural factors play an important role in dietary practices.
- Faulty food beliefs and faddism adversely affect nutrition and health.
- Cooking renders food palatable and helps in easy digestion.
- Cooking destroys harmful germs.
- Faulty cooking habits lead to loss of nutrients.
- Cooking at high temperatures leads to destruction of nutrients and formation of harmful substances.

What are common Indian food beliefs, fads and taboos ?

Food habits are formed early in childhood, passed on from the elders in the family and perpetuated into adulthood. Food beliefs either encourage or discourage the consumption of particular foods. There can be neutral, harmless or harmful practices. Unfortunately, most of the harmful beliefs and prejudices (taboos) are associated with the diets of women and children, who are also the most vulnerable to malnutrition. Exaggerated beneficial or harmful claims in respect of some foods, without scientific basis constitute food fads. In addition, the concept of hot and cold foods is widely prevalent. Hot foods are believed to produce heat in the body. Some examples are jaggery, sugar, groundnuts, fried foods, mango, bajra, jowar, maize, eggs and meat. Papaya fruit is strongly suspected to lead to abortion, though there is no scientific basis. Buttermilk, curd, milk, green gram dhal, green leafy vegetables, ragi, barley flour and apples are considered as cold foods which are actually nutritious. Vegetarianism is often practised in India on religious grounds. Since vitamin B_{12} is present only in foods of animal origin, vegetarians should ensure an adequate consumption of milk. During certain illnesses like measles and diarrhoea, dietary restriction is practised. This can aggravate malnutrition in young children.

What are the effects of the precooking process?

Foods, in their natural state, contain different nutrients in varying amounts. Cooking improves the digestibility of most foods. Flesh foods get softened on cooking and become easily chewable. Proper methods of cooking render foods palatable by improving the appearance, taste, flavour and texture, thereby

enhancing acceptability. In addition, they help in destroying disease causing organisms and eliminating natural inhibitors of digestion. In the course of dietary preparation, depending on the recipe, foods are subjected to various processes such as washing, cutting, fermentation, germination and cooking. In the Indian cuisine, fermentation *(idli, dosa, dhokla)* and germination (sprouting) are common practices. These methods improve digestibility and increase nutrients such as B-complex vitamins and vitamin C.

What are the effects of washing and cutting ?

Foods should be washed well before cooking and consumption to remove contaminants like pesticide residues, parasites and other extraneous material. However, certain precautions need to be taken while washing and cutting to minimize the loss of nutrients. Repeated washing of food grains like rice and pulses results in losses of certain minerals and vitamins. Vegetables and fruits should be washed thoroughly before cutting. Cutting of vegetables into small pieces exposes a greater surface area of the foodstuff to the atmosphere, resulting in loss of vitamins due to oxidation. Therefore, vegetables should be cut into large pieces. Cut vegetables should not be soaked in water for long, as water-soluble minerals and vitamins get dissolved. Water in which the food grains and vegetables have been soaked should not be discarded but put to use to prevent nutrient loss.

What are the effects of cooking ?

There are many methods of cooking like boiling, steaming, pressure cooking, frying, roasting and baking. Boiling is the most common method of cooking, during which heat-labile and water-soluble vitamins like vitamins B-complex and C are lost. The practice of using excess water while cooking rice should be discouraged since it leads to loss of vitamins; just sufficient water to be fully absorbed should be used. Vegetables should be cooked on low heat using just adequate water in a covered vessel to preserve flavour and nutrients and to reduce cooking time. Use of baking soda for hastening cooking of pulses should not be practiced, as it results in loss of vitamins. Frying involves cooking food in oil/ghee/*vanaspati* at high temperatures. Shallow frying involves use of much smaller amounts of oils than deep frying. Repeated heating of oils particularly PUFA-rich oils, results in formation of peroxides and free radicals and, hence, should be avoided by using just enough oil.

Similarly, oils which have been repeatedly heated should not be mixed with fresh oil but should be used for procedures such as seasoning.

Microwave Cooking

Microwave cooking is convenient, fast and preserves nutrients and also useful in reheating of food. But it can reheat or cook unevenly and leave some cold spots in the food by which harmful bacteria can enter into our body. So it is discouraged to use large amounts or big pieces in the microwave oven otherwise mix the food in between for even heating or cooking. Never use partially heated food. Don't cook frozen food in the microwave oven directly it leaves some parts of the food partially cooked.

Always use glass or pottery dishes and food grade microwave friendly plastic dishes and wrap to reheat foods. Approximate calorific value of some cooked food preparation are given in annexure 8.

POINTS TO PONDER

- ⊗ **Avoid food faddism and discard erroneous food beliefs.**
- ⊗ **Do not wash foodgrains repeatedly before cooking.**
- ⊗ **Do not wash vegetables after cutting.**
- ⊗ **Do not soak the cut vegetables in water for long periods.**
- ⊗ **Do not discard the excess water left over after cooking. Use only sufficient water for cooking.**
- ⊗ **Cook foods in vessels covered with lids.**
- ⊗ **Prefer pressure/steam cooking to deep frying/roasting.**
- ⊗ **Encourage consumption of sprouted/fermented foods.**
- ⊗ **Avoid use of baking soda while cooking pulses and vegetables.**
- ⊗ **Do not reheat the left over oil repeatedly.**

13. WATER SHOULD BE TAKEN IN ADEQUATE AMOUNTS AND BEVERAGES SHOULD BE CONSUMED IN MODERATION

- ❖ Water is the major constituent of the human body.
- ❖ Beverages are useful to relieve thirst and to meet fluid requirements of the body.
- ❖ Some beverages provide nutrients while others act as stimulants.
- ❖ Milk is an excellent beverage for all age groups as it is a rich source of nutrients.

Why do we need water ?

Water accounts for 70% of our body weight. It is a constituent of blood and other vital body fluids. Water plays a key role in elimination of body wastes and regulation of body temperature. The body loses water through sweat, urine and faeces. This loss must be constantly made good with clean and potable water. A normal healthy person needs to drink about 8 glasses (2 litre) of water per day. During very hot weather and while undertaking vigorous physical activity, this requirement increases as a considerable amount of water is lost through sweat.

When is water considered safe and wholesome ?

Water should be safe and wholesome i.e., it should be free from disease-causing agents like bacteria, viruses, parasites etc., and harmful chemical substances like pesticides, industrial wastes, heavy metals, nitrates, arsenic and excess of fluoride. Fluorosis, a disease with bone deformities and dental problems, results from drinking water containing an excess of fluoride over long periods. Generally, a concentration of 0.5 to 0.8 mg of fluoride per litre of drinking water is considered safe.

How is water rendered safe ?

If a water source is not safe for drinking, boiling it for 10-15 minutes is a satisfactory method of purification of the water. It kills all disease-causing organisms and also removes temporary hardness. However, boiling will not remove other chemical impurities. Tablets containing 0.5 g of chlorine can disinfect 20 litres of water. There are many modern gadgets which claim to provide safe and wholesome water. However, they vary in efficacy. Drinking water standards given in annexure 13.

How nutritious is milk ?

Milk is a well accepted and wholesome food and beverage for all age groups. It contains most of the nutrients necessary for growth and development. It is, therefore, specially useful or feeding infants, toddlers, growing children and expectant women and nursing mothers. All the macro- and micro-nutrients are present in an easily digestible and assimilable form in milk. Milk proteins possess high biological value which is almost equal to that of meat, eggs and other high-quality animal proteins. Milk proteins are valuable supplements to most vegetarian diets.

