

Dr. Amita's Pocket Guide for Clinical Nutrition

Dr.Amita Golande





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Preface

The modern world is becoming health & diet conscious day by day with the increasing number of health issues. Supermarkets are flooded with foods of varied kinds, challenging their nutritive value. The print and electronic media are sharing nutrition related news to the public. The common man is turning towards nutrition specialists to seek scientific information. Hence it is essential to understand the science of nutrition and dietetics by common people as well as the health care professionals.

Food behaves differently in health and diseases. Nutritional deficiencies are increasing especially in women due to improper digestion and assimilation of foods. Prevention of these non-communicable diseases can be achieved through healthy eating behaviors.

This book is meant to learn about importance of nutrition, normal nutritional requirement, different nutrition related diseases, their implications on health and how science of nutrition can be useful in treating different diseases.

I earnestly hope that the contents of this book shall largely benefit the readers in their understanding and practicing right diet.

INTRODUCTION

Food is basic necessity of life. Food has powerful yet complex effect on health.

Health is defined by World Health Organization (WHO), as a state of complete physical, mental and social

well-being and not merely the absence of disease and infirmity.

Dietetics is a science that deals with adequacy of nutrients during normal life cycle and modifications required during diseased conditions. There have been many evolutions since centuries in field of nutrition. First Vitamins were isolated and chemically defined in 1926, then began the study of single nutrition deficiency. Research on role of Nutrition in complex. Non communicable chronic diseases (NCD) such as, cardiovascular diseases, diabetes, obesity, thyroid disorders, PCOD, cancers etc. is accelerating over past two to three decades. The new science of single nutrient deficiency diseases led to fortification of selected staple foods with micronutrients such as iodine in salt, iron in wheat flour and bread. Foods around the world have been fortified with calcium, phosphorous, iron and specific vitamins (A, B, C, D), depending on the composition of local staple foods. (History of modern nutrition science – implications for current research, dietary guidelines and food policy: ncbi.nlm.nih.gov)

Owing to rapid urbanization, which has led to an overall economic rise, prevalence and risk of Non-Communicable Diseases (NCD), have been increased rapidly. An aspect of personal behavior or lifestyle, an environmental exposure or heredity is associated with increase in occurrence of these diseases. These factors associated with increased fat intake, increased sodium intake, low fruit vegetable intake is found to be responsible for high mortality and morbidity rates in India.

During earlier times, nutrition was practiced by the Vaidya's (physician) as they are termed in Ayurveda. Every patient was asked to follow certain dietary practices till complete recovery. This was known as "Pathya" (dietary management). Many do's and don'ts were prescribed which were tailored to suit his health and constitution. The role of diet as a treatment therapy is increasing day by day with newer advancements, experiments and experiences.



This book is written to understand the basics of Nutrition and a practical guide to diet and its application.

About Dr. Amita

Dr. Amita is being practicing classical homeopathy and have a wealth of experience in this great field for 12 years. She has obtained Master's degree in Nutrition and Dietetics from Symbiosis University of Health Sciences. Having very strong experience in the field of Homoeopathy, Nutrition & Dietetics, Gynaecology, Diabetes and Psychology, she has touched thousands of lives.

She is a firm believer of homeopathic principles and have had the privilege to treat numerous patients including various Behavioural, Emotional and Psychological problems, menstrual problems, PCOD, Hormonal imbalance, Thyroidism etc. in women without any kind of side effects. She has successfully treated patients not

only from India but from overseas. Dr. Amita served in London (UK) for 2 years.

She runs online Nutrition workshops for health care professionals and also conducts webinars for women and child health.

She is socially affiliated with Rayat Shikshan Sanstha & other Social Institutes through Oasis Counsellors.

Change in lifestyle has made India capital of diabetes and obesity due to increased metabolic disorders especially in affluent society. Dr. Amita had extensively worked for Sports Diet and nutrition and **National Diabetes Educator Program** and she has developed fantastic techniques through experience on how diet and homeopathy can bring about holistic healing in Obese and Diabetic patients. Many diseases are manifestations of nutritional deficiencies in body. In such cases proper guidance on food intake is must.

She has guided many students for developing themselves physically and mentally by providing them nutritious diet plans solving health related issues with homeopathy. Apart from this she has also guided them for their careers after conducting IQ tests.

Her experience in all fields has helped her clients in all aspects for their betterment.

An Idea behind writing this book is to know how improper and unbalanced dietary habits have become one of the important factors in causation of Non communicable Diseases, which are rising at an alarming rate. Also, to understand how Nutrition counselling and diet therapy has become the integral part of disease management.

Contents

1) NUTRITION

Basics of Nutrition.....	08
Signs of good Nutritional status.....	08
Signs of poor Nutritional status.....	09
Guidelines for good health.....	09
Food Guide Pyramid.....	10
What are Nutrients?	13

UNDERSTANDING BODY AND ITS METABOLISM

Body composition And Assessment of Nutritional Status.....	18
Basal Metabolic Rate (BMR).....	21
Recommended Dietary Intake Allowance (RDA).....	23
Menu Planning	30
Structure and Function of Digestive System	34

NUTRIENTS AND THEIR ROLE

Macronutrients and their role	37
Micronutrients and their role	37
Food Groups	29
Exchange list System	32

DIET THERAPY

Obesity	65
Diabetes	76
PCOD	91
Thyroid Disorders	96
Cardiovascular diseases	98

DIET DURING DIFFERENT STAGES OF LIFE

Nutritional Requirement for Pre- school children (1-6 years)....	105
Picky Eating behavior	
Nutritional Requirement for School children (6-12 years).....	110
Nutritional Requirement for Adolescents	112

MENU PLANNING AND MEAL PREPARATION FOR FAMILY

Diet and Nutrition Counselling	120
Role of Nutrition expert	121

Basics of Nutrition



Introduction to Nutrition

Definitions:

Nutrition is defined as the science of food and its interaction with body to promote health.

Optimum Nutrition means that the person is receiving and utilizing essential nutrients in proper proportions as required by the body.

Nutritional status is a condition of body that is related to consumption, utilization (digestion and absorption and metabolism) of food.

Good Nutritional status refers to intake of well-balanced diet to supply all the nutrients needed by the body.

Poor Nutritional status refers to inadequate or even excessive intake or poor utilization of nutrients to meet body's requirements.

Malnutrition refers to physical effects of inadequate or excessive quantity or quality of foods on body.

Under nutrition means low food intake. It depends on each individual Basal Metabolic Rate (BMR).

Over nutrition is defined as excessive intake of nutrients that can have adverse effect on body. (e.g.: obesity caused due to excess carbohydrates and fats).

Signs of Good Nutritional Status:

A person with good nutritional status shows following features:

- ✓ Shiny hair
- ✓ Smooth skin
- ✓ Clear eyes
- ✓ An alert expression on face
- ✓ Correct weight in relation to height
- ✓ Good stamina
- ✓ Good resistance to disease (Immunity)
- ✓ Well -developed physical and mental responses.

Signs of poor Nutritional status

- ✓ Lifeless hair
- ✓ Dull eyes
- ✓ Easy fatigability
- ✓ Very little stamina
- ✓ Poor vitality
- ✓ Grossly overweight or underweight
- ✓ Subclinical nutritional deficiencies

- ✓ Three important aspects namely those of diet, sleep and elimination habits are irregular

Guidelines for good health

- ✓ Maintain regularity in routine.
- ✓ Eat as much natural foods as you can.
- ✓ Consume seasonal foods as much as possible.
- ✓ Eat well but do not overeat.
- ✓ Avoid excessive salt, sugar, spices.
- ✓ Eat foods that contain carbohydrates, especially starch and fibers.
- ✓ Avoid oily foods that contain large amount of cholesterol and saturated fats.
- ✓ Include variety of foods in diet.
- ✓ Watch your weight and maintain ideal body weight.

Food Guide Pyramid (My Pyramid)

Food Guide Pyramid was formulated by U S Department of Agriculture in 1992.

It was designed to help people choose the foods and amounts that are right to them to balance their daily physical activity.

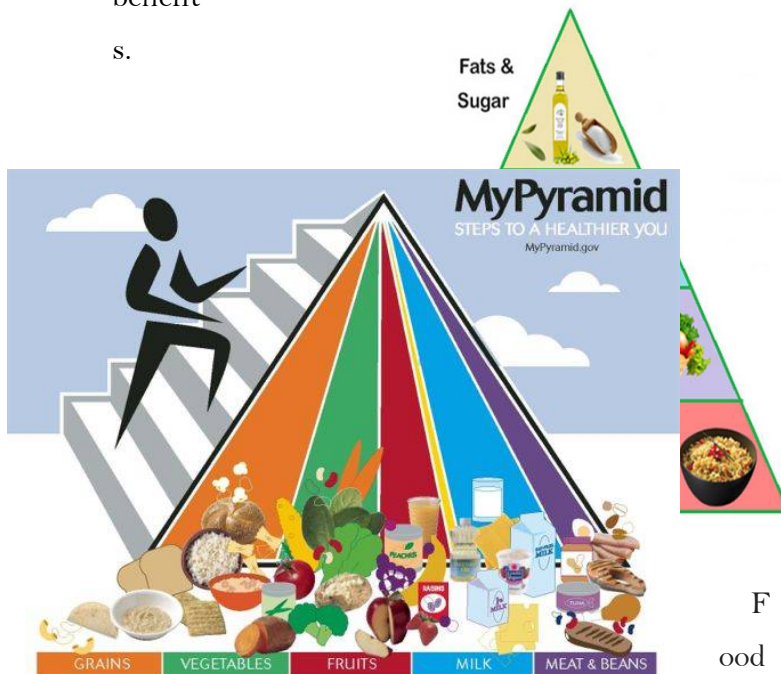
It is applicable after the age of 2 years.

Properties of Food Guide Pyramid:

- 1) Be active: The person climbing the stairs reminds consumers to include physical activity in day to day life.
- 2) Vary your choices depending on body's requirement.
- 3) Think in proportions
- 4) Make moderation of foods in mind: the wider the base stands for food, with little or no fats or sugars should be eaten more. The narrower tip stands for foods with more added sugars, free sugars and fats to be consumed the least.

- 5) Improve gradually: small steps should be taken for healthier eating behavior. Small steps add up to big benefit

s.

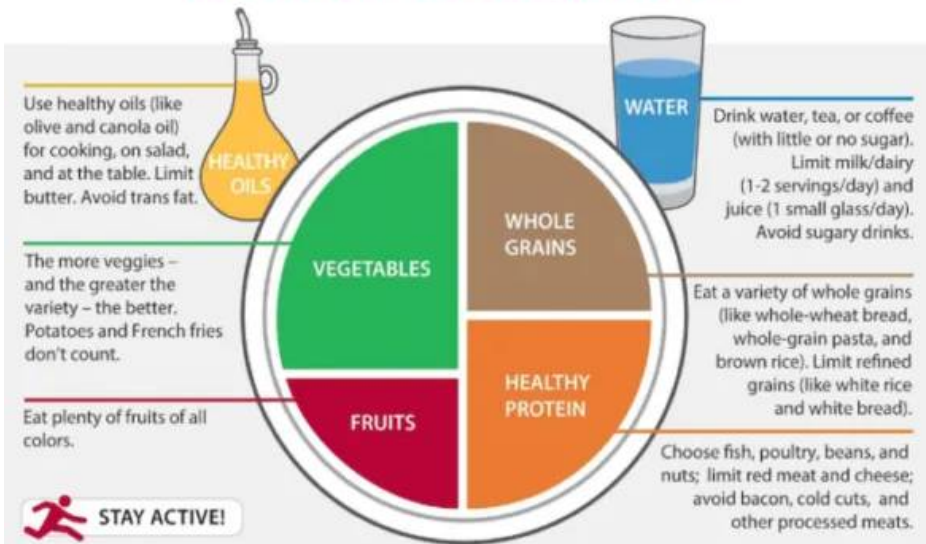


F
ood

Pyramid shows the optimal servings to be consumed each day from different food groups. The Food Pyramid was first formulated and published in Sweden in 1974. The 1992 pyramid introduced by United States Department of Agriculture (USDA) was called the "Food Guide Pyramid" or "Eating Right Pyramid". In 2005, the name given to the Pyramid was "My Pyramid", which was further change to "My Plate" in 2011.

Food Plate Model

HEALTHY EATING PLATE



Healthy Eating Plate is a conceptual plate created by a Team of experts at the Harvard School of Public Health and Harvard Medical School. They prepared conceptual plate which shows the proportions in which various foods should be included to obtain optimum nutrients.

The above image helps to understand the idea of the Healthy Eating Plate.

Benefits of food plate:

- This plate helps to choose healthiest foods in the market.
- Enables to plan meals without counting on calories.
- Helps stay away from unwanted unhealthy foods
- Lead healthy life in simpler way

Plate consists of foods distributed in following ways:

- ❖ **Whole grains:** One quarter of the plate contains whole grains. Choice of grains will depend on the geographical distribution. E.g. whole wheat, jowar, bajra, brown rice etc. Avoid white rice as it has high glycaemic index.

- ❖ **Proteins:** About 1 quarter of plate consist of healthy proteins obtained from healthy sources like pulses, legumes, eggs, meat, cheese, milk and milk products etc. Unhealthy proteins obtained from processed foods should be avoided.
- ❖ **Fats:** Oil is denoted by a small bottle on the left side of the plate. Olive oil is advised as s source of fats. Unhealthy saturated fats should be avoided.
- ❖ **Vegetables:** They occupy the most part of the plate. Vegetables are rich in fibres especially green leafy vegetables. Steamed vegetables can be consumed as salads.
- ❖ **Fruits:** Fruits of all variety can be made a regular part of meals. All fruits are rich in different vitamins, minerals, antioxidants and fibres. Fresh seasonal fruits are advisable to eat.
- ❖ **Water:** Pure drinking water is advisable to drink during meals. Carbonated beverages, milk, milk shakes, coffee or tea should be avoided.

Since the energy requirements of every individual are different it is important to decide the portion sizes depending on the energy requirement of that individual.

Quality of foods is given more importance than quantity. Proteins, whole grains, vegetables, fruits, oils etc. all gives energy after the process of digestion.

It doesn't matter how much carbohydrates you are eating (high or low). What really matters is the type of carbohydrates that you're eating. This is simply because there are some good sources of carbohydrates (as shown in the plate) as well as the bad sources of carbohydrates (like French fries, sugary drinks, potatoes etc).

Nutrients

Nutrients are chemical components that perform specific function to nourish the body. They are required in right amounts and must be eaten regularly. During adulthood nutrients are required for the purpose of energy and replacing the worn-out tissues. During Childhood nutrients are required for growth & development of cells & tissues. Nutritional requirement varies with different age group.

Functions of Nutrients:

- Supply energy to the body
- Build and repair body tissues
- Regulate body processes

Types of Nutrients:

Macronutrients: Carbohydrates, Proteins and Fats

Micronutrients: Vitamins (A, B, C, D, E, K) and Minerals (calcium, iron, potassium, sodium, magnesium, zinc)

Vit A: Retinol, Carotene

B complex vitamins: Vit B1: Thiamin

Vit B2: Riboflavin

Vit B3: Pantothenic acid

Vit B6: Pyridoxin

Niacin: Nicotinic acid

Folacin: Folic Acid

B12: Cyanocobalamin

Vit C: Ascorbic Acid

Vit D: D2: Ergocalciferol / Calciferol

D3: Cholecalciferol activated 7-dehydrocholesterol.

Vit E: Alfa-Tocopherols (α -Tocopherols)

Carbohydrates and fats primarily supply energy to body. Proteins provide functional and structural materials and also supply energy when dietary intake of (CHO) and fats is less. Vitamins and minerals along with water help regulate the body processes such as respiration, reproduction, circulation, digestion, absorption and metabolism in body.

Vit K: Phylloquinone, Menaquinone

Understanding Body and Its Metabolism



Introduction

Body is structurally made up of organs, tissues and cells. These are made up of different chemical compounds held together in different combinations. Body is made up different elements. Major elements that constitute our body are oxygen (65%), carbon (18%), Hydrogen (10%) and nitrogen (3%). Together they constitute 96% of total body weight. Remaining 4 % of body constitutes minerals majorly calcium and phosphorous.

About 55-70% of total body weight is water. Total percentage of water in body is inversely proportional to the amount of fat. Lean adults have higher water content than obese.

About three fourth of water in the body is intracellular and remaining is extracellular. Extracellular fluid contains blood circulation, lymph, interstitial fluid that bathes all the cells.

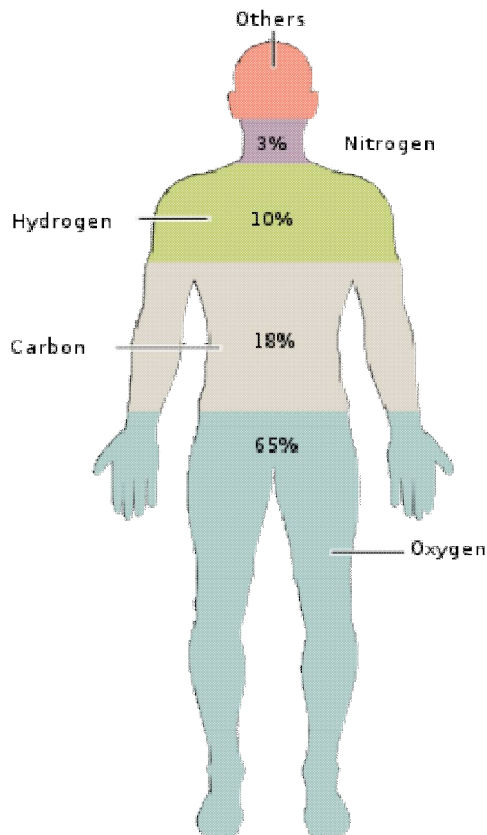
Proteins account for 18 % of body fat.