Milk is a rich source of bioavailable calcium which helps in the building up of strong bones. Milk fat serves as a vehicle for important fat-soluble vitamins A, D and E. Since milk fat is of the saturated type, those who have to be on a low fat diet can consume skimmed/toned milk. For strict vegetarians, milk is the only source of vitamin B_{12}. Milk is also rich in riboflavin, but is a poor source of vitamins C and iron. However, only pasteurized or boiled milk should be consumed to ensure protection from disease-causing agents.

What is lactose intolerance ?

Lactose, the sugar present in milk, helps in the establishment of lactic acid bacteria in the intestinal tract. If lactase, an enzyme required for digestion of lactose, is not present in sufficient amounts, such individuals develop abdominal symptoms on consumption of excess of milk. This is common in children following diarrhoea and is described as lactose intolerance. Drinking small quantities of milk at a time does not usually cause any gastrointestinal problems and there is no need to discourage intake of milk by children except in severe cases of diarrhoea.

What are soft drinks ?

Soft drinks are generally of two categories : natural soft drinks and artificial or synthetic soft drinks. Water is the main constituent of all beverages. Orange, lemon, grape, mango, pineapple and apple are generally used in making fruit juice. Cane sugar juice is also extensively used in India, particularly during summer. Natural fruit juices provide in addition to energy, some vitamins (beta carotenes, vitamin C) and minerals (potassium, calcium). Fruit juices being potassium rich are ideal beverages for those suffering from hypertension. However, they cannot be equated with fruits which also provide dietary fibre.

Compared to natural fruit juices, synthetic drinks do not contain nutrients unless they are fortified. Generally, synthetic drinks are prepared using preservatives,

artificial colours and flavours such as cola, orange, mango and lime, and mostly they are carbonated. Carbonated beverages contain phosphoric acid and may damage the enamel of teeth, and affect appetite if taken in excessive amounts. Water used for preparation of beverages should be free from disease-causing agents and harmful chemical impurities.

Beverages like buttermilk, lassi, fruit juices and coconut water are better alternatives to synthetic drinks.

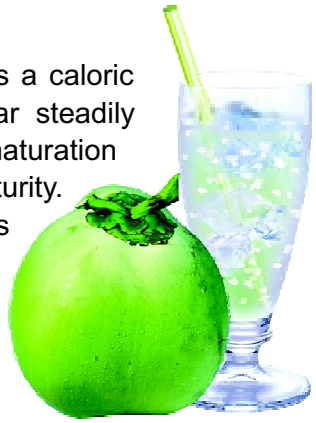
What about tea and coffee ?

Tea and coffee are popular beverages. They are known to relieve mental and muscular fatigue. This characteristic stimulating effect is due to their caffeine content. A cup (150 ml) of brewed coffee contains 80-120 mg of caffeine and instant coffee 50-65 mg, while tea contains 30-65 mg of caffeine. Caffeine stimulates the central nervous system and induces physiological dependence. Generally, low doses (20-200 mg) of caffeine produce mild positive effects like a feeling of well-being, alertness and being energetic. Higher doses (>200 mg) can produce negative effects like nervousness and anxiety, especially in people who do not usually consume caffeine-containing beverages. Therefore, moderation in tea and coffee consumption is advised so that caffeine intake does not exceed the tolerable limits. Tannin is also present in tea and coffee and is known to interfere with iron absorption. Hence, tea and coffee should be avoided at least for one hour before and after meals.

Coffee consumption is known to increase blood pressure and cause abnormalities in heart beat. In addition, an association between coffee consumption and elevated levels of total and LDL cholesterol ('bad' cholesterol), triglycerides and heart disease has been demonstrated. Therefore, individuals with heart disease need to restrict coffee consumption. Also, those who experience adverse effects from caffeine should stop drinking coffee.

Besides caffeine, tea contains theobromine and theophylline. These are known to relax coronary arteries and thereby promote circulation. Tea also contains flavonoids and other antioxidant polyphenols, which are known to reduce the risk for coronary heart disease and stomach cancer. However, as a result of its caffeine content, excess tea consumption is deleterious to health. Decaffeinated coffee and tea are being marketed to obviate the adverse effects of caffeine.

Tender coconut water



Tender coconut water is a nutritious beverage. It has a caloric value of 17.4 per 100 gm. The concentration of sugar steadily increases from 1.5% to about 5.5% in the early months of maturation and this slowly falls to about 2% at the stage of full maturity. Tender coconut water contains most of the minerals such as potassium (290 mg%), Sodium (42 mg%), Calcium (44 mg%), magnesium (10 mg%), Phosphorus (9.2 mg%), iron (106 mg%),and copper (26 mg%). It is a oral rehydration medium and keeps the body cool. However, in patients with hyper kalaemia such as renal failure, acute adrenal insufficiency and in patients with low urine output, TCW should be avoided.

Alcohol

Alcoholic beverages contain ethyl alcohol in varying proportions. Beer contains 2-5% and wine 8-10% of alcohol, while brandy, rum and whisky contain much higher concentrations (30-40%). Alcohol has been extensively abused as an appetite stimulant and as a sedative-hypnotic drug. Alcohol intake, which is initiated as an innocent social habit may gradually result in a serious addiction. It may lead to several serious psycho-social problems and accidents.

Alcohol provides higher calories (7 Kcal/g) than carbohydrates and proteins and, thus, can contribute to obesity. Ironically, excessive intake of alcohol is known to suppress appetite and interfere with absorption and metabolism of nutrients, leading to various nutritional deficiency diseases.

Excessive intake of alcohol suppresses appetite and as a result, leads to several nutritional deficiency diseases. People who regularly consume more than two alcoholic drinks (one equals about 30 ml of ethanol) are at a higher risk for hypertension and stroke. Alcohol intake has also been shown to increase the risk of cancer of the mouth, larynx and oesophagus, prostate and of the breast in women. Excessive alcohol intake weakens the heart muscle (cardiomyopathy) and also damages the liver (cirrhosis), brain and peripheral nerves. It also increases serum triglycerides.

POINTS TO PONDER

- ☼ **Drink enough of safe and wholesome water to meet daily fluid requirements.**
- ☼ **Drink boiled water, when safety of the water is in doubt.**
- ☼ **Consume at least 250 ml of boiled or pasteurized milk per day.**
- ☼ **Drink natural and fresh fruit juices instead of carbonated beverages.**
- ☼ **Prefer tea over coffee.**
- ☼ **Avoid alcohol. Those who drink, should limit its intake.**

14. PROCESSED AND READY TO EAT FOODS RICH IN SALT, SUGAR, FATS SHOULD BE CONSUMED JUDICIOUSLY. SUGAR SHOULD BE USED SPARINGLY.

- Urbanization has increased the intake and demand for processed foods.
- There is a trend towards replacing traditionally cooked foods with processed foods.
- Processed foods may not be nutritionally balanced unless fortified.
- Sugar, a processed food, provides empty calories.

What are processed foods ?

Foods that are subjected to technological modifications either for preservation or for converting into ready-to-use/eat foods, eliminating laborious household procedures, are called “processed foods”. Some of the examples are ready mixes, dehydrated foods, pasta products, canned foods, confectioneries, bakery, dairy products and breakfast foods. Manufacture of processed foods requires technology application and machinery, and as a result, processed foods are expensive.

Do we need processed foods ?