Fat content in body is 7-15% for men and 12-25% for women. Body fat excess of 20% in men and more than 30% in women is obesity.

Only about 300 gm of carbohydrate is stored in the body in the form of glycogen.

Other bodies constituents such as hormones, enzymes, vitamins are present in minor amounts and do not contribute to body weight.

Composition of body Percentage of Total Body Weight



Body Component	Man (%)	Women (%)
Protein	17.0	8.5
Fat	13.5	22.0
Carbohydrates	1.5	1.5
Water	62.0	62.0
Minerals	6.0	6.0
Total	100.00	100.00

ASSESSMENT OF NUTRITIONAL STATUS

Assessment of nutritional status is done by

1) Anthropometric measurements:

Anthropometric measurements include

- Height
- Weight
- Tricep skin fold thickness
- Arm Circumference
- Abdominal / waist circumference
- Hip circumference
- Thigh circumference
- Calf circumference



Height

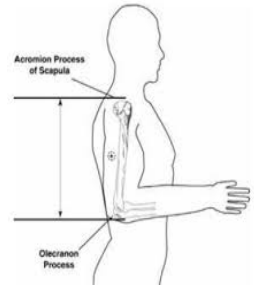


Weight



Triceps

Skinfold



Mid-

thickness

**Abdominal
Calf Circumference
Circumference**



**Hip
Circumference**



Thigh



Anthropometric measurements are the series of quantitative measurements of muscles, bone and adipose tissue used to assess the composition of body. Core elements of anthropometry are as mentioned above. These are important because they represent diagnostic criteria for obesity, which significantly increases

the risk of other diseases. There is further utility as a measure of nutritional status of children and pregnant women.

Additionally, they can be used as a baseline for physical fitness.

Equipments required are:

- Measuring tape
- Weight scale
- Stadiometer
- Knee caliper
- Skinfold calipers

Weight should be measured in kilograms. For infants and children who are unable to stand alone, first have an adult to weigh himself and zero the scale with adult standing on the scale. Then hand the child to the adult to obtain accurate weight of child.

While measuring the height one should stand with his/her heels together and weight evenly distributed.

To measure the waist circumference, the measuring tape should be placed around the

lateral aspect of each ilium at the mid axillary line.

Abdominal circumference is measured by placing the tape 2 cm above the umbilicus.

For mid arm circumference, length of arm is measured. Measurement is taken from the superior edge of spine of scapula to olecranon process of humerus. Mid -point of the two points is taken as a point of measurement.

Thigh circumference is measured at the mid -point of Iliac spine and bone of patella.

There are several skinfold sites available for measurements. Common sites include biceps, triceps, calf abdomen etc. For tricep skinfold thickness grab the skin 2 cm above the mid -point of right upper arm with thumb and index finger to create a skin fold and then place the calipers at the midpoint.

BMI calculations are the weight in kilograms divided by height in meters squared.

2) Biochemical Tests:

Blood and urine are easily available body fluids used for biochemical assessment of

nutritional status. Nutrients that are biochemically tested are proteins, Vitamins A, Vitamin D, ascorbic acid, Thiamin, riboflavin, niacin, iron, Folic acid and Vitamin B12.

Basal Metabolic Rate

Basal Metabolism represents the minimum energy required to keep up the life processes i.e. for internal functioning of body.

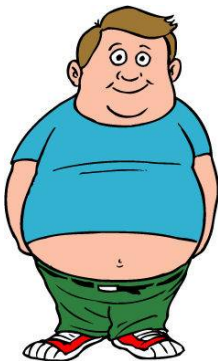
Basal Metabolic Rate (BMR):

**Rate at which the energy is supplied to body
for its vital functions.**

Factors influencing BMR:

- 1) Body size
- 2) Body composition
- 3) Age
- 4) Diet
- 5) Climate
- 6) Genetic Differences
- 7) Hormonal state
- 8) Psychological
- 9) Activity Substance
- 10) Disease





Obese – non exercising
Obese- exercising



Non obese

BMR differs in all depending on weight and lifestyle.

Calorific Value of Foods

The energy needs of the body are calculated in terms of calories or kilocalories. A calorie is the amount of heat needed to raise the temperature of one kg of water through 15 degree Celsius.

Number of calories obtained from a food is its calorific value. Every food varies in its calorific value

Sr.No.	Substance (1gm)	kcal
01	Proteins	4
02	Carbohydrates	4
03	Fats	9
04	Alcohol	7

Recommended Dietary Allowance

The requirement of nutrients in the normal diet of Indians has been recommended by a committee of experts from Indian Council of Medical Research (ICMR). These recommendations give more realistic estimates of energy requirements depending on the physical activity of an individual.

The important points regarding the RDA for Indians are as follows:

- 1) The dietary allowances suggested for adults are for reference man weighing 55kg and for reference women weighing 45kg. The allowances should be increased or decreased depending on the body's weight.
- 2) The protein allowance recommended is about 1 gm/ kg body weight per day. Proteins of animal origin have High Biological Value (HBV). It is desirable to supply about 25% of total protein requirement from animal foods such as milk, eggs, meat, fish etc.
- 3) Intake of fats should not be more than 15% of calories in diet. 15gms of total fats should be from vegetable oil to get Essential Fatty Acids (EFA)

- 4) 60-65% of total calorie requirement to be met through intake of carbohydrates.

RDA are recommendations for average daily amounts of nutrients that average population groups should be consumed over a period of time and cannot be directly applied to individual cases.

The RDA in all covers eleven nutrient factors.

Recommended Dietary allowances for an adult man and woman

Nutrient	Man (Activity levels)			Woman (Activity Levels)		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
Energy (kcal)	2425	2875	3800	1875	2225	2925
Protein (gm)	60	60	60	50	50	50
Calcium (mg)	400	400	400	400	400	400
Iron(mg)	28	28	28	30	30	30
Vit A						

Retinol(ug)	600	600	600	600	600	600
B carotene (ug)	2400	2400	2400	2400	2400	2400
Vit. B						
Thiamin(mg)	1.2	1.4	1.6	0.9	1.1	1.2
Riboflavin (mg)	1.4	1.6	1.9	1.1	1.1.3	1.5
Niacin(mg)	16	18	21	12	14	16
Pyridoxin (mg)	2	2	2	2	2	2
Vit C(mg)	40	40	40	40	40	40
Folic Acid (ug)	100	100	100	100	100	100
Vit B 12 (ug)	1	1	1	1	1	1

Source: Gopalan, B.V. Ramasastri and S.C. Balasubramanian, 1991, Nutritive value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India.
Requirement of proteins and Fats should be calculated on basis of percentage of calorie requirements.

Factors affecting RDA

The nutritional requirements are affected by several factors:

- 1) Age - Infants require more proteins per kg of body weight than adolescent, since their metabolic rate is higher than adolescent.
- 2) Sex: Adolescent girls require more iron than adolescent boys
- 3) Body size: RDA depends on height, weight, surface area, stature, BMI and Body fat composition.
- 4) Physiological state: Pregnant and lactating women require more nutritious food than normal ordinary adult women.
- 5) Clinical status of body.
- 6) Type of work: RDA depends on sedentary, moderate and heavy activity. Sedentary worker requires fewer calories than heavy worker.



Sedentary
Moderate Worker

Worker
Heavy worker

Translating RDA into daily food intake

The foods are classified systematically into various food groups in a way of translating RDA into meaningful system that can be used to plan diets and meals. This helps practically to choose foods from specific groups and bring variation to meal preparations. Thus, according to food guide foods are classified into five major groups:

1) Body building foods:

Foods those are rich in proteins and functions as a building material to cells. They are required for replacing wear and tear of cells & tissues in body.



2) Protective foods and fruits group:

These foods are rich in beta carotene and Vit C which play an important role in boosting immunity and thus help prevent infections. They are also responsible to neutralize toxic free radicals in body and thus maintain health.



3) **Other vegetables and fruits group:**

They include vegetables and fruits which provide other nutrients to body including fibers.



4) **Cereals and millets:**

Cereals and millets include edible seeds that belong to grass family. They are rich source of thiamin.



5) **Oil, fats, sugar and Jaggery group:**

This group of foods is known as fuel foods as they supply energy to body.

Oils: Oils include vegetable oils such as groundnut, mustard, sunflower, safflower, olive, soya bean, corn etc. 5 gm oil gives 45 kcal energy. 25 gm added oil can be consumed daily by healthy individual.

Fats: They include ghee, butter, vanaspati oil etc. Besides giving energy they carry fat soluble vitamins (A, D, E, K).

FATS AND OILS



Sugar: It is mainly used to sweeten beverages in India like tea, coffee, juices etc. 5 gm sugar gives 20 kcal energy. About 25 mg sugar can be consumed by healthy adult.

Jaggery: It was initially considered to be rich in iron as it used to be prepared in iron vessels. Now a days Jaggery is prepared chemically and hence it is considered as a poor source of iron.

Honey: Though honey contains has many health benefits, it gives calories equal to sugar.

Some interesting facts about Honey:

- Honey contains over 5000 different enzymes
- These enzymes have immediate detoxifying effect on body
- Detoxifying effect is multiplied many times when raw honey is taken
- It helps digest complex carbohydrates and proteins.
- Method of Consumption: take 1 spoon raw honey in cold water or luke warm water
- Flooding the body with digestive enzymes help improve digestion



Daily food guide

Food Groups	Foods	Size of serving g	No. of serving 1 serve =
1) Body building Foods	Pulses, legumes, nuts and oilseeds	30 gm	3-5 servings 1 cup dal
	Milk and milk products	150 ml	3 Servings 1 cup milk / curd
	Egg	1	1 egg
	Poultry, fish, meat	30 gm	1 medium size fish/ chicken/ meat

2) Protective foods	Green leafy vegetables	50 – 75 gm	1 or more 1 serve = half cup cooked vegetable
	Vit c rich foods (vegetables, fruits) Papaya, orange, apple, tomato etc.	50 -75 gm	1 or more serving 1 small orange/ medium tomato/ 1-2 slices of papaya
3) Other vegetables and fruits, roots and tubers	Lady finger, all gourds, sweet potato, banana, pear, peach	50 – 75 gm	2 or more serving 1 serve = half cup brinjal/ bhendi or banana

4) Cereals and millets	Jowar, bajra, maize, wheat, ragi	30 gm	6-12 servings 1 serve = $\frac{1}{2}$ cup cooked rice Or 1 medium chapati 1 slice bread 2 fulka (small)
5) Energy group	Oils and fats	5 gm	4-5 servings
	Sugar and jaggery	5 gm	4-5 servings

- 1 serving = 1 teaspoon fat/ oil
- 1 serving = 1 teaspoon table sugar

Menu Planning

Eating habits of each individual is different and it is responsibility of a dietician to respect food choices and dietary freedom while making dietary recommendations. The best way to achieve balanced diet is to plan meals in

relation to other healthy food choices. It is advisable to eat small and frequent meals rather than huge meals.

Before planning diets, assessment of client's or patient's nutritional status is done.

It includes:

- 1) Assessment of Nutritional Status**
 - a. Anthropometric Measurements**
 - b. Biochemical test**
- 2) Clinical illness if any:** History of any medical condition which can hamper nutritional status.
- 3) Food allergies:** food allergies like milk (lactose intolerance), wheat (gluten intolerance).
- 4) Any ongoing medications:** Medications may interact with different nutrients. Hence knowledge of medications person is taking is essential.
- 5) Diet Recall:** Includes regular pattern of food the patient is consuming. This will give rough idea about the calories he is consuming daily as well as food choices, likes and dislikes, pattern of eating.

Based on these parameters RDA or energy requirement is obtained and menu planning is done.



Principles of diet planning:

- 1) Foods must meet all the nutritional requirements.
- 2) Meal pattern must fulfill family needs
- 3) Meals should be easy to prepare and should save time.
- 4) Foods chosen should be nutritional and also economic.
- 5) Likes and dislikes of client should be given priority.
- 6) Planned meals should provide variety.
- 7) Meals should give satiety to avoid intermittent eating between the meals.
- 8) Menu should be planned considering availability of foods.

- 9) Functional foods should be included in diet to boost immunity and prevent recurrent infections.

Following points must be considered while planning a diet:

1. RDA should be taken into consideration depending on age, gender and clinical conditions.
2. Energy value +/- 50 can be allowed while planning.
3. Two cereals like rice and wheat or other combination can be included.
4. Refined flours like Maida should not be used. Sieved chapatti flour should be avoided.
5. Whole grain cereals or malted grains have higher nutritive value.
6. 2-3 serving of pulses should be consumed everyday.
7. 500 ml of milk or 2 servings of milk and 1 serving of curd/ buttermilk should be included every day.
8. Foods rich in fibers should be included at both meals.
9. Avoid consuming fruits along with main meals of the day. Keep gap of at least 30 mins before or after the meals.

10. Egg should be consumed along with other protein source to increase the quality protein in diet.
11. Green leafy vegetables can be consumed liberally though at least 5 times a week is mandatory
12. At least 2 fruits of different variety should be consumed.
13. Variety of foods should be consumed throughout the day. Each meal should have all 5 food groups.
14. Maximum calorie meals should be at breakfast. Empty calorie foods should be avoided during dinner.
15. Use salt and sugar in moderation.
16. Avoid processed foods as they may contain additives and coloring agents.
17. Children and patients whose nutritional requirement is high, supplementary foods should be given.
18. Water consumption should be adequate.

The Exchange List System

An exchange list can be defined as a list which contains a group of foods in specified amounts, which have approximately equal carbohydrates, proteins and fat

values. This does not mean that the values of two foods within the group are identical. There will be some difference in their values but they tend to nullify each other. Hence any food from the given exchange list can be exchanged for any other food in that list. e.g. 1 medium sized apple can be substituted with 1 medium sized pear.

Menu plan for Adult man using exchange list system.

Food Group	No. of exchanges	Carbohydrates (gm)	Proteins (gm)	Fats (gm)	Energy (kcal)
1) Milk	3	15	15	15	300
2) Legumes /pulses	2	30	12	-	200
3) Flesh foods/egg	1	-	10	10	100
4) Vegetable (A)	2	-	-	-	-
5) Vegetable (B)	2	20	-	-	100
6) Fruit	2	20	-	-	100
7) Cereals	10	200	20	-	1000

8) Fat	5	-	-	55	500
9) Sugar	5	25	-	-	100
		335	57	80	2400

(Reference man 60 kg)

(Requirement – 2400 kcal, Proteins: 55 g)

Menu Plan

Tea : 1 cup

Breakfast : Brown bread sandwich (2 slices of bread), using 5 gm butter, boiled egg, fruit.

Lunch : Fulka (4), Palak / veg + dal/curd + rice (1 bowl) + salads +tomato soup

Tea : 1 cup

Dinner : Fulka (3)/ small bhakari + veg + sprouts curry + curd + rice

Bed Time : Milk

Menu plan for Adult woman using exchange list system.

(Reference woman 50 kg)

Requirement: 2000 kcal; Proteins: 45 gm

Food Group	No: of exchan ges	Carboh ydrates (gm)	Protei ns (gm)	Fa t (g m)	Ene rgy (kca l)
1) Milk	3	15	15	15	300
2) Legumes/ pulses	2	30	12	-	200
3) Flesh food	1	-	20	10	100
4) Egg	1	-	7	-	50
5) Vegetable(A)	2	-	-	-	40
6) Vegetable(B)	2	20	-	-	100
7) Fruit	2	20	-	-	100
8) Cereals	8	160	16	-	800
9) Fat	4	-	-	20	180
10) Sugar	4	20	-	-	80
		285	53	69	200 0

Structure and Function of Digestive system

Nutrients are obtained from the food by the process of metabolism that takes place by processes:

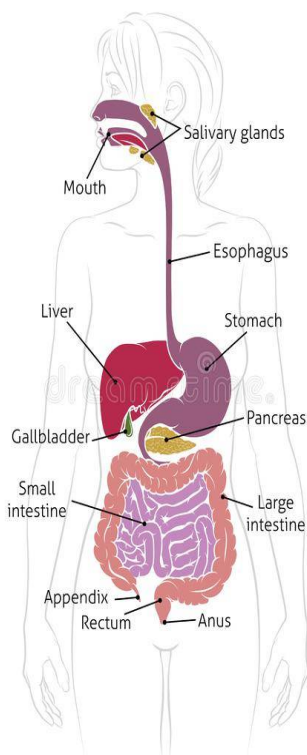
- **Digestion**
- **Absorption**
- **Assimilation**

Function of each organs in digestive system:

- Mouth: Chewing food and mixing with saliva coming from salivary glands
- Esophagus: Passage of food from mouth to stomach
- Stomach: churning of food along with various secretions such as hydrochloric acid, pepsin and renin.
- Small Intestine: Food is digested with bile juices and pancreatic juices. Digestion is complete. Absorption takes place through intestinal villi.
- Large Intestine (colon and rectum): Reabsorption of water and certain B vitamins takes place. The waste products pass down into the colon and stored in rectum till they pass as stools from anus.
- Liver: Largest gland in our body. Secretes bile, stores sugar in form of glycogen, fat soluble vitamins etc.
- Pancreas: Secretes enzymes for digestion and also hormone insulin responsible for glucose metabolism.
- Gall Bladder: Stores bile which has several functions:
 - Strongly alkaline, hence neutralizes acidity for foods

The Digestive system is specially developed for this purpose. It begins in Mouth and ends in anus. The parts of digestive system include Mouth, esophagus, stomach, small intestine, large intestine, Rectum and

Anus. Liver, gall bladder, pancreas and salivary glands help in the process of digestion of food by secreting different enzymes & hormones.