There is an increased demand for processed, ready-to-eat and convenience foods due to changes in lifestyle. As more and more women go to work outside, and families become nuclear, consumption of processed foods, particularly in urban areas, will be on the increase. Today's consumer is looking for convenient, easy-to-cook, and ready-to-eat foods which require less time to prepare than traditional home-cooked foods. Food processing is must to preserve highly perishable products like milk, meat, fish and fresh fruits and vegetables. Food processing increases the seasonal availability of foods and enables easy transportation and distribution over long distances.

Do processed foods contribute to nutrient intake ?

Processed foods are generally consumed either as part of a meal, or as a snack item. Their contribution in terms of essential nutrients depends on the type of processing and fortification, the frequency of use, and the quantity consumed. Processed foods are generally refined and a majority of them are rich in fat or in salt/sugar, and are calorie dense. They lack dietary fibre and micronutrients. Thus, caution needs to be exercised when processed foods constitute a major part of the meal.

Breakfast cereals are increasingly being used in urban areas. Traditional breakfast items like *idli, dosa, upma* and *roti* are richer sources of nutrients. Puffed and parched rice products (eg. flaked rice) besides being crisp and tasty, are easily digestible. Food items like chips, candies, peppermints, chocolates, etc., which are popular among children, are considered as unhealthy since, they provide only empty calories often containing artificial colours and other additives. Their use should be discouraged.

What is the difference between instant foods, fast foods, street foods and unhealthy (junk) foods ?

Instant foods

Instant foods are those, which undergo special processing designed to dissolve or to disperse particles more rapidly in a liquid than the untreated product. For instance, instant noodles, soup powders, cornflakes fall under this category. Although all instant foods need not be unhealthy in terms of high calorie or salt contents, there are concerns about certain additives like monosodium glutamate, which may also add up to the over-all sodium intake from the foods. Monosodium glutamate may be used instead of salt as the sodium content is lower than in ordinary salt.

Fast Foods

Fast foods are foods already made or cooked to order within minutes for consumption – noodles, burgers, fried fish, milk shakes, chips, salads, pizzas, sandwiches, etc. Storage, handling and microbiological contamination are the major concerns. Further they are calorie dense foods.

Street Foods

Street foods comprises a wide range of ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers, especially on streets and other similar public places. *Idly, Wada, Dosa*, Chat Items etc are examples of street foods. They may be contaminated with infective organisms unless hygienically prepared.

Unhealthy (Junk) Foods

Unhealthy foods are those containing little or no proteins, vitamins or minerals but are rich in salt, sugar, fats and are high in energy (calories). Some examples are chocolates, artificially flavored aerated drinks, potato chips, ice creams, french fries etc.

Why should we restrict intake of unhealthy processed foods ?

Frequent consumption of unhealthy processed food increases calorie intake without providing any vitamins and minerals. Apart from being non-nutritious, processed foods also contain food additives. Food additives consumed beyond permissible limits may have adverse effects on health. The national food regulatory authorities periodically review these limits. Thus, consumption of processed foods may not only affect intake of nutrients, but in addition, increase the risk of exposure to various chemical additives.

In the coming years, with larger constraints on time at home, demand for processed foods is certain to increase. Therefore, it is necessary to ensure that intake of a nutritionally balanced diet is not compromised with unwise intake of various processed and convenience foods. Also, processed vegetables and fruits available in the market are no match to nutrient rich fresh vegetables and fruits.

Why should we moderate intake of sugar ?

Sugars occur both naturally and as an ingredient in many foods. They are present in natural foods like fruits, vegetables, milk and honey. Added sugars provide taste and texture to foods. Sugar is present in processed foods like chocolates, jams, ice-creams and soft drinks. The most familiar sugar is sucrose. Refined or table sugar (sucrose) provides “empty calories”. Foods such as cakes, pastries, confectionery and sweets often have high amounts of fat, and sugar, and are prepared with refined cereals. Excess consumption of sugary foods may lead to obesity and elevated blood lipids. Children overindulging in chocolates and candies are prone to dental caries. For prevention of diet-related chronic diseases, sugars and refined cereals should be used sparingly.

POINTS TO PONDER

- Prefer traditional, home made foods.
- Avoid replacing meals with snack foods.
- Limit consumption of sugar and unhealthy processed foods which provide only (empty) calories.
- Prefer fortified processed foods.
- Always read food labels (given on containers) regarding nutrients, shelf-life and the additives used.

15. THE ELDERLY SHOULD HAVE A NUTRIENT RICH DIET TO KEEP FIT AND ACTIVE

- Body composition changes with advancing age, and these changes affect nutritional needs of the elderly.
- Elderly or aged people require reduced amounts of calories, as their lean muscle mass and physical activity decrease with ageing.
- Elderly are more prone to diseases due to lowered food intake, physical activity and resistance to infection.
- Good /healthy food habits and regular comfortable level of physical activity are required to minimise the ill effects of ageing and to improve the quality of life.
- Elderly need adequate amounts of protein, carbohydrates, fat, vitamins, minerals and dietary fibre.
- Elderly need more calcium, iron, zinc, vitamin A and antioxidants to prevent age-related degenerative diseases and for healthy ageing.

Who is an elderly person?

Individuals of 60 years and above (WHO) constitute the elderly. In India, the elderly constitute about 7 percent of the total population (Census, 2001) and by 2016 AD, this is likely to increase to 10 percent.

How are the elderly different?

Ageing affects almost all the systems of the body, and is associated with several physiological, metabolic and psychological changes. The changes incude, decline in physical activity, digestion, metabolism, bone mass and muscle mass. Failing eye-sight and impaired hearing may also occur. Low appetite as a result of loss of taste and smell perception, dental problems, atrophic changes in GIT, constipation and decreased physical activity could lead to overall decrease of food intake and poor absorption of nutrients. Inability to prepare food, economic dependency and other psycho-social problems adversely affects the health and nutritional status of the elderly.

There is a decline in immune function with advancing age, which leads to decreased resistance to infectious diseases. The increased parathyroid

hormone (PTH) secretion in the elderly leads to increased bone turn over i.e. osteoporosis. Similarly, elderly individuals are at increased risk of osteomalacia i.e. defective bone mineralisation due to lack of exposure to sunlight and poor diet.

How can the elderly lead an active life?

In general, majority of the health problems among the elderly are nutrition related. Consumption of nutritious foods rich in micronutrients including antioxidant vitamins & minerals and fibre, comfortable level of physical activity will enable the elderly to live active and meaningful healthy lives, without being a burden on society and their family members. Uncomplicated ageing can also be quite productive, say in the domestic sphere.

What are the common diseases among the elderly?

Resistance to disease declines in the elderly. The common ailments in the elderly are degenerative diseases such as arthritis (joint diseases), osteoporosis, osteomalacia, cataract, diabetes, cardiovascular (stroke, heart diseases) problems, neurological (Parkinson's, Alzheimer's) and psychiatric (dementia, depression, delirium) disorders and cancer. Besides these, the prevalence of respiratory, gastro intestinal tract (GIT) and urinary tract infections is common among the elderly.

What type of diet should the elderly eat?

As people grow older, they tend to become physiologically less active and therefore need fewer calories to maintain their weights. The daily intake of oil should not exceed 20 g. Use of ghee, butter, *vanaspati* and coconut oil should be avoided. They need foods rich in protein such as pulses, toned milk, egg-white etc. The elderly population is prone to various nutritional deficiencies. Therefore, the elderly need nutrient-rich foods rich in calcium, micro-nutrients and fibre. Apart from cereals and pulses, they need daily at least 200-300 ml of milk and milk products and 400 g of vegetables and fruits to provide fibre, micro-nutrients and antioxidants. Inclusion of these items in the diet improves the quality of the diet and bowel function. Flesh foods and eggs add to the quality of diet (annexure 14 & 15).

The diet needs to be well cooked, soft and less salty and spicy. Small quantities of food should be consumed at more frequent intervals and adequate water should be consumed to avoid dehydration, hyponatraemia and constipation.

How can elderly remain fit and active ?

Exercise is an integral part of maintaining healthy life. It helps to regulate body weight. The risk of degenerative diseases is considerably decreased by regular exercise. Exercise schedule should be decided in consultation with a physician.

POINTS TO PONDER

- ✷ Eat a variety of nutrient-rich foods.
- ✷ Match food intake with physical activity.
- ✷ Eat food in many divided portions in a day.
- ✷ Avoid fried, salty and spicy foods.
- ✷ Consume adequate water to avoid dehydration.
- ✷ Exercise regularly.

ANNEXURES

Annexure - 1

RECOMMENDED DIETARY ALLOWANCES FOR INDIANS
(Macronutrients and Minerals)

Group	Particulars	Body wt. kg	Net Energy Kcal/d	Protein g/d	Visible Fat g/day	Calcium mg/d	Iron mg/d
Man	Sedentary work	60	2320	60	25	600	17
	Moderate work		2730		30		
	Heavy work		3490		40		
Woman	Sedentary work	55	1900	55	20	600	21
	Moderate work		2230		25		
	Heavy work		2850		30		
	Pregnant woman		+350	82.2	30	1200	3 5
	Lactation 0-6 months		+600	77.9	30	1200	25
	6-12 months		+520	70.2	30		
Infants	0-6 months	5.4	92 Kcal/kg/d	1.16 g/kg/d	–	500	--
	6-12 months	8.4	80 Kcal/kg/d	1.69 g/kg/f	19		46 µg/ kg/day
Children	1-3 years	12.9	1060	16.7	27	600	09
	4-6 years	18	1350	20.1	25		13
	7-9 years	25.1	1690	29.5	30		16
Boys	10-12 years	34.3	2190	39.9	35	800	21
Girls	10-12 years	35.0	2010	40.4	35	800	27
Boys	13-15 years	47.6	2750	54.3	45	800	32
Girls	13-15 years	46.6	2330	51.9	40	800	27
Boys	16-17 years	55.4	3020	61.5	50	800	28
Girls	16-17 years	52.1	2440	55.5	35	800	26

RECOMMENDED DIETARY ALLOWANCES FOR INDIANS
(Vitamins)

Group	Particulars	Vit. A μg/d		Thiamin mg/d	Riboflavin mg/d	Niacin equivalent mg/d	Pyridoxin mg/d	Ascorbic acid mg/d	Dietary folate μg/d	Vit.B_{12} μg/d	Magnesium mg/d	Zinc mg/d
		Retinol	β-carotene									
Man	Sedentary work	600	4800	1.2	1.4	16	2.0	40	200	1	340	12
	Moderate work			1.4	1.6	18						
	Heavy work			1.7	2.1	21						
Woman	Sedentary work	600	4800	1	1.1	12	2.0	40	200	1	310	10
	Moderate work			1.1	1.3	14						
	Heavy work			1.4	1.7	16						
	Pregnant woman	800	6400	+0.2	+0.3	+2	2.5	60	500	1.2		12
	Lactation 0-6 months	950	7600	+0.3	+0.4	+4	2.5	80	300	1.5		
	6-12 months			+0.2	+0.3	+3	2.5					
Infants	0-6 months	--	--	0.2	0.3	710μg/kg	0.1	25	25	0.2	30	–
	6-12 months	350	2800	0.3	0.4	650μg/kg	0.4				45	–
Children	1-3 years	400	3200	0.5	0.6	8	0.9	40	80		50	5
	4-6 years			0.7	0.8	11	0.9		100		70	7
	7-9 years	600	4800	0.8	1.0	13	1.6		120		100	8
Boys	10-12 years	600	4800	1.1	1.3	15	1.6	40	140	0.2-1.0	120	9
Girls	10-12 years			1.0	1.2	13	1.6				160	9
Boys	13-15 years			1.4	1.6	16	2.0	40	150		165	11
Girls	13-15 years			1.2	1.4	14	2.0				210	11
Boys	16-17 years			1.5	1.8	17	2.0	40	200		195	12
Girls	16-17 years			1.0	1.2	14	2.0				235	12

Annexure - 2

Tim Cole Anthropometric Standards

BMI Age and Sex specific percentile values for children and Adolescents: Boys			Age (Years)	BMI Age and Sex specific percentile values for children and Adolescents: Girls		
5th Percentile	85th Percentile	95th Percentile		5th Percentile	85th Percentile	95th Percentile
15.14	18.41	20.09	2.0	14.83	18.02	19.81
14.92	18.13	19.80	2.5	14.63	17.76	19.55
14.74	17.89	19.57	3.0	14.47	17.56	19.36
14.57	17.69	19.39	3.5	14.32	17.40	19.23
14.43	17.55	19.29	4.0	14.19	17.28	19.15
14.31	17.47	19.26	4.5	14.06	17.19	19.12
14.21	17.42	19.30	5.0	13.94	17.15	19.17
14.13	17.45	19.47	5.5	13.86	17.20	19.34
14.07	17.55	19.78	6.0	13.82	17.34	19.65
14.04	17.71	20.23	6.5	13.82	17.53	20.08
14.04	17.92	20.63	7.0	13.86	17.75	20.51
14.08	18.16	21.09	7.5	13.93	18.03	21.01
14.15	18.44	21.60	8.0	14.02	18.35	21.57
14.24	18.76	22.17	8.5	14.14	18.69	22.18
14.35	19.10	22.77	9.0	14.28	19.07	22.81
14.49	19.46	23.39	9.5	14.43	19.45	23.46
14.64	19.84	24.00	10.0	14.61	19.86	24.11
14.80	20.20	24.57	10.5	14.81	20.29	24.77
14.97	20.55	25.10	11.0	15.05	20.74	25.42
15.16	20.89	25.58	11.5	15.32	21.20	26.05
15.35	21.22	26.02	12.0	15.62	21.68	26.67
15.58	21.56	26.43	12.5	15.93	22.14	27.24
15.84	21.91	26.84	13.0	16.26	22.58	27.76
16.12	22.27	27.25	13.5	16.57	22.98	28.20
16.41	22.62	27.63	14.0	16.88	23.34	28.57
16.69	22.96	27.98	14.5	17.18	23.66	28.87
16.98	23.29	28.30	15.0	17.45	23.94	29.11
17.26	23.60	28.60	15.5	17.69	24.17	29.29
17.54	23.90	28.88	16.0	17.91	24.37	29.43
17.80	24.19	29.14	16.5	18.09	24.54	29.56
18.05	24.46	29.41	17.0	18.25	24.70	29.69
18.28	24.73	29.70	17.5	18.38	24.85	29.82
18.50	25.00	30.00	18.0	18.50	25.00	30.00

Definition of overweight and obesity

< 5th Percentile : Undernutrition
≥ 5th to <85th percentiles : Normal
≥ 85th to <95th percentiles : Overweight
≥ 95th percentiles : Obesity

Source:
Tim J Cole: BMJ 2000; 320; 1240-1246 (Definition)
Tim J Cole: BMJ 2007; 335; 194-200