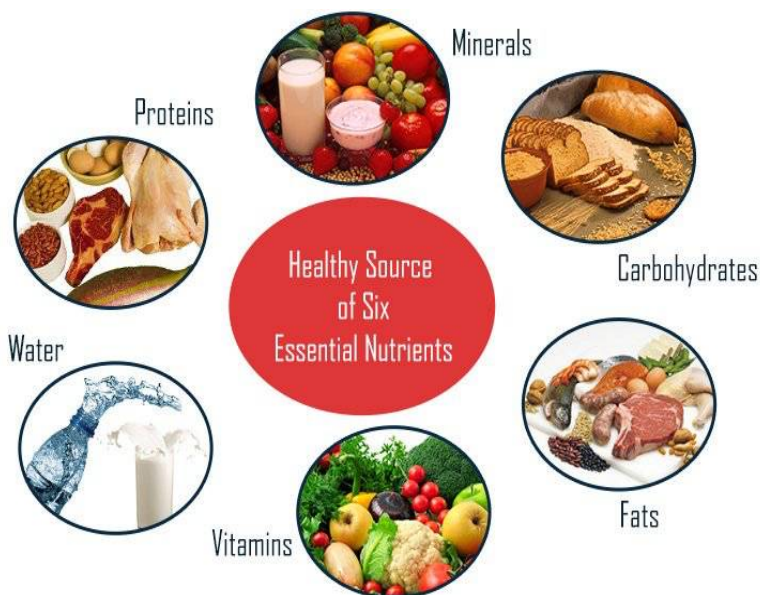


Factors that affect digestion

- a) Consistency and type of food
- b) Bacterial Infection

- c) Chemical factors: Strong acids, meat extracts, spices, caffeine and other substances that stimulate the flow of gastric juices.
- d) Psychological factors: Anger, fright, worry are adverse to digestion since they depress the secretion of gastric juices. The sight, smell and aroma of food as well as taste enhance the process of digestion.

Nutrients and their Role



Nutrients:

Nutrients are chemical compounds that the body needs for different functions like energy, building materials & controlling various body processes.

Functions of several nutrients are interlinked though foods that are greatly enriched with nutrients; people suffer from deficiencies due to various factors like ignorance, their misuse or improper metabolism in body.

Nutrients are classified as:

- 1) **Macronutrients:** Macronutrients are the nutrients that we need in larger quantities to

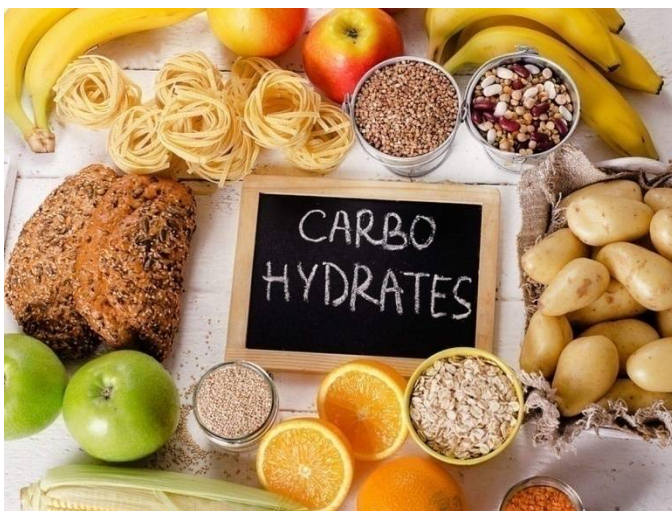
provide energy. They are Carbohydrates, Proteins and Fats

- 2) **Micronutrients:** Micronutrients are chemical compounds that are required by the body in smaller amounts. They are Vitamins and Minerals

Each nutrient has an essential role in body and has been elaborately explained below.

Carbohydrates

Carbohydrates are the most important source of energy for living organisms. Plants synthesize carbohydrates with the help of water, carbon dioxide in presence of air and sunlight. Carbohydrates are the chemical compounds made up of carbon, hydrogen and oxygen ($C_6H_{12}O_6$). Basic unit of carbohydrates is a monosaccharide which is the most common sugar used to store and release energy.



Classification of Carbohydrates and their sources

	Carbohydrates	Examples	Obtained from
1	Monosaccharides Simple sugar containing 1 unit	1) Glucose (dextrose)	Corn syrup, fruits, vegetables, honey
		2) Fructose	Honey, fruits, vegetables
		3) Galactose	The digestion of lactose

2	Disaccharides Double sugars containing two monosaccharide units	1) Sucrose (1glucose + 1 fructose)	Cane, Beet, fruits, vegetables
		2) Lactose (1galactose+ 1 glucose)	Milk
		3) Maltose (2 glucose)	Starch in sprouting Grains And digestion of starch

3	Polysaccharides (Complex compounds which contain many monosaccharide units)	<p>Digestible</p> <p>Starch, dextrin, glycogen</p> <p>Indigestible</p> <p>Cellulose</p> <p>Hemicellulose (Pectin)</p>	<p>Grain products, legumes, root vegetables</p> <p>Structural parts of fruits, vegetables , whole grains, seeds and nuts</p> <p>Cereals, seeds nuts and fruits like guava, apple.</p>
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Functions of Carbohydrates

- 1) They provide economical source of energy. 1 gm CHO = 4 kcal.
(1 spoon of sugar is 5 gm = 20 kcal)
- 2) They spare proteins so that proteins can be used for more important functions i.e. to build and repair of tissues.

- 3) Lactose encourages the growth of favorable intestinal bacteria. It has laxative properties and enhances absorption of calcium.
- 4) Cellulose provides fecal bulk and help in elimination.
- 5) Glucose alone can work as a energy for central nervous system.
- 6) Sufficient amount of glycogen in liver help in liver detoxification.

Deficiency of carbohydrates

- 1) Mild deficiency of carbohydrates in diet result in utilization of fats for energy purpose
- 2) However, in severe deprivation, fats too cannot be oxidized which result in accumulation of large amount of ketone bodies.

Excess Carbohydrates in diet result in:

- 1) Increase the incidence of dental caries
- 2) More calorie can cause obesity
- 3) Causes irritation in gastrointestinal track
- 4) Empty calories can decrease appetite
- 5) Increases triglyceride levels in blood

Sources of Carbohydrates:

A) Plant sources:

- 1) **Cereal grain:** Rice, wheat, bajra, jowar
- 2) **Vegetables:** Roots, tubers contain large amount of complex carbohydrates, Starchy legumes, beans, peas, tapioca and potato
- 3) **Fruits:** These contain the simpler forms of carbohydrates. Raw fruits contain starch which is converted to simpler sugar on ripening. Fruits also contain cellulose and pectin. Nuts contain 20% carbohydrates along with proteins and essential fatty acids.
- 4) **Sweets:** table sugar, ground sugar, maple syrup, corn syrup, jaggery and honey are concentrated sources of sugars. They do not supply important nutrients and hence called as empty calorie foods.

B) Animal Sources:

Milk is the only source of carbohydrates. Animal liver contains CHO in form of stored glycogen which easily gets degraded.

FATS

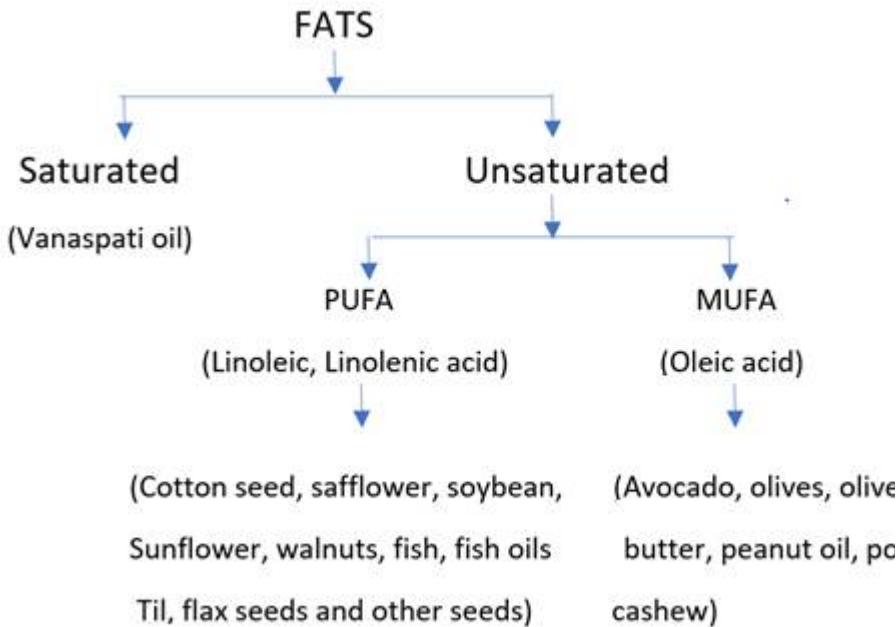
They are more concentrated form of energy. They are mixture of fatty acids and alcohol. They are present in adipose tissue of animals, nuts and oil seeds. An ingested fat gets emulsified with the help of pancreatic enzymes. Digestion and absorption of fats occur in small intestine. Adequate intake of carbohydrates leads to storage of fats in fatty tissues in body.

1 gm fat = 9 kcal

1 tablespoon oil = 5 ml = 45 kcal

The type of fatty acid present determines nature of fat, its flavor and other properties.

Fatty acids are classified as



- 1) **Saturated Fats:** They are solid at room temperatures. Palmitic, stearic acid are found in animal products such as milk, cheese, cream, ice-cream, fried foods, meat, egg yolk, rich desserts, chocolates, coconut and coconut oil.



2) Unsaturated Fats: They are liquids at room temperatures. Food fats are generally mixture of both types of fatty acids.

a) PUFA (Poly Unsaturated Fatty Acids)

b) MUFA (Mono Unsaturated Fatty Acids)



Nutritional classification of fatty acids:

1) **Essential Fatty Acids:** Fatty acids that cannot be synthesized in body. E.g. linoleic, linolenic, arachidonic acid. They are essential for the nutritional well- being of a person. Types of Essential Fatty Acids:

a. **Omega 3 Fatty acids (N3 Fatty acids):**

They are important for brain development during fetal and post – natal period. Dietary Decosahexaenoic acid (DHA) is needed for optimum function of retina, visual cortex which is important for vision & also mental

development. N3 fatty acids improve cognitive function in children.

b. **Omega 6 Fatty Acids (N6 Fatty acid) :**

They are used for reducing the risk of heart diseases, by lowering total cholesterol & bad cholesterol levels & increasing good cholesterol levels. They also reduce the risk of Cancer.

- 2) **Non- essential Fatty Acids:** Fatty acids that can be synthesized in body and need not be supplied through diet. E.g. Palmitic acid, oleic acid and butyric acid.

Cholesterol:

Cholesterol is one of the sterol found in different concentrations in all animal tissues and blood and has several important functions in body.

It is synthesized by the body (in liver, 2gm daily) independent of dietary intake.

Normal blood cholesterol level is 150 – 200 mg/dl (100ml of blood). Dietary intake can have significant effect on cholesterol levels.

Cholesterol is precursor of bile salts.

It is related to sex and adrenal hormones.

Good vs. Bad Cholesterol

What's the Difference?



Fats are also classified as visible and invisible fats

- **Visible Fats:** They are added fats in diet. E.g. oils, ghee, butter, mayonnaise, cheese etc.

VISIBLE FATS



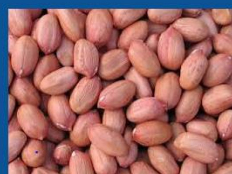
- **Invisible Fats:** Many foods contain fats which cannot be seen directly.
- a) **Healthy Invisible fats:** Almonds, walnuts, flax seeds, sesame seeds, fish, olive, avocado etc.

HEALTHY INVISIBLE FATS



- b) **Unhealthy invisible fats:** Dry coconut, groundnuts, cashew, meat, milk, egg yolk, ice-cream etc.

FOODS THAT INCREASE CHOLESTEROL



Functions of Fats:

- 1) 1 gm fat gives 9 kcal energy. All Tissues except Central Nervous System (CNS) uses fats as a source of energy.
- 2) Subcutaneous fat acts as a insulator in extreme cold.
- 3) Fat provides padding around vital organs. Helps them hold in place and absorb shock from physical blow.
- 4) Fat is a carrier of fat-soluble vitamins (A, D, E, K).

- 5) EFA's are needed to maintain different body functions: integrity of cells, precursor of important hormones etc.
- 6) Fats slow secretion of HCL from the stomach and slows rate of digestion and prevents feeling of hunger.
- 7) Fats add flavor to meals.
- 8) It has Protein sparing action.
- 9) Cholesterol is needed for synthesis of sex and adrenal hormones.

Deficiency of fats

Absence of PUFA in the diet results in failure of growth and reproduction, also result in skin diseases.

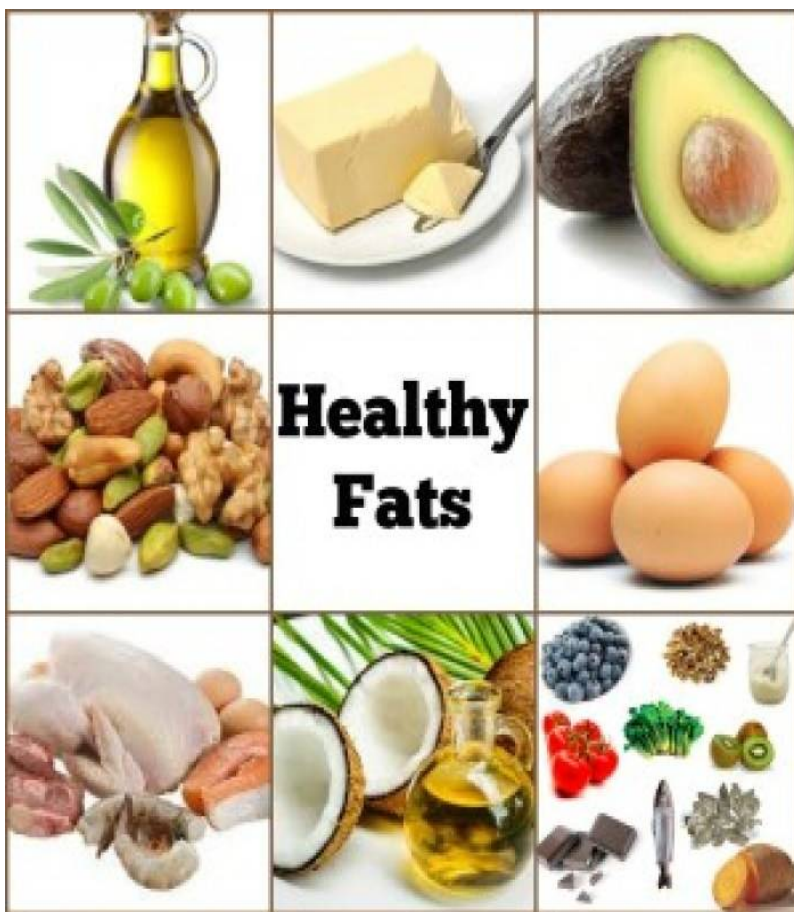
Excess fats in diet:

- 1) Can result in obesity.
- 2) Slows digestion and absorption of food products.
- 3) Interfere with absorption of calcium by combining with calcium to form soap which cannot be absorbed through intestines.
- 4) Can cause ketosis if fats are not fully oxidized due to absence of carbohydrates.

Sources of Fats:

- 1) Plant Sources

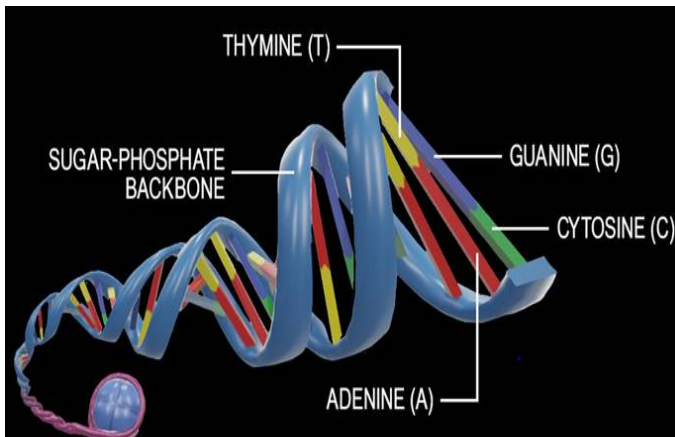
2) Animal Sources



PROTEINS

Proteins are life forming and life sustaining substance of all organisms. Proteins make up the major structure of all living cells and form most of the dry weight of the body cells. On digestion, they are broken down into unit-building blocks called amino-acids. Protein molecules are much larger than fat molecules and those of polysaccharide molecules. They are made when different amino acids come together.

Amino Acids: Each amino acid has carboxyl group (acidic group - COOH) and an amino group (basic group - NH₂). In all there are more than 21 amino acids in 1 protein molecule.



Classification of Amino acids:

Essential amino acids:

They cannot be synthesized by the body and they need to be taken through diet. There are 10 essential amino acids. (Methionine, isoleucine, leucine, lysine, threonine, tryptophan, valine, phenylalanine, Histidine, Arginine)

Non- Essential Amino Acids:

Can be synthesized by the body and they need not be supplied through diet. (Cystine, cysteine, proline, glycine, serine, alanine, Aspartic acid, glutamic acid and tyrosine)

Classification of Proteins:

Proteins are classified into 2 types:

- 1) **Complete Proteins:** These proteins contain all the essential amino acids in sufficient quantity and ratio to supply the body's needs. They are called High Biological Value Proteins (HBV). These proteins are animal origin. E.g. milk, meat, poultry, fish etc.