Annexure - 3

Balanced Diet for Adults - Sedentary/ Moderate/ Heavy Activity
(Number of portions)

	g/portion	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals & millets	30	12.5	9	15	11	20	16
Pulses	30	2.5	2	3	2.5	4	3
Milk & milk products	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	2	2	2	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1
Sugar	5	4	4	6	6	11	9
Fat	5	5	4	6	5	8	6

Annexure - 4

Balanced Diet for Infants, Children and Adolescents (Number of Portions)

Food groups	g/ portion	Infants 6-12 months	Years								
			1 - 3	4 - 6	7 - 9	10 – 12		13 – 15		16 - 18	
						Girls	Boys	Girls	Boys	Girls	Boys
Cereals & millets	30	0.5	2	4	6	8	10	11	14	11	15
Pulses	30	0.25	1	1.0	2	2	2	2	2.5	2.5	3
Milk (ml) & milk products	100	4a	5	5	5	5	5	5	5	5	5
Roots & tubers	100	0.5	0.5	1	1	1	1	1	1.5	2	2
Green leafy vegetables	100	0.25	0.5	0.5	1	1	1	1	1	1	1
Other vegetables	100	0.25	0.5	1	1	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1	1	1	1	1
Sugar	5	2	3	4	4	6	6	5	4	5	6
Fat/ oil (visible)	5	4	5	5	6	7	7	8	9	7	10

[a] Quantity indicates top milk. For breastfed infants, 200 ml top milk is required.

One portion of pulse may be exchanged with one portion (50 g) of egg/meat/chicken/fish.

For infants introduce egg/meat/chicken/fish around 9 months.

Specific recommendations as compared to a sedentary woman/man :

Children :

1-6 years- ½ to ¾ the amount of cereals, pulses and vegetables and extra cup of milk.

7-12 years- Extra cup of milk

Adolescent girls- Extra cup of milk

Adolescent boys- Diet of sedentary man with extra cup of milk

Annexure - 5

Approximate Calorific Value of Nuts, Salads and Fruits

	Portion	Calories
Nuts		
Almonds	10 Nos.	85
Cashewnuts	10 Nos.	95
Coconut (fresh)	100 g	444
Coconut (dry)	100 g	662
Peanuts	50 Nos.	90
Fresh fruits		
Apple	1 medium	65
Banana	1 medium	90
Grapes	30 Nos.	70
Guava	1 medium	50
Jackfruit	4 pieces	90
Mango	1 medium	180
Mosambi/orange	1 medium	40
Papaya	1 piece	80
Pineapple	1 piece	50
Sapota	1 medium	80
Custard apple	1 medium	130
Watermelon/muskmelon	1 slice	15
Salads		
Beetroot	1 medium	30
Carrot	1 medium	70
Cucumber	1 medium	12
Onion	1 medium	25
Radish	1 medium	10
Tomato	1 medium	10

Annexure - 6

Low calorie vegetables and fruits (20 kcal)

Name of the vegetables	Kcal
GLV	
Amaranth (stem)	19
Ambat chukka	15
Celery stalk	18
Ipomoea stem	19
Spinach stalk	20
Roots and tubers	
Radish table	16
Radish white	17
Other vegetables	
Ash gourd	10
Bottle gourd	12
Cluster beans	16
Colocasia stem	18
Cucumber	13
Ghosala	18
Kovai	18
Parwal	20
Ridge guard	17
Snake guard	18
Vegetable marrow	17
Fruits	
Bilimbi	19
Jamb safed	19
Musk melon	17
Water melon	16
Orange juice	9
Tomato ripe	20

Source: Nutritive Value of Indian Foods, 2006

Annexure - 7

Vegetables and Fruits with High calorie value (≥ 100kcal)

Food Stuff	Kcal/100g
Leafy vegetables	
Chekkur manis	103
Colocasia leaves (dried)	277
Curry leaves	108
Fetid cassia (dried) (Chakunda)	292
Rape leaves (dried)	297
Tamarind leaves	115
Roots & Tubers	
Arrow root flour	334
Parsnip	101
Sweet potato	120
Tapioca	157
Yam ordinary	111
Yam wild	110
Other vegetables	
Beans, scarlet runner	158
Jack fruit, seeds	133
Karonda (dry)	364
Lotus stem (dry)	234
Sundakai (dry)	269
Water chestnut (fresh)	115
Water chestnut (dry)	330
Fruits	
Apricot (dry)	306
Avacado pear	215
Banana	116
Bael fruit	116
Currants, red	316
Dates (dried)	317
Dates fresh	144
Mahua (ripe)	111
Raisins	308
Seetaphal	104
Wood apple	134

Source: Nutritive Value of Indian Foods, 2006

Annexure - 8

Approximate Calorific Value of Some Cooked Preparations

Preparation	Quantity for one serving	Calories (Kcal)
1. Cereal		
Rice	1 cup	170
Phulka	1 No.	80
Paratha	1 No.	150
Puri	1 No.	80
Bread	2 slices	170
Poha	1 cup	270
Upma	1 cup	270
Idli	2 Nos.	150
Dosa	1 No.	125
Kichidi	1 cup	200
Wheat porridge	1 cup	220
Semolina porridge	1 cup	220
Cereal flakes with milk (corn/wheat/rice)	1 cup	220
2. Pulse		
Plain dhal	½ cup	100
Sambar	1 cup	110
3. Vegetable		
With gravy	1 cup	170
Dry	1 cup	150
4. Non-Vegetarian		
Boiled egg	1 No.	90
Ommelette	1 No.	160
Fried egg	1 No.	160
Mutton curry	¾ cup	260
Chicken curry	¾ cup	240
Fish fried	2 big pieces	190
Fish cutlet	2 Nos.	190
Prawn curry	¾ cup	220
Keema kofta curry	¾ cup (6 small koftas)	240

Preparation	Quantity for one serving	Calories (Kcal)
5. Savoury snacks		
Bajji or pakora	8 Nos.	280
Besan ka pura	1 No.	220
Chat (Dahi-pakori)	5 pieces	220
Cheese balls	2 Nos.	250
Dahi vada	2 Nos.	180
Vada	2 Nos.	140
Masala vada	2 Nos.	150
Masala dosa	1 No.	200
Pea-kachori	2 Nos.	380
Potato bonda	2 Nos.	200
Sago vada	2 Nos.	210
Samosa	1 No.	200
Sandwiches (butter - 2tbsp)	2 Nos.	200
Vegetable puff	1 No.	200
Pizza (Cheese and tomato)	1 slice	200
6. Chutneys		
Coconut/groundnuts/til	2 tbsp	120
Tomato	1 tbsp	10
Tamarind (with jaggery)	1 tbsp	60
7. Sweets and Desserts		
Besan barfi	2 small pieces	400
Chikki	2 pieces	290
Fruit cake	1 piece	270
Rice puttu	½ cup	280
Sandesh	2 Nos.	140
Double ka meetha	½ cup	280
Halwa (kesari)	½ cup	320
Jelly/Jam	1 tbsp	20
Custard (caramel)	½ cup	160
Srikhand	½ cup	380
Milk chocolate	25 g	140
Ice-cream	½ cup	200

Preparation		Quantity for one serving	Calories (Kcal)
8. Beverages			
Tea	(2 tsp sugar + 50 ml toned milk)	1 cup	75
Coffee	(2 tsp sugar + 100 ml)	1 cup	110
Cow's milk	(2 tsp sugar)	1 cup	180
Buffalo's milk	(2 tsp sugar)	1 cup	320
Lassi	(2 tsp sugar)	1 cup/glass (200 ml)	110
Squash		1 cup/glass	75
Syrups (Sharabats)		1 cup/glass	200
Cold drinks		1 bottle (200 ml)	150
Fresh lime juice		1 glass	60

Annexure - 9

ALA Content of Foods (g/100g)

Foods	(g)ALA
Cereal/Millet	
Wheat & Pearl millet (bajra)	0.14
Pulses	
Blackgram (kala chana), kidney beans (rajmah) & cowpea (lobia)	0.5
Other pulses	0.16
Vegetables	
Green leafy	0.16
Other Vegetables	0.025
Fruits	0.025
Spices	
Fenugreek seed (methi)	2.0
Mustard (sarson)	10.0
Unconventional	
Flaxseed (alsi)	20.0
Perilla seeds (Bhanjira)	33.0

Annexure - 10a

SAMPLE MEAL PLAN FOR ADULT MAN (SEDENTARY)

Meal Time	Food Group	Raw	Cooked Recipe	Servings Amounts
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	15 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	70 g	Breakfast Item	
	Pulses	20 g		
Lunch	Cereals	120 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	120 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish

Use 35 g visible fat per day.

Breakfast Items: Idli - 4 Nos. / Dosa - 3 Nos. / Upma - 1-1/2 Cup / Bread - 4 Slices/ Porridge - 2 Cups / Corn flakes with milk - 2 Cups.

Snacks: Poha - 1 Cup /Toast - 2 Slices /Samosa - 2 /Sandwiches-2 /Biscuits - 5.

Annexure - 10b

SAMPLE MEAL PLAN FOR ADULT WOMAN (SEDENTARY)

Meal Time	Food Group	Raw Amounts	Cooked Recipe	Servings
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	10 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	50 g	Breakfast Item	
	Pulses	20 g		
Lunch	Cereals	100 g	Rice	1 Cup
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	100 g	Rice	1 Cup
			Phulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

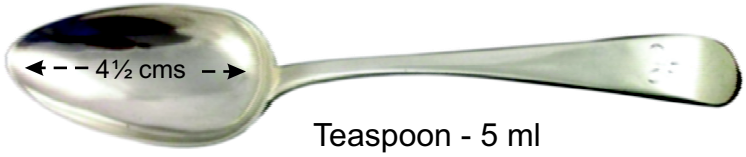
1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish
Use 25 g visible fat per day.

Breakfast Items: Idli - 3 Nos. / Dosa - 2 Nos. / Upma - 1 Cup / Bread - 3 Slices / Porridge - 1-1/2 Cups / Corn flakes with milk - 1-1/2 Cup.

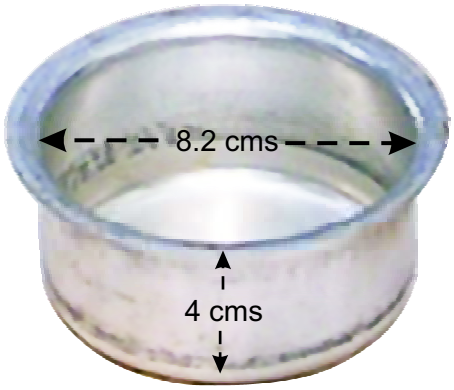
Snacks: Poha - 1 Cup / Toast - 2 Slices/Samosa - 2 / Sandwiches-2 /Biscuits - 5.

SIZE OF TEASPOON, TABLESPOON AND CUP



Teaspoon - 5 ml

Tablespoon - 15 ml



Cup 200 ml

Annexure - 11

PORTION SIZES AND MENU PLAN

Portion Size of Foods (raw) and Nutrients

	g/Portion	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Cereals & millets	30	100	3.0	20	0.8
Pulses	30	100	6.0	15	0.7
Egg	50	85	7.0	-	7.0
Meat/chicken/ fish	50	100	9.0	-	7.0
Milk (ml)[@] & milk products	100	70	3.0	5	3.0
Roots & Tubers	100	80	1.3	18	-
Green leafy vegetables	100	46	3.6	-	0.4
Other vegetables	100	28	1.7	-	0.2
Fruits	100	40	-	10	-
Sugar	5	20	-	5	-
Fat & Oils (visible)	5	45	-	-	5.0

The balanced diets are given as multiples of these portion sizes

[@] Toned milk.

Annexure - 12

EXERCISE AND PHYSICAL ACTIVITY

Individuals over the age of 20 years should undertake a minimum of 30-45 minutes of physical activity of moderate intensity (such as brisk walking 5-6 km/hr) on most, if not all, days of the week. Greater health benefits can be obtained by engaging in physical activity of longer duration or more vigorous intensity (such as jogging, running, cycling and swimming).

Sedentary people embarking on a physical activity programme should undertake a moderate intensity activity of short duration to start with and gradually increase the duration or intensity. Other day-to-day activities like walking, housework, gardening, will be beneficial not only in weight reduction but also for lowering of blood pressure and serum triglycerides. It also elevates HDL (good) cholesterol in blood. Simple modification in lifestyle like deliberately climbing up the stairs instead of using the lift and walking for short distance instead of using a vehicle could also immensely help in increasing our physical activity.

Exercise programme should include 'warm up' and 'cool down' periods each lasting for 5 minutes. During exercise, the intensity of exercise should ensure 60-70% increase in heart rate.

Previously inactive men over the age of 40 years, women over the age of 50 years and people at high risk for chronic diseases like heart disease and diabetes should first consult a physician before engaging in a programme of vigorous physical activity such as running and swimming.

*ENERGY EXPENDITURE ON VARIOUS PHYSICAL ACTIVITIES (Kcal/hr)

Activity	Kcal/hr
Cleaning/Mopping	210
Gardening	300
Watching TV	86
Cycling	
15 (Km/hr)	360
Running	
12 (Km/hr)	750
10 (Km/hr)	655
8 (Km/hr)	522
6 (Km/hr)	353
Walking 4 (Km/hr)	160

Activity	Kcal/hr
Shuttle	348
Table Tennis	245
Tennis	392
Volley Ball	180
Dancing	372
Fishing	222
Shopping	204
Typing	108
Sleeping	57
Standing	132
Sitting	86

* Approx. energy expenditure for 60 Kg reference man. Individuals with higher body weight will be spending more calories than those with lower body weight. Reference woman (50 kg) will be spending 5% less calories.

CALORIES USED

A 60-kg man will use the number of calories listed doing each activity below. A person who weighs more will use more calories, and someone who weighs less will use fewer calories.

ENERGY COSTS OF PHYSICAL ACTIVITIES

Activity Zones	Examples of Activities	Energy (Kcal/min)
1	Sleeping, Resting, Relaxing	1.0
2	Sitting, Sitting (Light Activities); Eating, Reading Writing, Listening, Talking	1.5
3	Standing, Standing (Light Activity); Washing Face, Shaving Combing, Watering Plants	2.3
4	Walking (Slow), Driving, Dusting, Bathing Dressing, Marketing, Childcare	2.8
5	Light manual work, sweeping, cleaning utensils, washing clothes, other house chores	3.3
6	Warm-up & recreational activities, walking up/ down stairs, cycling, fetching water	4.8
7	Manual work (moderate pace), Loading/unloading, Walking with load, Harvesting, Carpentry, Plumbing	5.6
8	Practice of Non-competitive sport/ Games, Cycling (15 kmph), Gymnastics, Swimming, Digging	6.0
9	High intense manual work & sports activities–Tournaments, Wood cutting, Carrying heavy loads, Running, Jogging	7.8

Forty five minutes per day of moderate intensity physical activity provides many health benefits. However, even greater health benefits can be gained through more vigorous exercise or by staying active for a longer time. This also burns more calories. Regardless of the activity being selected, one can do it all at once or divide it into two or three parts during the day.