- 2) **Incomplete Proteins:** These proteins are deficient in one or more essential amino acids hence do not support life on their own. They are obtained from plant sources i.e. vegetables, pulses, legumes, cereals, nuts etc.



Proteins require more time to get digested and release amino acids hence protein diet has satiety value.

A number of hormones, vit B6 (pyridoxine) and fiber affect digestion of proteins. Proteins are absorbed in small intestine. The pattern of amino acid absorption from the small intestine depends largely on both qualitative and quantitative composition of mixture of amino acids present.

Hence mixture of proteins such as dal and rice compensate each other for the limited amino acids present in them separately.

Function of Proteins

- 1) Growth and maintenance: Proteins are chief constituents of muscles, organs and endocrine

glands. They are major constituent of skin, hair, nails, bones etc. They are required by each and every cell of the body

2) Regulation of Body Processes:

- a) Immune proteins: Antibodies necessary for immunity reactions are proteins in nature.
- b) Hormones: Adrenocorticotrophic hormone and insulin hormones are protein in nature.
- c) Enzymes: All enzymes are protein in nature and are required at every step of digestion, absorption and metabolism.
- d) Nucleoproteins: These govern synthesis of all body proteins.
- e) Actin and myosin are responsible for contraction and relaxation of muscles.
- f) Blood Proteins: Hemoglobin, the most familiar constituent of blood is a protein which carries oxygen. Other blood proteins are lipoproteins, transferrin etc. Serum albumin is responsible for oncotic pressure in capillaries and maintains fluid balance.

Proteins are last source of energy to body.

1 gm protein = 4 kcal

Symptoms of Protein deficiency:

- Weight loss
- Anemia
- Easy fatigue
- Decreased immunity
- Impaired wound healing
- Edema
- Retarded growth in children
- Wasting of tissues

Extreme protein deficiency leads to kwashiorkor and marasmus (Dry skimmed milk powder is the most effective treatment).

Sources of Proteins:

Animal Sources (HBV) proteins: Meat, egg, fish, poultry, milk

Plant sources: Soybean, legumes, pulses, nuts and oilseeds.

Important points to remember in vegetarians:

- 1) **Protein:** Requirement of essential amino acids should be met with well balanced foods of plant origin like dal-khichdi, idli, dosas etc.

- 2) **Calcium:** If milk is omitted then calcium in diet should be increased through green leafy vegetables, colocasia, methi, ragi etc.
- 3) **Iron:** Plant sources of iron are absorbed less than animal source. The concentration of iron is less in plant foods. Hence good iron source with foods rich in ascorbic acid (vit c) should be taken to enhance its absorption.
- 4) **Zinc:** Grains are good source of zinc but absorption of zinc may be affected due to presence of phytic acid. Yeast fermentation lowers phytic acid and increases availability of zinc and other trace elements.
- 5) **Vit. D:** Rich source of Vit. D are non-vegetarian foods. Exposure to sunlight is important in vegetarians.
- 6) **Riboflavin:** Major source is meats, milk and dairy products. However legumes and whole grains provide good amount of riboflavin.
- 7) **Vit. B12:** There are no plant sources of this vitamin. It should be obtained from fortified foods such as soy milk.

FIBERS

Fiber is a component of dietary plant materials which cannot be digested by human enzymes. They are mixture of polysaccharide and non- polysaccharide polymers.

Fibers are classified as

1) Soluble Fibers

2) Insoluble Fibers

Soluble Fibers:

- They are soluble in water, gel forming and fermentable fibers.
- Help stimulate microbial growth in the intestines.
- Increases fecal bulk by decreasing the transit time.
- Slows glucose absorption lowers blood glucose levels and cholesterol levels.
- E.g. Gums, Mucilage and pectin (Natural fiber components).
- Sources: Oat bran, beans, barley, vegetables and fruits

Insoluble Fibers:

- They are insoluble in water, structural and non-fermentable fibers.

- They help retain water in stools, increases fecal bulk and decreases transit time.
- Aids in digestion and help prevent constipation.
- Reduces carbohydrate availability.
- Induces propulsion of food in small intestines.
- Reduces post prandial hypoglycemia.
- E.g. Celluloses, lignin and some hemicelluloses (Natural fiber components).
- Sources: Whole wheat bread (wheat bran), beans (kidney, Lima etc.), cereals, skins of fruits and vegetables.

Deficiency of Fibers:

Acute problems caused due to lack of fibers in diet are constipation, hemorrhoids, indigestion etc.

Chronic deficiency can lead to obesity, diabetes and other cardiovascular diseases, colon cancer.

Sources of fibers:

Fruits and vegetables provide 1 gram of cellulose per serving

Whole grains cereals and nuts supply ½ gm of cellulose per serving.

According to the Academy of Nutrition and Dietetics

25 grams (g) per day for adult females






38 per day for adult males

Tips for increasing fiber

- Begin by making small changes.
- Eat fruits and vegetables with the skins on.
- Add beans or lentils to salads, soups, and side dishes.
- Replace MAIDA by high fiber cereals.
- Eat 4 cups of vegetables and 4 cups of fruit each day.
- If unable to meet the daily requirements, consider using fiber supplements.

Sources of Fibers

Sr. No	Foods	Quantity	Amount of fiber	Image
1	Oats	1 cup	5 gm	
2	Legumes (lentils, black beans, split beans and legumes)	1 cup	15 gm	
3	Fruits (Apple, banana, pear, raspberries, orange, strawberries)	1 medium / 1 cup	3 – 6 gms	
4	Seeds : Chia seeds Almonds Flax Seeds	1 tablespoon 20 in number	10 gms 4 gms	

6	Green Peas	1 cup	9 gm	
7	sprouts	1 cup	5 gm	
8	Sweet Potato	1 medium	4 gm	
9	Barley / jowar / Bajra	1 cup	6 gm	
10	Wheat / brown rice	1 cup	3 gm	

Micronutrients

Micronutrients are substances that are required in very small quantities by our body but plays very crucial role in carrying out important

MICRONUTRIENTS



Minerals



Vitamins

functions in our body.

They are classified as:

- a. Vitamins
- b. Minerals.

VITAMINS

Vitamins are vital substances needed in very small quantities for growth maintenance and reproduction. Most of them are not synthesized by the body, but has to be obtained from the diet except few like folic acid and Vit D which whose requirement can be partially met by synthesis in body.

Classification of Vitamins

A) Fat Soluble vitamins: Vit. A, D, E, K

Properties of fat-soluble vitamins:

- 1) Not destroyed by ordinary cooking methods
- 2) They are stored in body and can cause hypervitaminosis if consumed in excess.
- 3) They are always associated with fats and are destroyed by rancidity.
- 4) Stored in liver.
- 5) Stable to acid and alkali.

Daily requirement & Sources of Fat Soluble Vitamins

Vitamin	Daily requirement	Sources	Functions	Deficiency
Vit. A Retinol Carotene	Men: 900mcg Women: 700 mcg Men , Women: 2400 mcg	Green leafy vegetables, carrot, animal liver	Vision Maintain integrity and growth of tissues Reproduction	Rough scaly skin, dry mucous membranes, Conjunctival xerosis Bitot's spot Keratomalacia (corneal xerosis)

<p>Vit D</p>	<p>15mcg (600 IU) till adult age</p> <p>20 mcg (700 IU) in old age</p>	<p>Sun is one of the best sources of this nutrient</p> <p><u>Sunlight between 10 am to 3pm for 15 min</u></p> <p>Fatty fish and seafood. Mushrooms. Egg yolks Fortified foods.</p>	<p>Absorption of calcium, For growth and remodeling of bones Strengthen bones(calcification of osteoblast cells) Byproduct of Vit D helps in muscle contraction and relaxation Important for dental growth, and gums Regulates renal function Helps in cellular growth. Plays a key role in reducing obesity</p>	<p>Weakening of bones and muscles, Dental and gum problems Disturbed renal function Obesity Depression and hypertension</p>
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Vit E	Adult: 15 mg/day (22IU)	Almonds, peanuts, sunflower, safflower, soybean oil, wheat germ oil, spinach, beet greens, red bell pepper, Mango, Avocado Dairy products	Converts free radicals to less toxic substances (antioxidants) Nutritional interaction with other nutrients.	Decreased immune function Loss of control of body (ataxia) Peripheral neuropathy.
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Vit K	Men: 180 mcg Women: 160 mcg	Spinach, broccoli, sprouts, green beans, green peas, cauliflower, cabbage, kiwi, soybean oil, avocado, egg.	Its important function is blood clotting.	Causes hypoprothrombinemia, Results in bleeding tendency.
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B) Water Soluble Vitamins:

- 1) They are unstable as they are easily affected by heat, light oxidation, radiation contamination by metals etc.
- 2) They are affected by preparation methods. If water in which food is cooked is thrown away.
- 3) Excess intake of these vitamins can cause their excretion through urine.

Types of Water-soluble vitamins:

- 1) B- complex vitamins: they are considered under three groups

Group 1	Classic disease factors	Thiamin - B 1 Riboflavin – B2 Niacin – B3
Group 2	Discovered as coenzyme factors	Pyridoxin – B6 Pantothenic Acid
Group 3	Blood forming factors	Folic Acid Cyanocobalamin - B12

Folic Acid:

Daily requirement: 100mg/day

Sources: Fresh green leafy vegetables like spinach, lettuce, dry beans and pulses, liver.

Coenzymes of folacin known as tetrahydrofolates are necessary for following functions:

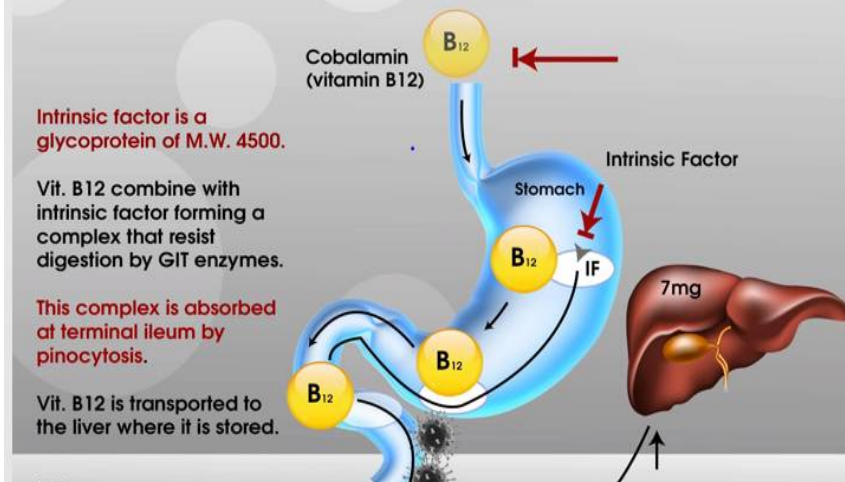
- Formation of purines, pyrimidines and amino acids
- Formation of hemoglobin

Deficiency of folic acid results in megaloblastic anemia

Symptoms of deficiency: Glossitis, diarrhea, weight loss

Vitamin B 12

Absorption of Vitamin B12

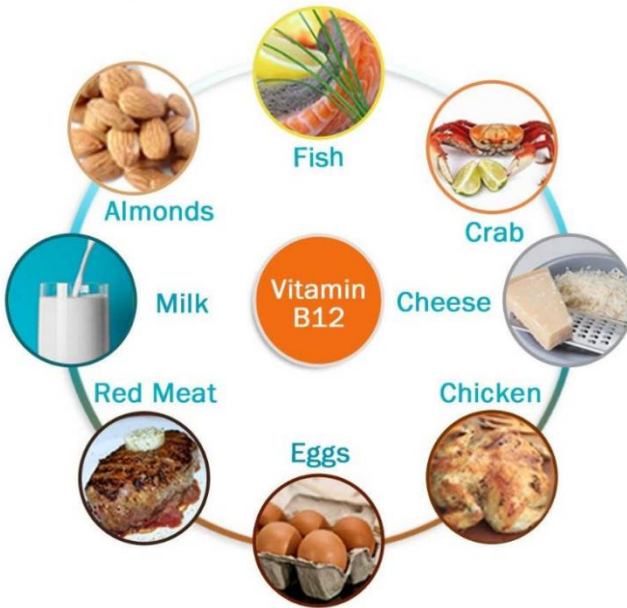


Its food sources are only animal origin. Vit B12 is a large molecule that requires special mechanism for absorption. It is broken down from its complex form and bound to Intrinsic Factor (IF) secreted by stomach cells. This forms a complex with calcium which is then transferred across the intestinal mucosa and finally attached to transcobalamin 2 and transported into blood.

Daily requirement: 1 ug/day

Sources: Only animal source- liver, kidney and lean meat. Milk, eggs and cheese are poor sources.

Vitamin B12 Rich Foods



Causes of B12 Deficiency:

- Dietary deficiency.
- Atrophic gastritis, in which stomach lining has thinned.
- Pernicious anemia (IF Deficiency), which makes it hard for your body to absorb vitamin B12.

Functions:

- Acts as a coenzyme for formation of DNA, and other proteins.
- Formation of red blood cells.
- Activation of folic acid coenzymes.

Deficiency: Results in pernicious anemia.

VITAMIN C OR ASCORBIC ACID

- Ascorbic acid is highly unstable, reducing, and easily oxidizable acid. It can be destroyed by, oxygen, alkalis and high temperatures.
- Oxidation is accelerated by heat, light, alkalies, oxidative enzymes and iron.
- Hence food should be cooked for short period of time and kept covered to retain its nutritional properties.
- Soda and alkali should be avoided to be added while cooking food to retain vit. C.
- Foods should be cut into larger pieces to avoid much exposure of food to air to prevent oxidation process and loss of Vit C.
- Fruit juices should not be left uncovered.
- Vegetables should be cooked in minimum quantities of water.
- Pressure cooking maintains good amount of vitamin as cooking time is short and exposure to oxygen is minimum.

RDI of Vit C: 90 mg in men and 75 mg in women

Functions of Vit C:

- 1) Intracellular cement substance: Vit.C is required to build and bone matrix, cartilage, tooth, collagen and connective and general tissues of body.
- 2) General body Metabolism: More metabolically active tissues contain more vit. C. Requirement of vit. C is higher in periods of stress.
- 3) For Hemoglobin formation: It helps in absorption of Iron from food.
- 4) It is essential for wound healing and internal fractures in bones.
- 5) Vit C plays an important role in immunity.
- 6) There is increased demand for vit c during periods of infancy, childhood and pregnancy.

Deficiency of vit c:

Deficiency of vit c results in defective formation of intracellular cementing substance leading to retardation of growth in infants and children, joint pains,

anemia, shortness of breath, poor wound healing, decreased immunity.

Blood vessels and capillaries become fragile due to which they rupture and bleed. Tendency to easy bruising is the first sign of vit c deficiency.

Severe deficiency leads to scurvy. In adults, symptoms of scurvy are recurrent bleeding gums, blackish blue spots on skin. Slightest injury causes bleeding and tendency to infections.

Sources of vit c:

Amla is the richest source of vit c. (100 gm Amla gives 600 mg vit c)

Fruits: Sweet lime, oranges, lemon, pineapple, guava, strawberries are chief sources

Vegetables: Tomato, lettuce, cabbage, sweet potatoes, potatoes, green and yellow vegetables, green peppers are good sources.

Care must be taken while handling foods containing vit c.



MINERALS

Minerals contribute to 3 – 4 % of body weight. Minerals occur in body in form of its salt. Minerals that are present in our body are calcium, phosphorous, iron, zinc, magnesium, copper, Sulphur, iodine, chlorine.

They are classified as:

- 1) **Major minerals:** They are required in large amounts (100mg/day) e.g. Calcium, phosphorous, sodium, potassium, chlorine.

- 2) **Minor Minerals:** They are required in small amounts. E.g. iron, sulphur, magnesium.
- 3) **Trace elements:** Their requirement is in micrograms, e.g. iodine, fluorine, zinc.

Functions of different minerals:

- 1) They are structural components of bones, teeth, soft tissues, muscles and nervous system.
- 2) They cause stimulation of nerves and thus contraction of muscles.
- 3) Help maintain acid- base balance.
- 4) They control water balance in body.
- 5) They help in the process of digestion by helping to utilize nutrients.
- 6) They are enzyme activators
- 7) They regulate cellular oxidation.
- 8) Basically, they maintain body's homeostatic mechanism.

Minerals



Calcium:

This mineral is abundantly found in muscles, bones and teeth. It is found in form of calcium phosphate which gives hardness to bones and teeth.