Annexure - 13

Drinking water standards

Sl.No.	Parameters	Prescribed by			
		BIS (IS 10500-91)		ICMR	
		Desirable Limit	Max. permissible Limits in the absence of alternate source	Desirable Limit	Max. permissible limits
1	2	3	4	5	6
1	P^H	6.5 to8.5	No relaxation	7.0 – 8.5	6.5 – 9.2
2	Total dissolved solids mg/L	500	2000	500	1500-3000
3	Total hardness as CaCO3 mg/L	300	600	300	600
4	Calcium as Ca mg/L	75	200	75	200
5	Magnesium as Mg mg/L	30	100	50	-
6	Chloride as Cl mg/L	250	1000	200	1000
7	Sulphate as SO4 mg/L	200	400	200	400
8	Nitrate as NO3 mg/L	45	100	20	100
9	Iron as Fe mg/L	0.3	1	0.1	1
10	Fluoride as F mg/L	1	1.5	1	1.5
11	Arsenic as As mg/L	0.05	0.05	-	0.05
12	Manganese as Mn mg/L	0.1	0.3	0.1	0.5
13	Zinc as Zn mg/L	5	15	0.1	5
14	Copper as Cu mg/L	0.05	1.5	0.05	1.5
15	Chromium as Cr mg/L	0.05	0.05	-	-
16	Lead as Pb mg/L	0.05	0.05	-	0.5
17	Mercury as Hg mg/L	0.001	0.001	-	0.001
18	Cadmium as Cd mg/L	0.01	0.01	-	0.01
19	Cyanide as CN mg/L	0.05	0.05	-	0.05
20	Minerals Oil mg/L	0.01	0.03	-	-
21	Phenolic compounds mg/L	0.001	0.002	-	-
22	Total Coliform MPN/100 ml	1	10	-	-
23	Residual free chlorine mg/L	0.2	-	-	-
24	Aluminium as A1 mg/L	0.03	0.2		
25	Boron as B mg/L	1	5		
26	Selenium as Se mg/L	0.01	-		
27	Pesticides	Absent	0.001		

Source: http://indiawaterportal.org

Annexure - 14

REMOVAL OF THE PESTICIDE RESIDUES FROM THE FOOD PRODUCTS BY DIFFERENT METHODS

Most of the pesticide residues can be removed by adopting four methods of residues removal. These methods should be easily adopted at the house hold level to remove the pesticide residual contamination. These methods are washing, blanching, peeling and cooking.

Washing

The first step in the removal of pesticide residues from the food products is washing. Washing with 2% of salt water will remove most of the contact pesticide residues that normally appear on the surface of the vegetables and fruits. About 75-80% of pesticide reduces are removed by cold water washing.

The pesticide residues that are on the surface of the grapes, apples, guava, plums, mangoes, peaches, pears etc, fruity vegetables like tomatoes, brinjal, okra require 2-3 washings. The green leafy vegetables must be washed thoroughly. The pesticide residues from green leafy vegetables is removed satisfactorily by normal processing such as washing blanching and cooking.

Blanching:

A short treatment in hot water or steam applied to most of the vegetables. Certain pesticide residues can effectively be removed by blanching. But before blanching it is very important to thoroughly pre-wash the vegetables & fruits etc.

Peeling

Both systemic and contact pesticides that appear on the surface of the fruits and vegetables can be removed by peeling. Steps such as concentration, dehydration, and extraction from the raw product can further reduce pesticide residues in the end product. The net influence of processing almost always results in minimal residues in processed food.

Cooking

Animal Products

Animal products are also the major source of contamination for pesticide residues in human diets since the animals feed on fodder, which are sprayed with pesticides. Pressure cooking, frying and baking will remove pesticide residues from the animal fat tissues.

Dairy products

Boiling of milk at elevated temperatures will destroy the persistent pesticide residues.

Vegetable Oils

Refined oils will have fewer amounts of pesticide residues. Household heating of oils up to a particular flash point will remove pesticide residues.

Annexure - 15

SOME NUTRIENT-RICH FOODS

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Energy	Cereals and Tubers	Rice, wheat and tapioca	340 Kcal
	Nuts and Oilseeds	Almond, cashewnut, dry coconut and groundnut	600 Kcal
	Vegetable oil, ghee and *Vanaspati*		900 Kcal
Protein	Pulses and Legumes	Bengalgram, blackgram, greengram, lentil and redgram	22 g
	Nuts and Oilseeds	Groundnuts, cashewnuts and almond	23 g
	Fish		20 g
	Meat and Poultry	Meat Egg white	22 g 11 g
	Milk products	Cheese, *khoa*, skimmed milk powder (cow) and whole milk powder (cow)	30 g
Beta-Carotene	Leafy vegetables	*Ambat chukka*, coriander leaves, *ponnaganti,* spinach, leaves, mint, radish leaves	2-6 mg
		Some other leafy vegetables like agathi, amaranth, curry leaves, fenugreek leaves and *gogu*	7-15 mg.
	Other vegetables	Pumpkin and green chillies Carrot	1 mg 6.5 mg
	Fruits	Ripe mango Papaya	2.0 mg 0.9 mg
Folic Acid	Green leafy vegetables	Amaranth, *ambat chukka*, mint and spinach	120 µg
	Pulses	Bengalgram, blackgram, greengram and redgram	120 µg
	Oilseeds	Gingelly and soyabean	180 µg

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Iron	Green leafy vegetables	Amaranth, bengalgram leaves, cauliflower greens and radish leaves	18-40 mg
Calcium	Cereals and Legumes	Ragi, bengalgram (whole), horsegram (whole), rajmah and soyabean	200-340 mg
	Green leafy vegetables	Amaranth, cauliflower greens, curry leaves, knol-khol leaves	500-800 mg
		Agathi	1130 mg
		Colocasia leaves	1540 mg
	Nuts and Oilseeds	Coconut dry, almond, mustard seeds and sunflower seeds	130-490 mg
		Gingelly seeds	1450 mg
		Cumin seeds	1080 mg
	Fish	Bacha, katla, mrigal, pran and rohu	320-650 mg
	Milk and Milk Products	Buffalo's milk, cow's milk, goat's milk, curds (cow's)	120-210 mg
		Cheese, *khoa*, skimmed milk powder and whole-milk powder	790-1370 mg
Vitamin C	Green leafy vegetables	Agathi, cabbage, coriander leaves, drumstic leaves, knol-khol greens	120-220 mg
	Other vegetables	Giant chillies *(capsicum)*	137 mg
		Green chillies	117 mg
	Fruits	Amla	600 mg
		Guava	212 mg
Fibre	Pulses and Legumes	Wheat, jowar, bajra, ragi, maize, legumes, dhals and fenugreek seeds	>10 g

Nutrients	Food Groups	Foods	Nutrient Content Unit/100 g edible portion
Vitamin A	Fats and edible oils	Butter, ghee (cow milk) and hydrogenated oil (fortified)	700 μg
Riboflavin	Cereal grains and products	Bajra, barley, ragi, wheat germs and wheat bread (brown)	0.2 μg
	Pulses and legumes	Bengalgram, blackgram, greengram, lentil, red-gram and soyabean	0.2 mg
	Leafy vegetables	Amaranthus, carrot leaves, colacasia leaves, curry leaves, fenugreek leaves, gogu, mint, radish leaves and spinach	0.25 mg
	Nuts and Oilseeds	Gingelly seeds, mustard seeds, niger seeds, sunflower seeds, almond and walnut	0.3 mg
	Condiments and spices	Chillies dry, chillies green, coriander and cumin seeds	0.35 mg
	Fruits	Apricot dried and papaya	0.23 mg
	Meat and poultry	Egg (hen)	0.26 mg
		Sheep's liver	1.7 mg
	Milk and milk products	Skimmed milk powder and whole milk powder (cow's milk)	1.5 mg

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GLOSSARY

Allergic reaction : Immunologically induced tissue response to a foreign substance (allergen).