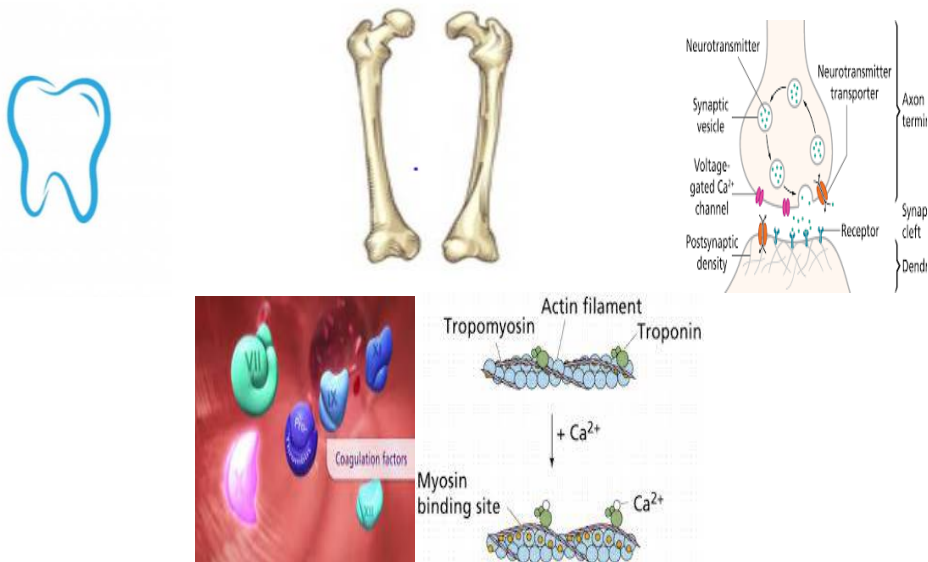
RDA of calcium: Adults: 2500mg

Children: 1000mg

Functions:

- 1) Helps in growth and maintenance of skeletal system.
- 2) It plays a vital role in contraction and relaxation of muscles.
- 3) Helps in coagulation

- 4) It is important for synthesis of acetylcholine. Acetylcholine is a substance that is important for nerve impulse transmission.
- 5) It helps in absorption process by increasing the permeability of membranes.



Deficiency of calcium:

- 1) General deficiency of calcium leads to generalized fatigue, weakness, rheumatic type of pains in bones. Tendency to fractures.
- 2) Severe deficiency leads to Rickets in children and osteomalacia in adults.

Hypercalcemia: excessive intake of calcium results in raising blood calcium levels thereby causing increased

deposition of calcium in soft tissues and increased excretion through urine.

Sources:

Rich source of calcium are milk, cheese and gingelly seeds (til), poppy seeds, dry coconut,

Good sources include: spinach, fenugreek (methi), coriander, colocasia, betel leaf (pan) which is eaten with lime and small fish like mandeli, shrimp which are eaten with bone.

IRON

Iron is an essential nutrient but is generally deficient in Indian diet resulting in anemia in all age groups are seen commonly in India.

RDA of iron: Men: 1 gm/day

Women: 1.5 gm/day

Functions of iron:

Principle and most vital function of iron is formation of hemoglobin of Red Blood Cells (RBC) which carries oxygen to different tissues and carries Carbon dioxide back to lungs from where it is eliminated from body. Lifespan of RBC is 120 days. After which iron is released as the cell dies and it again goes in to bone

marrow where it is reutilized to form new hemoglobin molecule.

Iron is stored in form of hemoglobin in blood and myoglobin in muscles.

Deficiency of Iron occurs due to:

- Deficient intake in diet.
- Poor absorption due hyperacidity and other factors.
- Increased blood loss: menses, piles, worm infestation.
- Interfering Factors: Tea, Coffee, and Phytates.

Symptoms of iron deficiency:

Common symptoms of iron deficiency are pallor, weakness, easy fatiguability, palpitations, and poor performance in activities physically and mentally. Oedema can result in severe deficiency.

Sources of iron:

- **Animal sources:** Liver, Lean meats, Fish, Poultry, Crabs are good sources of iron in form of haem.
- **Plant sources:** Green leafy vegetables (shepu), coriander, fenugreek (methi), betel leaves (pan) legumes, dry fruits and whole grains (ragi)

DIET THERAPY



Introduction

Energy balance is maintained depending on various factors. Hence high and low- calorie diets are to be planned.

If there is balance between energy intake and energy output, the scales of energy balance will be equal. Hence a person can maintain his weight. If the amount of calorie intake through foods remains constant but the energy output is either excess or less, the energy balance will not be maintained and will result in weight loss or weight gain respectively.

If the energy intake is more than expenditure then the person will start putting on weight resulting in obesity. Another factor associated with obesity is the assimilation capacity, i.e. the ability of body to convert available excess food energy into fat. This is seen in some persons and it is related to heredity.





OBESITY

Obesity is defined as the positive energy balance. There is generalised accumulation of excess adipose tissue into the body leading to more than 20% of desired body weight.

Obesity is defined as:

1. **Overweight:** A person whose weight is 10 – 20 % more than the desired weight for his age, sex and height.
2. **Obese:** A person whose weight is increased by 20% than desired weight for his age, sex and height.

However, overweight and obesity are to be reviewed in terms of lean body mass or muscle to body fat. E.g. an athlete will have more muscle mass and therefore may be overweight. Therefore, one must be able to distinguish weight, if it is due to muscle mass or due to excess fat.

Obesity is classified as:

1) Developmental Obesity:

This type of obesity begins in early childhood, and continues steadily over the adult years. It usually sets at the age of 4 years. The cells become saturated with fats and as the child grows older the more fat accumulates and the child grows more fat. In these children muscle and bone mass also increases as the body has to carry extra weight. Such children usually grow taller and looks robust.

2) Reactive Obesity:

This type of obesity occurs as a result of emotional stress during childhood and in adults. During the periods of stress, individual eats more resulting in increased weight. Since these periods are intermittent, weight may fluctuate or remain constant.

Causes of Obesity

- 1) **Genetic factors:** Genetic inheritance influences 50-70 % person's chance to become obese.
- 2) **Social and cultural factors:** People of higher socioeconomic status have started becoming obese due to rich food intake and luxurious lifestyle.
- 3) **Emotional Factors:** Emotional stress is highly related to obesity due to stress resulting in overeating.
- 4) **Age and sex:** Women usually put on weight after first delivery and during menopause. Men's weight increases after the age of 50 as the basal metabolic rate decreases during that period.
- 5) **Eating habits:** Certain type of eating habits can result in obesity
 - Munching habit (repeated eating in between meals).
 - Eating faster can lead to overeating and also non absorption of essential nutrients.
 - Housewives who are fond of preparing variety of foods that appeal to taste can become obese.

- Housewives who do not want leftover to be thrown, may consume forcibly and put on weight.
- Business people who usually eat out tend to become fat.
- People who eat outside food, flavoured, processed, junk food frequently, put on weight easily.
- Excess calorie consumption during the times of festival result in weight gain.
- Non- inclusion of fruits and vegetables in diet favour weight gain.
- Consumption of excess sugar and beverages very often can lead to obesity.

6) Physical activity:

Lack of physical activity and sedentary lifestyle can result in obesity at any age.

- 7) Stress:** Some foods stimulate endorphins (feel good hormone). Self-gratification, anxiety, depression and stress can lead to excess calorie intake. People eat more food during times of stress, can lead to obesity.

- 8) Endocrine Factor:** Obesity is found in hypothyroidism, hypogonadism, PCOD

(Polycystic Ovarian Disease) and physiological conditions like puberty, pregnancy and menopause.

- 9) **Trauma:** Damage to hypothalamus after head injury as it is not able to regulate satiety. (related to leptin and ghrelin hormones)

Hormones and obesity

Hormone	Level in obesity	Effect on weight loss
Insulin	Obesity enhances hyperinsulinemia. 80% of obese patients have hyperinsulinemia.	Improves insulin sensitivity and all aspects of glucose uptake are improved.

Assessment of Obesity:

- 1) **Body weight:** An adult weighing 10% more than the standard weight according to age, sex and height is overweight and 20% more is obese.

% body weight excess of normal	Degree of Obesity
25	Mild
50	Moderate
75	Severe
100	Very severe

- 2) Body Mass Index (BMI):** BMI is accepted as a better estimate of body fatness and health risk factor than body weight

$$\text{BMI} = \text{Weight (kg)} / \text{Height (m}^2\text{)}$$

Grading Obesity based on BMI:

Grade	BMI (kg/m ²)
Underweight	<18.5
Normal	18.5 – 22.9
Overweight	23 – 27.5
Obese(grade1)	27.6 – 34.9
Obese(grade2)	35 - 39.9
Obese(grade3)	>=40

- 3) **Waist Circumference:** This is an easy tool used by clinician to compare abdominal fat before and after weight loss treatment.

High risk waist circumference: Men: (>40 inches / >102 cm)

Women: (>35 inches / >88cm)

- 4) **Waist to Hip ratio:** The fat distribution in an obese person can be in upper part or lower part of the body. The distribution of fat may determine the disease pattern.

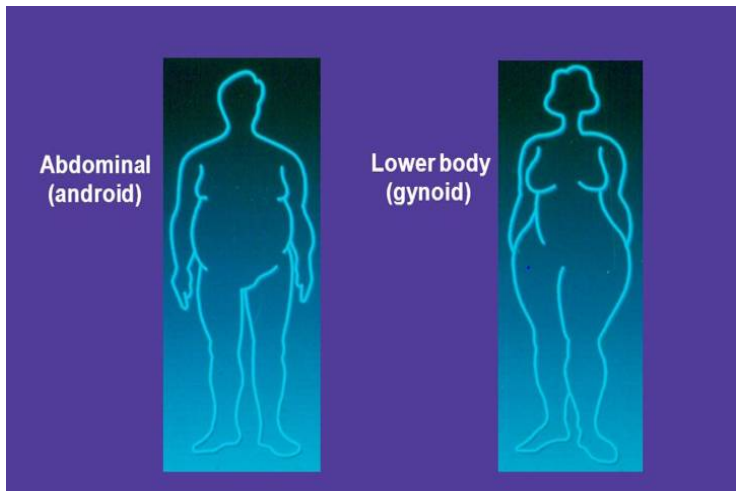
The normal waist to hip ratio is 0.7

With upper body obesity the ratio is 0.85 in females and 0.9 in males.

Abdominal obesity does not always go hand in hand with overweight or obesity.

- 5) **Broka's index:** The formula for Broka's index is
Height (cm) – 100 = Ideal Body Weight (IBW)
This measurement is easy to calculate and accurate.

Types of Obesity:



- 1) **Android Obesity:** This is apple shaped or central obesity. There is hypertrophy of adipose tissue cells. Fat deposition occurs on abdomen, chest and hands. There is high insulin resistance and decreased glucose tolerance resulting in Diabetes. This type of obesity is high risk for heart diseases.
- 2) **Gynaecoid Obesity:** This is pear shaped or peripheral obesity. There is hyperplasia of adipose tissue cells in this type of obesity. The fat accumulates around hips and buttocks. These individuals usually suffer from hip, knee and other joint pains rather than having risk of heart disease due to obesity. Glucose tolerance is normal.

Treatment of Obesity:

Obesity is a chronic disease that requires long term treatment. Even 5-10% of total weight loss can produce marked improvement in other associated diseases like diabetes, dyslipidaemia etc.

- 1) Diet therapy
- 2) Physical exercise
- 3) Stress management
- 4) Behavioural therapy

1) Diet Therapy

- a) **Very low calorie (<800 kcal) diets:** Although much weight loss occurs initially but usually it is regained as it does not change the eating behaviour of a person for longer period of time. These diets are usually indicted in patients with 50% increase from their normal weight.
- b) **Reducing diet:** There is step by step reduction in weight in this type of diets. Initially, goal of 10% weight loss is achieved and then further weight loss is attempted. Patient is put on negative energy balance of 500 to 1000 calories lees than RDA. Usually 3 kg weight is lost in

the first month due to utilization of carbohydrate stores and water. These diets should provide adequate amount of proteins, vitamins and minerals.

Calorie restriction is the safest and most effective method of weight reduction.

1pound fat = $\frac{1}{2}$ kg Apx. = 3500 kcal

500 kcal should be restricted every day, to lose 1-pound ($\frac{1}{2}$ kg) body fat in a week. A calorie deficit of 1000 kcal/day is required to lose 1kg fat in a week.

Practical calorie restriction should be done after analysing 24-hour diet recall. Accordingly, calories should be restricted depending on one's clinical status of body and physical activity.

Energy deficit calculations:

Step 1:

Calculate Resting Energy Expenditure (REE) to determine the calorie requirement (kcal/day).

REE for adult males = $(10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) + 5$

$$\text{REE for adult females} = (10 \times \text{weight in kg}) + (6.25 \times \text{height in cm}) - (5 \times \text{age in years}) - 161$$

Step 2

Multiply REE by Activity Factor of 1.5 for women and 1.6 for men for light activity

REE X AF = Estimated total calorie need (kcal/day) to maintain weight.

Step 3

From this number subtract 500 kcal to get adjusted calorie intake required to achieve weight loss of appx. 500 gm/week.

Loss of weight or low calorie diet

BMI (kg/m ²)	Less calories/day	Weight loss/ week	Weight loss in 6 months
27.5	300 - 500	0.5 kg	10%
>35	500 - 1000	0.5 - 1 kg	10%

C) Weight maintenance diets:

These diets provide 1500 to 1800 kcal/day. When weight loss goals are achieved after reducing diets, these diets plans are followed to maintain achieved weight.

Principles of diet management:

Low calorie, normal protein, low fat, restricted carbohydrate and liberal fluid, high fibre diets are given in such cases.

Energy: The person has to be on negative energy balance. About 20kcal/kg body weight for sedentary worker and 25 kcal/kg body weight in moderate worker.

Proteins: 0.8 to 1 gm protein /kg body weight is prescribed to maintain tissue repair and other functions.

Carbohydrates: Complex carbohydrate containing food should be given. High carbohydrate foods and foods with high glycaemic index should be avoided (potatoes, sugar, sweets, soft drinks etc.)

Fat: High fatty foods should be avoided. In low calorie diets nuts and oil seeds are to be avoided.

Vitamins: With prolonged fat restriction fat soluble vitamins like A and D deficiency occurs which must be checked and supplemented.

Minerals: Sodium restriction is recommended as sodium causes retention of fluids leading to weight gain. Calcium depresses certain hormones which consequently improves body's ability to break down fat in cells and slow fat production.

Fluid: Fluids can be taken liberally.

High Fibre: High fibre low calorie foods like green leafy vegetables, fruits, vegetable salads, whole grain cereals and pulses can be included in diet.

British Nutrition Foundation 1990 has established the effectiveness of dietary fibre intake in reducing body weights without any side effects.

Glycaemic Index of foods: Low glycaemic index foods benefit weight control by promoting satiety and by promoting fat oxidation at the expense of carbohydrate oxidation.

Maintaining weight is a lifelong process and permanent changes in eating behaviour are the only key to maintain normal body weight.

Diet should be low calorie, high protein, high fibre diet.

Dietary Guidelines:

- Consume short and frequent meals. Do not overeat.
- Consume complex carbohydrates such as green leafy vegetables, pulses and legumes, low glycaemic index fruits etc.
- Avoid consumption of foods prepared from refined flour (maida) like bakery products, cakes, pastries, chapatis made from maida etc.
- Foods containing good amount of proteins should be consumed. Foods like chicken, fish, egg white, pulses and legumes, soybean and its products (soy milk, tofu, soy chunk).
- Skimmed milk or whole milk (cow) can be consumed. Butter, cream, ice-creams should be avoided.
- Consume whole fruit instead of juices to retain fibres in them.
- Diet should be low in fat. Foods rich in saturated fats, Trans fats, fried foods, should be avoided. Gravy dishes should be avoided.

Junk foods including pizza, burgers, French fries should be strictly avoided.

- Carbonated drinks should not be consumed.

Fasting should be avoided as eating only one time can lead to overeating and excess consumption of calories.

Snacking in between meals should be avoided.

2) Physical exercise

Physical exercise is extremely important in weight loss patients/clients because exercise increases basal metabolic rate, help increase lean body mass, help regulating appetite and helps reduce stress.

- 3) Stress Management:** Stress is the major reason for overeating and relapse. Stress related overeating can be reduced by breathing exercises, deep meditation, and yoga.

4) Behavioural Therapy:

Behavioural therapy is the most important key to achieve and maintain weight loss goals. Maintaining the modified lifestyle is a challenge for clients. This can be done with proper counselling and repeated motivation. Patients

should be taught to recognise 'eating cues' (emotional/ situational), and also taught how to avoid or control them.

UNDERWEIGHT

People whose BMI is less than 18.5 are considered as underweight.

Inadequate energy intake can lead to loss of weight.





Causes

- Starvation
- Debilitating diseases like tuberculosis, cancers, diabetes and mal absorption syndromes.
- Psychological factors like anorexia nervosa, stress etc.
- Active, tense, nervous people who do not rest.

- Pathological conditions where there is disturbance in absorption and assimilation of foods

Medical Nutrition Therapy

A high calorie, High protein, high fat diet is recommended. Before going for diet the underlying cause of under nutrition must be diagnosed and treated by physician.

A balanced diet should be planned according to the nutritional needs.

Energy: Depending on the physical activity and BMI, the energy requirement is estimated and additional 500 kcal energy is given. There should be a gradual increase in the calorie levels to avoid gastric disturbances.

Carbohydrates: High carbohydrate diet is recommended. Dry fruits, sweets, jams, jellies etc. should be included in diet. Porridge, cutlets, desserts should be included in diet.

Proteins: High Biological Value (HBV) proteins are recommended. Proteins are calculated as 1.2 gm/ kg body weight and planned. High protein drink like milk, malted milk, badam kheer should be included.

Fats: Easily digestible fats are to be included in the diet. Excess fried foods should be avoided. Instead omega fatty acid containing food should be increased.

Vitamins and minerals: High energy diets usually are rich in vitamins and minerals hence they need not be supplied with supplements unless severe deficiency.

Fluids: Fluids should not be taken before and after the meals.

Dietary Guidelines:

- There should be a positive energy balance. Intake should be more than expenditure.
- Energy dense foods are the key to weight gain.
- At least three meals a day are recommended along with intermediate healthy snacks.
- Variety of foods should be included in the diet.

- Foods should be appetising.
- Regular outdoor exercise to stimulate appetite is recommended.

DIABETES

There has been exponential rise in Diabetes worldwide and India is no exception. According to statistics India ranks second with the highest population of diabetics in the world. The management of Diabetes involves a multidisciplinary approach that includes:

- Regular Medication
- Appropriate diet
- Exercise and stress management
- Regular follow up.

While counselling a diabetic patient one should have a thorough knowledge about diabetes and its complications, food and its metabolism in body, interaction of food with medications and food to food interactions.

Physiology of glucose absorption:

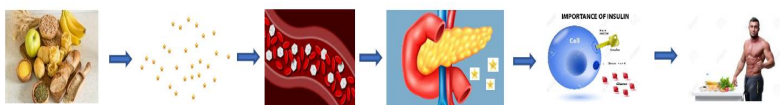
Glucose enters the blood from sources:

- 1) Carbohydrate containing food (grains, fruits, milk, sweets) in the gut.

- 2) Breakdown of complex glucose stored in liver.
- 3) New synthesis of glucose in liver.

The level of glucose in the blood depends upon the amount of glucose entering the blood and amount utilised for different physiological process.

Overview of glucose absorption:



Foods containing carbohydrates when enter out body they are broken down into sugar (glucose) after digestion. Glucose then enters the blood and reaches all parts of the body for energy. Pancreas senses the presence of glucose into the blood and secretes a hormone called insulin. Insulin is secreted by the beta cells of pancreas. It acts as a key to entry of glucose into the cells. This leads to complete metabolism of glucose in healthy individuals. In absence of insulin, glucose is not able to enter the cells thus resulting in excess accumulation of glucose into the blood resulting in hyperglycaemia (diabetes). Diabetes is a persistent long standing disease where utilisation of carbohydrates, fats and proteins is disturbed.

Insulin resistance: Insulin resistance is said to occur when body is able to produce enough insulin but is unable to respond to its effects leading to excess glucose levels in the blood (hyperglycaemia). This is seen in type 2 diabetes.

Types of Diabetes:

Type 1:

Inability of body to produce enough insulin due to dysfunction of beta cells of pancreas. This type of diabetes is caused by an autoimmune reaction, where body's defence system attacks the insulin producing beta cells of pancreas. Genetic factors, changes in environmental factors, viral infections are found to be related. This can occur at any age but onset is usually at early stage of life. Type 1 diabetic people lead a normal life with proper insulin therapy, healthy eating and regular exercise. They are more prone to hypoglycaemia and ketoacidosis.

Type 2:

Inability of body to use insulin effectively. It usually occurs in children but is found to increase in

children and adolescent due to wrong lifestyle. Progressive hyperglycaemia induced beta cell destruction is the main cause underlying type 2 diabetes. Unlike type 1 diabetes, patients with type 2 diabetes usually do not required insulin therapy unless there is need. Patients can be managed by regular medications, proper diet therapy and exercise.

Type 3: Gestational Diabetes Mellitus

Pregnant women develop resistance to insulin and hence increase in blood glucose levels are said to have gestational diabetes mellitus. It occurs around 24th week of pregnancy due to anti insulin hormones produced by placenta. The immediate risk to baby is not severe as diabetes occurs during late stage of pregnancy. Blood sugar levels should be controlled with medications and insulin if required and with proper diet therapy. But uncontrolled diabetes can have severe complications to mother and child.

Diagnosis of Diabetes mellitus:

Following tests are to done to diagnose DM:

1) **HbA1c:** This refers to glycosylated haemoglobin.

It happens when haemoglobin, a protein within the red blood cells which carries oxygen to various tissues of the body joins with the blood getting glycosylated.

A person is said to have Diabetes if the level of HbA1c is $\geq 6.5\%$

In Prediabetics, HbA1c is $\geq 5.7\%$.

This test has several advantages as compared to other tests done for blood glucose

HBA1C IN NGSP UNITS (%)		HBA1C IN IFCC UNITS (MMOL/MOL)
Normal	<5.7	<39
Prediabetic	5.7–6.5	39–47
Diabetic	≥6.5	≥48

levels. The total lifespan of RBCs is 8 – 12 weeks (2-3 months). Therefore, measuring blood levels of HbA1c can be used to reflect average blood glucose levels over that duration. If the blood glucose levels are higher during recent week time, the HbA1c would be greater and vice versa. Hence it is recommended to do the test every 3months to see the average sugar levels during that period.

2) Fasting and Post Prandial Blood Glucose (FPG):

FPG (Fasting is tested when the patient is fasting for at least 8 hours and Post Prandial glucose levels are tested 2 hour after the meal. Both tests are usually done on the same day.

Person is considered diabetes when

FPG: ≥ 126 mg/dl (for two consecutive tests)

PPG: ≥ 140 mg / dl



The main advantage of this method is easy availability and it can be done at home using glucometers. The drawback is it tells about blood glucose levels of few days only.

3) Oral glucose tolerance test (OGTT):

OGTT is the test done to confirm the diagnosis of diabetes in doubtful cases when FPG and / or PPG are in borderline range. 75 g glucose is taken on empty stomach and sugar is tested after two hours. Two hours OGTT test

value of ≥ 200 mg per dl is considered as diagnostic for diabetes.

Oral Glucose Tolerance Test



The pathologist will give you:
75 ml glucose drink

Then ask you to:
Wait 2 hours



Take blood
and test
glucose
levels



4) Random blood sugar:

The test is done at any time during the day for suspected patients. A value of ≥ 180 mg /dl is considered as diagnostic for diabetes.

Who are more prone to Diabetes?

- 1) Age ≥ 45 years
- 2) Being physically inactive
- 3) Family history if diabetes
- 4) High risk races
- 5) Hypertension
- 6) HDL < 35 mg/dl or Triglycerides > 250 mg/dl

- 7) Women with history of Polycystic Ovarian Disease.
- 8) $\text{HbA1c} \geq 5.7\%$, IGT or IFG
- 9) Clinical signs of insulin resistance (severe obesity, acanthosis nigricans)
- 10) Long standing stress.

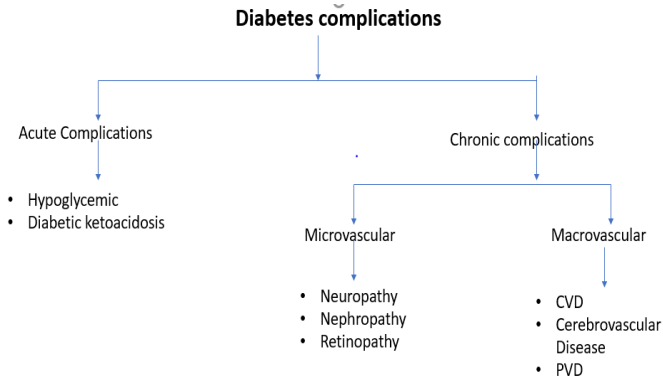


Following chart depicts complications of diabetes:

Complications of Diabetes:

➤ Chronic Complications

1. **Retinopathy:** Capillaries (blood vessels) in retina of eyes gets damaged due to sustained hyperglycaemia. Sustained hyperglycaemia causes blockage of tiny vessels in retina. This leads to formation of new blood vessels which are weak. These blood vessels eventually rupture and causes vitreous haemorrhage



which later forms scar tissue and leads to loss of vision.

2. **Neuropathy:** Diabetic neuropathy is caused due to damage to nerves. It can manifest as mononeuropathy (involvement of single nerve), or polyneuropathy (when group of nerves are involved).



The risk increases with increased duration of



diabetes. Symptoms like pain, numbness, and weakness in hands, arms, feet and legs are seen.

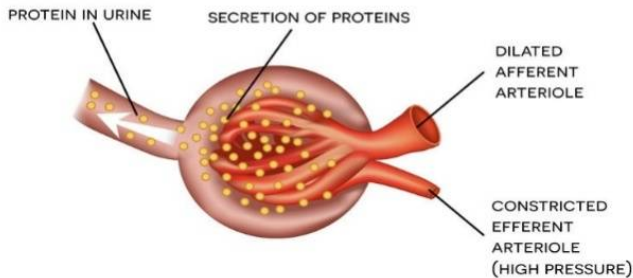
3. **Nephropathy:** Diabetic Nephropathy is a condition caused due to damage to filtering systems of kidneys with persistent loss of proteins in urine (loss of proteins in urine).

➤ **Acute Complication**

1. **Hypoglycaemia:** Hypoglycaemia refers to abnormally low blood sugar levels ≤ 70 mg/dl.
2. **Diabetic Ketoacidosis:**

It is characterised by serum glucose levels

DIABETIC NEPHROPATHY KIDNEY DISEASE



greater than 250 mg/dl, Blood pH less than 7.3, serum bicarbonate levels less than 18 mEq / L and elevated blood ketones.

Management of diabetes

A) Regular medication

American Association of Clinical Endocrinologists (AACE) has developed practice guidelines for comprehensive management of diabetes.

There may be some side effects of certain medications which nutritionist must know.

The following medications are usually prescribed for diabetic patients.

- 1) **Metformin:** This drug can cause side effects like gastro intestinal discomfort.
 - 2) **Sulphonylureas:** The most common side effect of this medicine is hypoglycaemia. Weight gain is often seen in this group of medicines as it is potent stimulant of appetite.
 - 3) **Pioglitazone:** This medicine can cause fluid retention, oedema, and anaemia.
 - 4) **Alpha-glucosidase Inhibitors:** These medicines slow down digestion and absorption of glucose in small intestine. Common side effects are flatulence, abdominal discomfort, diarrhoea.
 - 5) **Dipeptidyl peptidase 4 inhibitors (DPP4)**
 - 6) **Glucagon like peptide-1:** Side effects of this medicine are nausea, weight loss, Diarrhoea, headache.
 - 7) **Sodium -glucose co-transporter -2 (SGLT-2) inhibitors:** Side effect of these medicine are increase urination and urinary tract infections.
- In uncontrolled diabetes, insulin is given externally to balance glucose levels depending on patient's blood sugar levels. Type1 diabetic patients need lifelong insulin therapy's as they cannot be managed on oral medications. Type 2

diabetic patients sometimes need insulin if pancreatic function is deteriorated by 50%.

B) Diet

Diabetes is a chronic illness that requires multidimensional treatment needs life style modification for life time to maintain good blood glucose levels. Diet is the integral part of diabetes management.

Medical nutrition therapy (MNT) can bring about balance in blood glucose levels in diabetic patients.

1) Objectives of MNT:

- To modify diet in such a way that healthy eating patterns are promoted. Emphasis is made on variety of nutrient dense foods in appropriate portion sizes to improve overall health.
- Delay or prevent complications.
- Criteria are patients nutritional needs, disease knowledge, personal and cultural preferences and life style issues also attention should be given to healthy food choices, willingness and ability to make behavioural changes.

- Motivations to maintain modified life style should be provided at every step regarding food choices.
- Providing diabetic patients with practical tools to modify their life style and meal planning.

2) Principals of MNT

Appropriate energy and nutrients for health and maintain blood sugar levels should be provided.

To preserve patients social and psychological well beings.

To reduced, achieved and maintain target blood glucose levels and prevent hypoglycaemia and hyperglycaemia.

To attend and sustain ideal body weight.

Reduce risk of micro and macro vascular complications

3) Assessment of patients

- **Assessing the individual:** Assessment of patient's age, sex, life style, culture, family, environment, work, food habits and food preferences is done.
- **Clinical assessment:** Blood test, urine test, lipid levels, kidney function test, type time and dosage of medications, nutritional supplement etc.
- **Anthropometric measurements:** Body weight, height, waist circumference, body mass index, waist hip ratio.
- **Assessment of nutritional state:** Usually 24 hour diet recall is taken to assess patient's normal meal pattern and food habits. **Assessment is done by asking following questions.**
 - Food pattern on a usual day
 - Size of portions at home
 - Outside eating frequency
 - Favourite foods
 - Food choices
 - Hunger pattern
 - Food allergies

- Persons response to stress: binge eating or starving




4) Dietary recommendations:

For planning a diet for diabetic patients, it is important to know the glycaemic index of foods.

Glycaemic Index (GI): Glycaemic index is the capacity of a particular food of how quickly it can raise the blood sugar levels. Easily digested foods released glucose immediately to raise the blood sugar levels have a high GI. Those foods which take longer time to digest and released glucose slowly in the blood have low GI.

Low GI foods are better for the health of diabetic and for those who are prone to it. GI ranks food on a scale from 0 to 100 depending on the effect they have on blood glucose levels.

Based on GI, the foods are classified into three groups:

Class I (High GI > 90)	Class II (Intermediate GI 70 -90)	Class III (Low GI < 70)
Maida and foods prepared from maida, rice, bread, sugar, cornflakes, baby corn, fruits like grapes, chikku, custard apple, pineapple, jackfruit,	Oats, all bran polished rice, sweet potatoes, rava, idli, chana, potatoes, carrots, green peas banana	Parboiled rice, milk, peanuts, tomatoes, apples, nuts, Pulses, rajma, soya bean.
		

Percent distribution of calories

Carbohydrates: 50-60%

Proteins: 10 – 20%

Fats: 20 - 30%

Dietary Fibres: 20gm/1000 kcal.

Macronutrients:

1) Carbohydrates:

- It is recommended that carbohydrates should come from whole grains, pulses, fruits, vegetables, milk and milk products.
- Consistence carbohydrates intact with respect to time and amount can result in improved glycaemic control.
- A meal plan considering portion control and healthy food choices can have better results

2) Proteins:

Proteins play many vital functions body such as energy production, growth and repair of tissues, production of Harmones, antibodies, etc. **Sources of proteins are:**

Animal Sources: Eggs, milk, chicken, fish, curd, cottage cheese (Paneer).

Plant Sources: Beans, legumes, tofu, nuts, and seeds.

Vegetable proteins sources are preferred as they are low in fats.

It is recommended that one must consumed 0.8 g protein per kg body weight per day.

3) Fats:

They are essential as they provide vital role such as oil for skin, Harmon production insulation of organs as a carrier of fat-soluble vitamins intake of MUFA and PUFA fats should be consumed. Saturated fats Trans fats and hydrogenated fats should be avoided. Foods rich in omega three fatty acids are oil fish, soya, fenugreek, mustered, walnuts and flax seeds etc. Consumption of fatty fish is recommended at least two times per week

4) Dietary fibres:

Soluble and insoluble fibres both play an important role to slow down the reabsorption of glucose and reduce the absorption of dietary fats. They also help soften stools by retaining the water in intestinal tract.

Sources of soluble fibres: legumes, oats, apple, banana, citrus fruits and potatoes.

Insoluble fibres provide bulk to food and therefore high fibre foods have fewer calories.

Sources of insoluble fibres wheat bran, whole grain seeds, fruits and vegetables.

Diet rich in both types of fibres is essential for people with diabetes.

5) Micronutrients:

They are required in smaller amounts and include vitamins and minerals. They are needed for proper functioning of macronutrients and help produce enzymes, hormones and other substances needed for growth and development.

6) Vitamins:

B12 deficiency is often found in patients with long standing diabetes. Deficiency leads to loss of myelin sheath of nerves leading to tingling and numbness in patients. They are essential for many vital functions in body and must be supplemented in case of deficiency.

7) Minerals:

They help maintain physiological processes, strengthen skeletal structures; preserve brain and

heart function as well as functions of muscular and nervous system. Foods rich in Calcium are required in elderly people.

Salt restriction is recommended to avoid as hypertension is recognised risk factor in diabetics. Hypertension is risk factor for diabetic nephropathy and cardiovascular diseases. Processed foods, bakery items, and preserved foods contain high amounts of sodium and hence they should be avoided.

Recommended intake of salt should not be more than 2300 mg/day (1 tea spoon) for diabetic patients.

Fruits and vegetables are low in sodium and high in potassium and hence they reduce the risk factor for hypertension.

Foods rich in antioxidants must be supplied in order to decrease the oxidative stress in body due to diabetes. Foods like herbs and spices should be encouraged as they have antioxidant properties.

- **Artificial sweeteners:**

Artificial sweeteners contain other carbohydrates and proteins and hence they should be consumed in acceptable amounts. ADI (Acceptable Daily Intake)

describes the amount of sweeteners consumed daily as follows:

Non -nutritive sweeteners	ADI (mg/kg body weight)
Saccharin	5
Aspartame	50
Acesulfame-k	15
Sucralose	5
Stevoside (naturally sweet herbal plant – stevia)	12

Meal Planning

In general intake of foods such as fruits, vegetables, whole grains, low fat dairy products, proteins, healthy oils and fats should be consumed.

Foods that have high glycaemic index should be strictly avoided.

Following plan shows one day diet plan for diabetic patient:

Menu	Amount	Carbohydrates	Proteins	Fats	Calories
Early Morning					
Fenugreek seeds with 1 cup of water	1 tsp	-	-		
Milk	1 cup	6.5	5	6	100
Breakfast					
Methi paratha	2 small	44	4	7	200
curd	1 cup/50 gm	4	2.5	3	50

		48	Total calories	250	
OR					
2 egg white omelette with capsicum	2 egg whites	-	6	10	100
Brown bread slice	2 no.	22	3.2	0.6	100
		22	Total energy	250	
Mid- Morning					
Apple	1 no. (50- 60gm)	12.5	-	-	50
Lunch					
Fulka	3 no.	35	5	0.6	100
Vegetable	1 bowl	4	1	5	100
Mix veg. salad	1 bowl (15gm)	6	2.5	-	40
Cucumber raita	1 bowl	4	5	6	80
Dal	1 bowl	17	7	0.5	100

Total		66	20	12	420
Evening					
Green tea/ tea/ coffee (without sugar)	1 cup	4	2.5	3	40
Puffed rice/ murmura	1 bowl	22	3	-	100
Total		26	5.5	3	140
Dinner					
Fulka	3 medium	33	4.5	0.4	180
Mix veg.	1 bowl	8	1.5	5.4	80
Curd/dal/k adhi	1 bowl	6.5	5	6	150
Total		47.5	11	11.8	410
Bed time					
Milk	1 cup	6.5	5	6	75
Soaked almonds	4 no.	-	1	3	30

Total	6.5	6	9	105
Total energy	222.5	62	61	1600

PCOD (Polycystic Ovarian Disease)

PCOD (Poly Cystic Ovarian Disease or (PCOS) Poly Cystic Ovarian Syndrome is characterised by multiple small fluid filled sacs in ovaries known as cysts.