Alpha-linolenic acid : 18 carbon fatty acid with three double bonds; the first double bond is on the third carbon atom from the methyl end and therefore it is called n-3 fatty acid. It is abbreviated as 18: 3 n-3.

Amino acid : The fundamental building block of proteins.

Anabolism : Process by which complex materials in tissues and organs are built up from simple substances.

Antioxidants : A group of substances that prevent the damage caused by the oxidation of fatty acids and proteins by oxygen free radicals.

Atherosclerosis : Gradual deposition of fatty materials and fibrous tissues in the inner lining of the arteries with eventual obstruction of blood flow.

Balanced Diet : A diet containing all essential (macro and micro) nutrients in optimum quantities and in appropriate proportions that meet the requirements.

Beta-Carotene : A yellow - orange plant pigment which yields vitamin A by oxidation in the body.

Bifidus factor : A substance in human milk which stimulates the growth of a micro-organism (*Lactobacillus bifidus*) in the infants' intestine.

Body Mass Index : Body weight in relation to height. Body weight in kilograms divided by height in metres^2.

Calorie : Unit used to indicate the energy value of foods. Quantitative requirements are expressed in terms of energy, i.e., kilocalories (Kcals). Newer unit for energy is Kjoules.

Catabolism : Process of breakdown of complex organic constituents in the body.

Cataract : An opacity of the lens of the eye resulting in impaired vision.

Cholesterol : A lipid constituent of blood and tissues derived from diet as well as from synthesis within the body.

Cirrhosis : Inflammation and scarring of liver tissues resulting in impaired liver function.

Colostrum : The milk produced by mammals during the first few days after delivery.

Congenital anomalies : Deformities existing at birth or even before.

Coronary heart disease : A disease of the heart due to inadequate blood supply as a result of narrowing/obstruction of coronary arteries which nourish heart muscle.

CU : Consumption Unit. One unit represents Recommended Dietary Allowance of energy for a sedentary man.

Diabetes mellitus : A disease in which the blood glucose is increased and the body tissues cannot use glucose properly.

Diverticular disease : The presence of many pouches or sac-like protrusions on the wall of the intestine.

Empty calories : Term used for foods that provide only energy without any other nutrient, eg. white sugar and alcohol.

Enzymes : Biological catalysts which enhance the rate of chemical reactions in the body.

Essential fatty acids (EFA) : Fatty acids like linoleic acid and alpha linolenic acid which are not made in the human body and must be supplied through the diet.

Fatty acids : Fundamental constitutents of many lipids.

Fibre : Collective term for the structural parts of plant tissues which are resistant to the human digestive enzymes.

Flavonoids : Pigments widely distributed in nature in flowers, fruits and vegetables.

Food Exchange : Foods are classified into different groups for exchange. Each “exchange list” includes a number of measured foods of similar nutritive value that can be substituted inter-changeably in meal plans.

Free radicals : Highly reactive oxygen-derived species formed in the body during normal metabolic processes. They have the capacity to damage cellular components by oxidation.

Haemorrhoids : Commonly known as piles.

High-density lipoproteins (HDL) : These transport cholesterol from the extra-hepatic tissues to the liver. They are anti-atherogenic.

Hormones : Substances produced by a gland (endocrine) which are secreted directly into the blood stream to produce a specific effect on another organ.

Hyperlipidemia : An increase in the concentration of blood lipids (triglycerides and cholesterol).

Invisible fats : Fat present as an integral component of plant and animal foods such as in cereals, legumes and spices.

Ischaemia : Lack of blood supply to an organ or tissue resulting in reduced oxygen supply, caused either by constriction or obstruction of the blood vessel.

Lactoferrin : Minor protein of milk containing iron.

Lactose intolerance : Disorder resulting from improper digestion of milk sugar called lactose, due to lack of an enzyme, lactase, in the intestinal mucosa.

Linoleic acid : Fatty acid containing 18 carbon atoms and two double bonds. The first double bond is on the sixth carbon atom from the methyl end. Therefore it is called n-6 fatty acid and is abbreviated as 18:2 n-6.

Lipids : A technical term for fats. They are important dietary constituents. The group includes triglycerides, steroids, cholesterol and other complex lipids.

Lipoproteins : Lipids are not soluble in blood; they are therefore transported as lipid and protein complexes.

Low-density lipoproteins (LDL) : These transport cholesterol from the liver to tissues. High blood levels indicate that more cholesterol is being transported to tissues.

Macrocytic anaemia : Anaemia characterized by red blood cells which are larger than normal.

Macronutrients : Nutrients like carbohydrates, proteins and fats which are required in large quantities .

Metabolism : Includes catabolism and anabolism.

Microcytic anaemia : Anaemia characterized by red blood cells which are smaller than normal.

Micronutrients : Nutrients which are required in small quantities, such as vitamins and trace elements.

Monounsaturated fatty acids : Unsaturated fatty acids with one double bond.

n-6 PUFA : Linoleic acid and its longer chain polyunsaturated fatty acids are collectively called n-6 PUFA.

n-3 PUFA : Alpha-linolenic acid and its longer-chain polyunsaturated fatty acids are collectively called n-3 PUFA.

Osteoporosis : A condition of abnormal porousness or thinning of bones.

Phytochemicals : General name for chemicals present in plants.

Polyunsaturated fatty acids (PUFA) : Unsaturated fatty acids with two or more double bonds.

Processed foods : Foods that are produced by converting raw food materials into a form suitable for eating.

Pre-eclampsia: A toxemic condition of late pregnancy characterized by increased blood pressure, swelling of feet and excretion of protein in the urine.

Protein Energy Malnutrition (PEM) : A marked dietary deficiency of both energy and protein resulting in undernutrition.

Recommended Dietary Allowances (RDA) : The amounts of dietary energy and nutrients considered sufficient for maintaining good health by the people of a country.

Refined foods : Foods which have been processed to improve their appearance, colour, taste, odour or keeping quality.

Saturated fatty acids : Fatty acids containing maximum number of hydrogen atoms that each carbon atom can carry. They do not have double bonds.

Satiety : Feeling of satisfaction after food intake.
Stroke : Popular term for cerebro-vascular disease, a sudden condition that arises from blocking or bleeding of blood vessels in the brain, resulting in paralysis.

Thrombosis : The condition in which the blood changes from a liquid to a semi-solid state and produces a blood clot (thrombus) which blocks blood flow.

***Trans*-fatty acids** : Are mainly produced during hydrogenation of oils; a few also occur naturally in very small quantities.

Triglycerides (Neutral fat) : The major type of dietary fat and the principal form in which energy is stored in the body. A complex of fatty acids and glycerol.

Unsaturated fatty acids : Fatty acids in which there is a shortage of hydrogen atoms. The carbon atoms then become linked by double bonds. Unsaturated fatty acids are less stable than saturated fatty acids.

Visible fats : Fats and oils that can be used directly or in cooking.

Weaning foods : Foods which are used during gradual transition of the infant from breast-feeding to a normal diet.