PCOD is a lifestyle disorder that includes metabolic changes in body and requires various aspects for treatment including medications, diet and exercises.

Patients with PCOD have varied presentation from patient to patient; most common are abnormal levels of hormones that result in irregular menses, infertility and certain masculine changes in the body.

Causes of PCOD?

PCOD problems are caused by **hormonal imbalance in body**. One hormone change triggers another and brings about series of changes in body to end into Polycystic Ovarian Syndrome (PCOS).

Common causes of PCOS are:

- 1) Increased obesity
- 2) High levels of testosterone

- 3) Increased LH (Luteinising Hormone)
- 4) Raised levels of Prolactin
- 5) High Insulin Levels
- 6) Hereditary component has major role in developing PCOD

It is seen that there is no specific gene responsible to cause PCOS. Variety of genetic mechanisms work together due to which the disease manifests in different forms at different age groups. In women with PCOD, insulin resistance is commonly seen due to effect on hormones. These women have higher chances of weight gain. Obesity and overweight status contribute to insulin resistance. Women who are lean can also experience insulin resistance. Hence insulin resistance in PCOS is not directly related to obesity though obese female can have insulin resistance. Insulin resistance in PCOS puts women at a higher risk of developing Diabetes.

In insulin resistance, uptake of glucose into the cells is reduced. In response to this insulin produces more insulin to enhance uptake of glucose by the cells and thus balance blood glucose levels. In attempt to do this, blood insulin levels rise. This insulin may have several side effects. Its effect on ovaries is seen in form of increased androgen (testosterone) production.

Increased androgens are likely to interfere with ovulation by altering the levels of Luteinising Hormone (LH) and Gonadotropin Releasing Hormone (GRH). These hormones are responsible for releasing egg at the midpoint of the cycle during normal menstruation. Anovulation leads to irregular cycles or amenorrhoea. Excess androgens can lead to severe acne and excess hair growth on face, chest etc. (hirsutism). Insulin resistance can lead to darkened areas on skin and contribute to undesirable and stubborn weight which in turn worsens PCOS symptoms. PCOS can lead to infertility and in severe cases sterility.

Irregular periods and cycles can cause endometrial hyperplasia due to non-shedding of endometrium regularly. This can put women at a risk of ovarian, endometrial and breast cancers.

Signs and Symptoms of PCOD

PCOD can develop at the time of Puberty or later. Signs and symptoms of PCOS vary from person to person. PCOS is diagnosed when at least two or three of following signs are experienced by the patient.

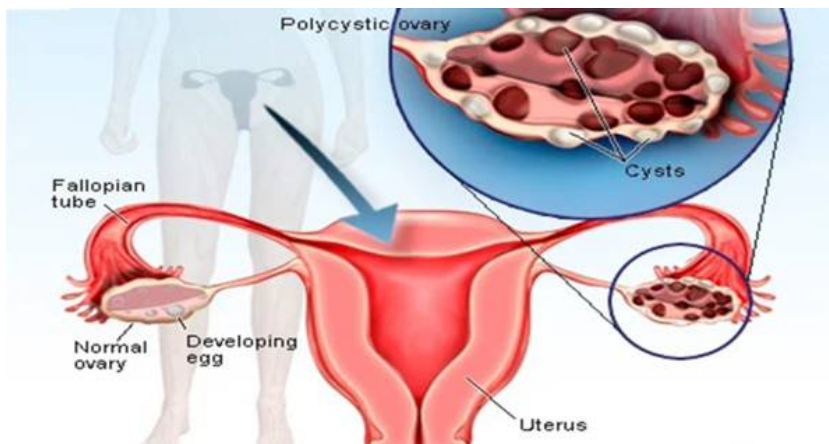
- **Irregular periods:** Menstrual irregularities including amenorrhoea (absence of menses), delayed menses, menorrhagia (prolonged menses) etc. are the common signs of PCOS.

For example, Patient or client might have fewer than nine periods a year, or the cycle can be 35 days or more.

- **Excess androgen:** Male hormones may be increased showing physical signs such as excessive facial and body hair (hirsutism), male pattern baldness and excessive acne on face and other part of body such as chest, back, arms etc.
- **Polycystic ovaries:** Ovaries might be enlarged and contain follicles that surround the eggs. Increased follicles can lead to impaired function of ovaries and Anovulation leading to hormonal imbalance. PCOS signs and symptoms worsens with increased weight. There can be more than 25 cysts in single ovary. The cysts are usually silent but can cause pelvic pain in some women.

PCOD should be treated on time. If remains untreated it may result premature ovarian failure.

Diagnosis of PCOD



1. **Menstrual history:** Regular/ irregular menstrual cycles, heavy/scanty menstrual flow, the need to take hormonal tablets (progestins) to induce a period, etc.
2. **Physical Signs:** Often **obese** and may have **hirsutism**, (excessive facial and body hair) as a result of the high androgen levels.
3. **Diagnosis can be confirmed by vaginal Ultrasound (USG pelvis):** Shows that the ovaries are enlarged; the bright central stroma is increased, and there are multiple small cysts in the

ovaries. These cysts are usually arranged in the form of a necklace along the periphery of the ovary

4. **Blood levels of hormones:**

- High LH (luteinizing hormone) level; and a Normal FSH level (follicle stimulating hormone) i.e. a **reversal of the LH: FSH ratio**, which is normally 1:1.
- Elevated levels of androgens (a high **dehydroepiandrosterone sulphate (DHEA-S)** level).
- Fasting cholesterol and triglyceride levels.
- Glucose tolerance test.



Diet for PCOD:

High Fibre, Low Carbohydrate, Low Fat Diet

PCOS diet includes the following foods:

- Natural, unprocessed foods.
- High-fibre foods.
- Fatty fish, including salmon, tuna, sardines.
- Spinach and other dark, green leafy Vegetables.
- Dark red fruits, such as red grapes, blueberries, and cherries.
- Broccoli and cauliflower
- Dried beans, lentils, and other legumes
- Nuts, including pine nuts, walnuts, almonds, and pistachios
- Healthy fats containing foods such as olive oil, coconuts, avocados etc.
- Dark chocolate in moderation
- Spices, such as turmeric and cinnamon.

Foods to be avoided

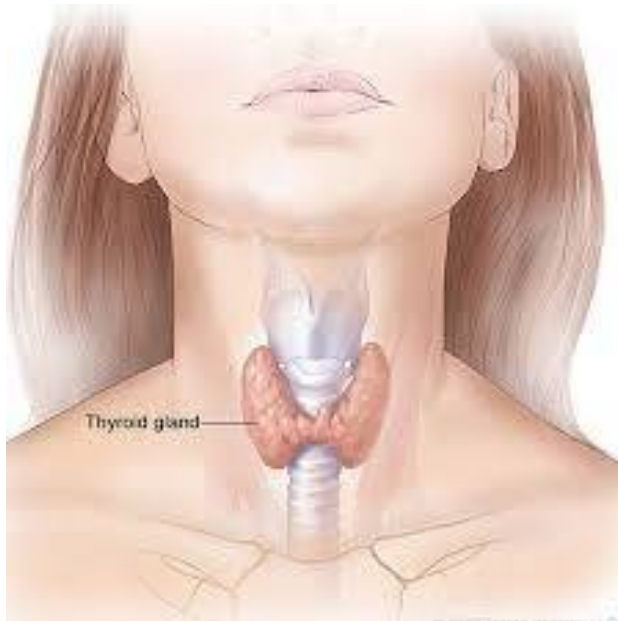
- Refined carbohydrates, such as mass-produced pastries and white bread.
- Fried foods, such as fast food.
- Sugary beverages, such as sodas and energy drinks.
- Processed foods

- Milk and milk products
- Salt consumption in moderation

HYPOTHYROIDISM

Thyroid gland is a butterfly shaped gland situated on the front of the neck. It is a vital hormone gland. It secretes hormone T3 and T4. These hormones are very essential to carry out normal metabolism, growth and development of human body. These hormones carry out growth, repair of different tissues. Hypothyroidism is a condition in which body does not make enough thyroid hormones. Thyroid secreting Hormone (TSH) is secreted by pituitary gland in response to decreased production of thyroid hormones (T3 and T4). In patients with hypothyroidism the metabolism becomes slow and thus calories are burnt at a slower rate. Hence patients with hypothyroidism put on weight easily and becomes difficult to lose weight due to slow metabolism.

Exercise may boost thyroid hormones and thus help losing weight.



MNT for hypothyroidism

Moderate energy, high protein and low-fat diet is recommended.

Energy calculations are done based on patient's anthropometric measurements.

Nutrients that are required for optimal thyroid health are:

- **Iodine:** It is an essential mineral needed to make thyroid hormones. Iodised salt is the best source of iodine. Other iodine rich foods are sea weeds, fish, dairy and eggs.
- **Selenium:** Helps activate thyroid hormones. It also acts as an antioxidant. It protects thyroid gland from damage due to free radicals. Food sources of selenium are- legumes. Tuna fish, sardines, eggs.
- **Zinc:** Zinc rich foods are recommended in patients with hypothyroidism. Foods rich in zinc are oysters, shellfish, beet and chicken.

Nutrients that are harmful for hypothyroid patients are goitrogens. Goitrogens are compounds that interfere with the normal function of thyroid gland.

Goitrogenic foods are:

- Soy foods: soybean and its products like tofu, soy milk soy flour etc.
- Vegetables: Cabbage, cauliflower, broccoli, spinach.
- Fruits and starchy plants: sweet potato, peaches, strawberries etc.
- Nuts and seeds: peanuts, millets etc.

All other healthy foods should be consumed in appropriate calories.

Cardiovascular Diseases:

Cardiovascular Diseases (CVD) describes the diseases of heart and the blood vessels. Coronary Heart Disease (CHD) is a common form of CVD and is caused due to atherosclerosis in large and medium sized arteries. It is the leading cause of death in many countries including India.

Atherosclerosis is defined as the deposition of cholesterol plaque in the walls of the arteries causing obstruction to the normal flow of blood. These plaques develop slowly over the period of years and may rupture causing acute occlusion of artery by a clot.

Symptoms of occlusion of vessels of heart include dyspnoea on exertion, weakness, pain in chest and in severe cases angina may result.

Role of fat in development of atherosclerosis:

Cholesterol and fats are the main forms of Lipids that are carried in the blood stream. These lipids come

partly from food and partly from body's own production in liver. Fats are not water soluble and hence they require fats to carry them to different tissues. With the help of lipoproteins, digested fat from the liver is carried to various parts of body through blood vessels. These lipoproteins are made of lipids and proteins. Lipoproteins namely chylomicrons carry triglycerides, VLDL (very low-density lipoproteins).

LDL (low density lipoproteins), is the main carrier of cholesterol. Some LDL pieces get stuck into the blood vessel walls thus narrowing them over a period of time. High LDL also decreases Endothelium Derived Relaxing Factor (EDRF), thus causing narrowing of blood vessels. Hence it is called bad cholesterol.

HDL plays an important role in reverse transport of cholesterol from tissues throughout the body to liver for conversion to bile acids or excretion as biliary cholesterol. Hence it is called good cholesterol. It also acts as an antioxidant or antiaggregant in the vessel wall.

Hence HDL plays a vital role in preventing heart diseases.

Desirable cholesterol levels:

Cholesterol	Desirable	Normal risk	High risk
Total cholesterol	<200	200 – 240	> 240
HDL cholesterol	> 40	35 – 40	< 35
Triglycerides	< 200	200 – 400	> 400
LDL cholesterol	< 100	130 – 160	> 160

Dietary Management of CHD

Objectives:

Achieving Ideal body weight.

Maintenance of good nutrition through lifestyle modification

Maintaining modified lifestyle.

Principles of MNT:

Diet therapy is the first and important line of treatment for patients with high cholesterol levels.

Low calorie, low fat (low saturated fat, low cholesterol), high in PUFA (Poly Unsaturated Fatty Acids) with omega 6 to omega ratio 4-10:1, low carbohydrate and normal protein therapy is advised. High fibre diet with increased amount of antioxidants is recommended.

The first step is restriction of fats to not more than 20% of the total calories consumed. According to ICMR, the ratio of PUFA to saturated fats should be 0.8:10.

Importance of PUFA:

- They promote esterification of cholesterol and make into easily utilisable form.
- PUFA, especially arachidonic acid are precursors of prostacyclin and thromboxane which are vasodilators that prevent thrombus formation.
- Linoleic acid prevents accumulation of cholesterol in blood.
- PUFA decrease production of LDL and triglycerides and help in the clearance of LDL.
- Hence foods rich in PUFA are cardioprotective.

MUFA (Mono Unsaturated Fatty Acids)

Mono unsaturated fatty acids are oleic acid and erucic acid. MUFA are present in vegetable oils such as olive oil, almond oil, canola and groundnut oil. They lower LDL and triglyceride levels. However, their effect on HDL has still not been understood. Studies have shown that both low fat diets and diets higher in MUFA

decrease LDL susceptibility and decrease in risk of coronary heart disease.

Oils that are rich in MUFA and PUFA are groundnut oil, olive oil, safflower oil, sunflower oil, gingelly oil, rice bran oil, soybean oil and butter.

Foods that are rich in unsaturated fatty acids are: flax seeds, sesame seeds, mustard seeds, oily fish, fenugreek seeds, legumes (black gram, cow pea, rajma), pulses.

Carbohydrates

High carbohydrate intake can increase triglyceride levels. Complex carbohydrates should be included in diet. Carbohydrate intake should be limited to 60% of total energy.

Proteins, vitamins and minerals

Animal proteins are not suggested for atherosclerotic patient.

Since fats are restricted, deficiency of fat soluble vitamins specially vit A can be seen.

Niacin plays important role in effective treatment of dyslipidaemia. Niacin increases HDL and decrease LDL levels.

Vit C activates adrenal glands and reduces cholesterol levels.

Sodium is restricted in CHD patients. Not more than 2300 mg of sodium is recommended for these patients.

Functional foods for CHD patients:

Functional foods are the foods that have positive effect on person's health, physical performance and state of mind. These foods are rich in antioxidants, have hypocholesterolaemic effect.

Some functional foods that should be used in patients with CVD are:

- 1) **Vit E:** It maintains integrity of cells and thus prevents oxidation of polyunsaturated fatty acids. It is found in almonds & other oil seeds.
- 2) **Carotenoids and b-carotene:** They act as antioxidants as it quenches singlet oxygen and reacts with the free radicals generated during lipid peroxidation. It is found in green leafy vegetables and yellow-orange coloured vegetables.
- 3) **Vit C:** It acts as an anti-oxidant, and reducing damage caused by free radicals. Fruits and vegetables are good sources of vit c. Amla,

oranges, guavas, red grapes and pomegranate are rich source of vit c.

- 4) **Selenium:** This also acts as antioxidant and is found in sea foods, liver and kidney.
- 5) **Soy protein:** Soy protein reduces the plasma total concentration levels.
- 6) **Garlic:** Garlic consumption over a period of time reduces the blood cholesterol levels. 1 clove of garlic is effective to lower cholesterol levels in blood.
- 7) **Nuts:** Nuts like almonds, walnuts are rich source of MUFA. 70 % of almonds contain MUFA which is highly cardio protective. Magnesium and copper present in nuts protect against CHD.
- 8) **Yogurt and milk:** synthesis of cholesterol is decreased when milk and yogurts are consumed.
- 9) **High fibre:** High fibre diet reduces cholesterol and enhance excretion through faeces. Dietary fibre reduces fibrinogen levels in blood.

Tips for adding fibres to diet:

- Choose fresh fruits rather than canned fruits or juices.
- Choose whole grain cereals and pulses.

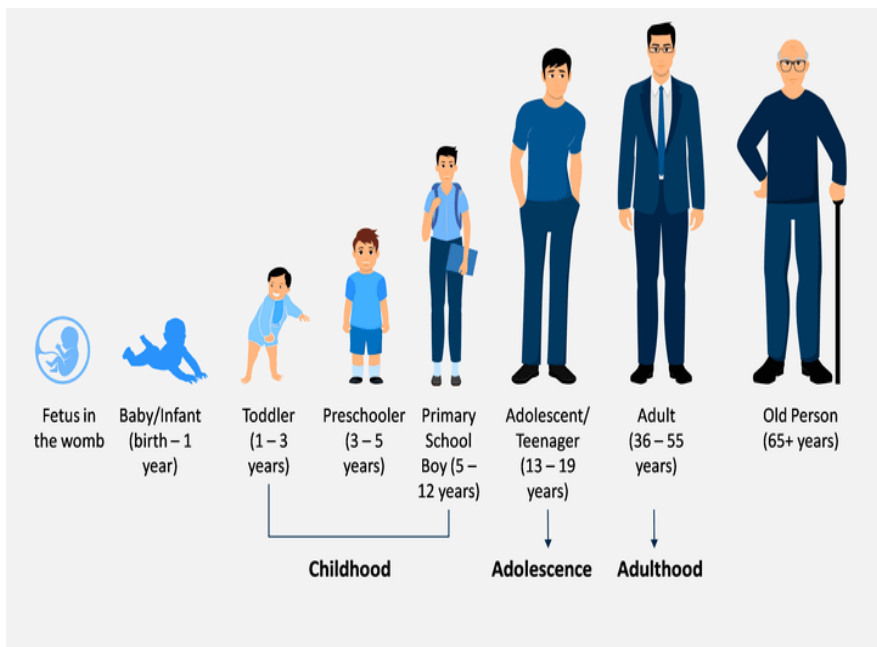
- Do not peel skins of fruits such as apple, pear and peaches.
- Salads should be consumed every day.
- Choose raw vegetables and snacks every day.
- Dried beans and peas should be consumed everyday at least 1 serving.

Dietary Guidelines:

- Always consume short and frequent meals.
- Maintain slightly lower weight than Ideal body weight.
- Patient should know the energy content of foods.
- High fibre foods like whole cereals, legumes pulses, green leafy vegetables, whole fruits should be included in diet.
- Nuts like almonds walnuts, sesame seeds, flax seeds should be included in diet.
- High protein rich foods pulses, eggs, chicken, fish should be included.
- Five servings of fruits and vegetables should be included as they have antioxidant properties and also contain fibres.

- Patient should consume skimmed milk or low-fat cow milk.
- Patient should avoid taking preserved foods, especially high energy syrups, sauces etc.
- Foods giving empty calories like carbonated beverages, alcohol, sugar, sago should be totally avoided.
- Coffee and tea can be consumed in moderation.
- Foods that have hypocholesterolaemic effect such as soybean, fenugreek, garlic, onion, flax seeds, oats and turmeric should be included in diet.
- Salt should be restricted in diet.
- Taking meals outside should be avoided as they are high in fats and calories.

Diet during Different stages of Life



Diet during Different stages of Life

Group	Age	Weight kg	Energy Kcal	Protein g/d	Fat g/d	Calcium Mg/d	Iron Mg/d	Vit. A Reti B car. Nol ug/d ug/d
Infants	0-6 months	5.4	108/kg	2/kg		500		350
	6-12 months	8.6	98/kg	1.65/kg		500		350
Children	1-3	12.2	1240	22	25	400	12	400
	4-6	19	1690	30	25	400	18	400
	7-9	27	1950	41	25	400	26	600
Boys	10-12	35.4	2190	54	22	600	34	600
Girls	10-12	31.5	1970	57	22	600	19	600

Boys	13-15	47.8	2450	70	22	600	41	600
Girls	13-15	46.7	2060	65	22	600	28	600
Boys	16-18	57	2640	78	22	600	50	600
Girls	16-18	50	2060	63	22	500	30	600

Nutritional demands differ at every stage of life. Physiological, hormonal and psychological changes in body demand different nutrients at different age groups. It is essential to know the physiological, hormonal and psychological changes occurring in body and supplement the needs with varied healthy foods.

Recommended dietary Allowances for children

Source: Gopalan., B.V. Ramasastri and S.C. Balasubramanian, 1991, Nutritive value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India.

Nutrition Requirements for Preschool children (1-6 years):

Growth during 1 to 2 years age is slower than that before 1st year of life. The child may gain weight 150-200 gm per month between one and two years of life.

There is increased need for all the nutrients but the pattern of rise varies in relation to their growth.



Nutritional Requirements:

Energy: Energy requirement increases as the activity levels increase in these children. Insufficient food & inadequate nutrients will not only result in under nutrition in terms of weight gain but also hinder mental and physical development.

Proteins: Positive energy balance is required in these patients as there is increase in muscle mass along with bone growth. 1.5 to 2 gm per kg body weight proteins is required for various functions of body.

Fat: 25% of fat of total energy is required out of which 5% energy should come from invisible fats.

Minerals: Calcium-requirement is increased for growing bones. Recommended calcium required per day is 400 mg/day as all dietary calcium is not absorbed. Milk is the best source so 1-2 glasses of milk are recommended.

Iron: Daily iron requirement at this age group varies from 0.2 – 0.5 mg / kg body weight. About 1.5 mg iron must be absorbed. 6 – 12 months old children are at a greatest risk of irreversible long term consequences of iron deficiency mainly physical as well as mental development.

Foods rich in iron: Egg yolk, garden cress seeds, Niger seeds (karale), meat, liver and green leafy vegetables.

Vitamins: According to ICMR, vit A deficiency is common in children. 400 mcg Vit A per day is suggested in children. Foods rich in Vit A are: Green leafy vegetables, carrot, milk, eggs, fresh apricot, ripe mango, orange, papaya, tomato, raspberry etc.

Vit D: 200 I.U. of Vit D is recommended for children

Vit B: Requirement of Vit B depends on energy intake of children. The allowances for 1000 kcal are the same as that of adults. Micronutrient B 12 is related to

development of brain structure and function, cognitive development, executive function and growth.

Fiber: The American Foundation recommends children an adolescent 3 -20 years of age are the age of child plus 5 gm dietary fiber. Role of dietary fiber during childhood is related to lowering risk of developing constipation, obesity and diabetes. Higher the intake of whole grains, fruits and vegetables, better is the quality of diet.

Picky eating Behavior:

Though there is no universally accepted definition, Picky eating children are known to be fussy, choosy eaters. They are classified as unwillingness to eat familiar foods, try new foods as well as having strong preference for particular foods.

Picky eating behaviors in children have been found to cause nutritional deficiencies in children. It has become a common behavior in early childhood. Causes of picky eating behavior include early feeding difficulties, late introduction of weaning foods, pressure to eat and early choosiness especially if mother is worried about this. This has resulted in insufficient consumption of fruits, vegetables, fiber containing foods, functional foods etc.

The consequence of this has resulted in low intakes of iron, zinc, fibrous foods etc. constipation, overweight and obesity. This is also related anorexia nervosa and altered Behavior. Persistent picky eating is related to pervasive developmental problems.

Caregivers should be made aware of the consequences of picky eating in children and measures must be taken such as:

- Having realistic expectations from children regarding portion sizes.
- Repeated exposure to unfamiliar foods must be made.
- Avoid pressure to eat.
- Parental modeling to eat fruits and vegetables and trying unfamiliar foods.
- Promoting appetite by limiting snacks and empty energy foods.
- Promote family meals together with all members eating together.
- Focusing on long term goals and being consistent.

Children's picky eating behavior may have negative impact on family relationships and so it is important that health care providers identify the children in the society and counsel parents accordingly.

Infections and Nutritional Status:

Nearly 60% of Nutritional deficiencies are seen in children. Protein Energy Malnutrition (PEM) and Vit A are more common in children.

Frequent infections in childhood have been related to nutritional deficiencies. Repeated illnesses such as recurrent viral infections, diarrhea and respiratory infections can lead to decrease in nutritional status, cognitive impairment.

Dietary Guidelines:

- Diet should be rich in quantity and quality.
- Regularity in feeding should be practiced.
- 1-2 glasses of milk is recommended daily
- Protein rich foods such as eggs. Pulses, paneer or cheese should be consumed in appropriate amounts.

- Fibrous foods such as fruits, vegetables and whole grain products should be given to avoid constipation.
- The diet should include variety of foods that include all five food groups, to achieve optimal health.
- Inclusion of curd or buttermilk in diet can decrease the incidence of diarrhea and maintain gut health.
- Foods should be slightly seasoned to make them tastier and more acceptable. E.g. flavor and color of milk can be modified to make it more acceptable.
- Food can be made attractive by designing different shapes to chapatis, sandwiches, fresh fruits and vegetables like carrot cucumber etc.
- Different cooking methods should be adopted to encourage child to eat.
- Atmosphere while feeding the child should be pleasant, peaceful and lack distraction.
- Foods like tea and coffee should be avoided.

Suggested recipes for preschool children:

- Tricolor sandwich (mint chutney, tomato sauce, butter)
- Sweet and sour Paneer (with capsicum, carrot, cabbage, lettuce) Flavors: jaggery, amchur powder, pinch of salt.
- Whole wheat noodles with different vegetables.
- Fruit salad with sweet dressings
- Chikki / oats bar / nutritious bar
- Flavored pulao

Dental problems in children:

Oral health, dietary factors, nutritional status and health status are interrelated to each other. Malnutrition adversely effects oral health and vise versa. Studies have shown that early malnutrition causes delay in tooth eruption, early tooth decay, impairment of saliva secretion due to salivary gland hypofunction.

Vit A is important for enamel and vit C is important for dentine. Calcium, phosphorous and vit D are essential for calcification. Fluorine decreases susceptibility of caries.

Fermentable carbohydrates which adhere to tooth surface and free sugars are major dietary factors responsible for tooth decay.



Nutritional Requirement for school children (Age: 6-12 years)

Nutritional requirement for boys and girls is the same till the age of 9 years. After that there is variation in nutrient requirements.



Calories and proteins:

Energy needs varies with child's growth rate, body size and physical activity. Energy requirements increase steadily in this age group. For girls the energy requirements are the same from age 7-12 years. For boys, energy requirements are increased after 9 years till 12 years.

Minerals: Growth spurt is more in this age group. 10-12-year-old children require more calcium than adults to meet skeletal growth. They need to take 2- glasses of milk to meet nutritional need.

As the blood volume increases, the requirement of iron also increases.

Vitamins: Apart from B complex deficiency, deficiency of Vit D has been found to be common in children according to recent studies. This has been directly related to increased body mass index in children between the age of 6 -12 years.

Vit D is essential not only for bone health but also for metabolism of calcium and phosphorous. In addition, Vit D is important for production of various cytokines, and interleukins which have a role in metabolic syndromes. Moreover, Vit D deficiency is related to respiratory infections, food allergies and asthma.

Food Requirements:

In this age group natural increase in appetite leads to increase in food consumption. Nutrition education to children of this age group is important as control of food selection is shifted from parents to children. Role modeling plays a very important role. Between the ages of 8 to 11 girls may be at a risk of developing eating disorder.

Increased exposure to mass media, there is negative awareness in children on unhealthy eating. Hence counselling children about eating behaviors is an important factor.

Importance of breakfast:

Breakfast is important meal of the days as it breaks the fats of sleep hours and prepares the child for utilizing mental abilities in school. Children who skip breakfast do not make up the days energy requirements and thus cognitive performance drops according to study conducted by (NIN) in 2003 – 2004. Ideal breakfast should contain all five food groups. Hence only is not sufficient source to meet energy requirements.

Breakfast recipes for children:

Home: Milk + nuts/ egg

Tiffin recipe in school:

1. Idli + sambhar/ coconut chutney
2. Paratha + mint and coriander chutney
3. Potato peas pates + green chutney
4. Paneer sandwich + green chutney + guava
5. Stuffed paratha (green vegetable) + egg
6. Chapati + Usal and carrot salad
7. Cheese sandwiches + orange
8. Dal khichdi + koshimbir (salads)

Dietary Guidelines:

- Children are usually restless and do not like to sit in one place and hence foods must be energy dense to provide nutritional needs yet satisfying to taste.
- Menus need to be provided in variety: color, texture, taste and flavor.
- Snacky meals should be given as they do not like to eat full meals at one time.
- Foods that are not accepted by children need to be provided to them in form of sandwiches or Parathas.
- Fruits which are not liked by children can be given in form of juices.
- Vegetable salad dressings can be used occasionally to enhance the taste for vegetables which are not usually in diet.

Nutritional Requirements for Adolescent

Age group of 10 – 19 is considered as adolescent age group. This is a period of transition from childhood to adulthood. Many physiological changes take place in body including physical, biochemical, emotional and hormonal changes. Growth spurt in boys occurs slower than that of girls. There is increase in height and weight.

With these profound changes there are increased demands for energy, proteins, minerals and vitamins.



Rapidly changing Poor lifestyle in Adolscense

Energy: Owing to increased metabolic demands, calorie requirement in children is increased. Calorie requirement in boys and girls is same till the age of 9 years. After the age of 10 years there is marked difference. Increased hunger and large appetite is seen especially in boys. Daily calorie requirement in boys is 2500 – 2600 kcal and that of girls is 2000 kcal.

Proteins: Protein requirement is usually 1 gm/kg body weight. Regular exercise is important at this age group.

Fats and Essential Fatty Acids: Foods low in fats, saturated fats and trans fats should be emphasized in meal planning. Desirable level of visible fat intake is 20 gm/kg body weight for adolescents.

Minerals:

Calcium: 500-600 mg of calcium per day is essential. Bone growth demands calcium and phosphorous. 150 mg of calcium must be retained in body after all metabolic processes in order to increase bone mass.

Iron: Iron is needed for hemoglobin synthesis for expansion of blood volume as well as to replace the lost iron during menstruation in girls. Girls need to ensure adequate iron to maintain normal hemoglobin. Zinc deficiency is not normally seen in during puberty but zinc supplements have been shown to increase pubertal growth in children with delayed puberty.

Vitamins:

Skeletal growth requires vit D while the structural and functional integrity of newly formed bones required vit A, C, and E.

Folic acid and B12 are required for DNA synthesis and needed in higher amounts when tissue synthesis is occurring rapidly.

Pre menstruation tension in can be reduced by vit B6 100 mg/day.

Physical activity is necessary in this age group to prevent obesity.

Common Nutritional disorders during Adolescence:

- 1) **Obesity:** High calorie foods can cause obesity. Skipping meals and eating junk food is commonest problem seen in children. High glycaemic index foods may lead to metabolic and thus hormonal changes leading to obesity, PCOD in girls etc.
- 2) **Eating Disorders:**
 - a) Anorexia Nervosa
 - b) Bulimia Nervosa
 - c) Binge Eating Disorder.

Dietary Guidelines:

Period of adolescence represents an active period of life. Adequate well- balanced diet should be taken to prevent obesity or undernutrition.

An adolescent girl should take enough calcium and iron rich foods.

Avoid empty calories from foods like bakery foods, carbonated beverages, fried foods etc.

Cooking of foods by children should be encouraged.

No meals must be missed to avoid outside junk food eating.

Eating habits should be independent of emotions.

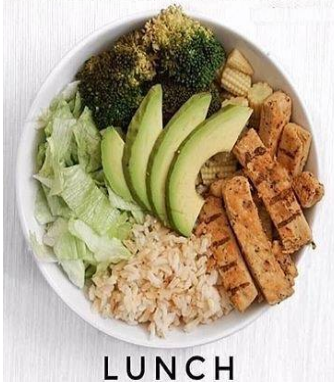
Menu Planning & Meal preparation for Family



BREAKFAST



SNACK



LUNCH



DINNER

Menu Planning and Meal preparation for Family

Planning the menu is the most important aspect of nutritious diet. It is challenge of housemaker to meet the energy and nutrient requirements of her family. Developing good eating behavior helps the person in long run. Selection of foods is the reflection of one's eating habits. Our food habits are influenced by culture, religion, social norms, geographic distribution and availability of foods. Likes and dislikes also govern eating behavior and habits in different persons. A child's appetite determines the volume of food the child eats. The appetite in turn is influenced by factors like surrounding atmosphere, hunger, satisfaction etc. Child imitates the food habits of those around him. If person around do not strongly exhibit their likes and dislikes towards food that is served then child learns to accept the same and eats everything. If most vegetables, fruits, dals etc. are introduced to him in the first year of life then the child develops the taste for wide range of products.

Encourage child to eat with his own hands, he will learn to enjoy food as much as he wants.

Certain misconceptions about food prevail in our country. Like milk should not be eaten with fish and meat. Milk should be avoided with fruits. The concept of hot and cold foods, particularly nonveg foods are considered as hot and milk and milk products and vegetables are considered as cold foods.



Snacks:

In today's fast paced world, people are not finding time to consume 3 – 4 meal patterns that was traditionally followed. Now people follow snacks pattern which is easy to prepare and also saves time. The snacks served should be healthy and nutritious. Selection of

snacks should be nutritious. The time of snacks is also an important factor. Planned intake of snacks is an important factor to meet nutrition requirements. Most of the snacks though meet the energy requirements are poor in proteins and healthy fats. These snacks must be complemented with healthy food choices.

Nutritive value of some snacks

- **Bhel**

1 serving: $\frac{3}{4}$ cup

Proteins: 4.3 gm

Energy: 210 kcal



- **Potato wada**

Serving size: 2 medium

Protein: 4 gm

Calories: 190 kcal



- **Rice Flakes Chiwda**

Serving size: $\frac{3}{4}$ cup

Proteins: 3.7 gm

Calories: 154 kcal



- **Potato chips**

Serving size: 10 pieces

Proteins: 0

Calories: 100 kcal



- **Vegetable Sandwich**

Serving Size: 2 pieces

Proteins: 3.2

Calories: 150 kcal.



- **Cheese Sandwich**

Serving Size: 2 pieces

Proteins: 9.3

Calories: 230



- **Egg Sandwich**

Serving size: 2 Pieces

Proteins: 9.8

Calories: 230

- **Plain Dosa**

Serving size: 1

Proteins: 5.6

Calories: 210



- **Medu wada**

Serving size: 2 medium pieces

Proteins: 5.0

Calories: 200



Utappam

Serving size: 1 medium

Proteins: 5.5

Calories: 205



- **Potato Bhajiya**

Serving size: 5 medium

Proteins: 6.3

Calories: 210



- **Misal**

Serving size: $\frac{3}{4}$ cup

Proteins: 10.2

Calories: 215

- **Rava sheera (sooji halwa)**

Serving size: $\frac{3}{4}$ cup

Proteins: 4.6

Calories: 280



- **Sabudana Khichdi**

Serving Size: $\frac{3}{4}$ cup

Proteins: 4.3

Calories: 310



- **Dahi wada**

Serving size: 2 medium

Proteins: 6.4

Calories: 200



- **Fruit Yogurt**

Serving size: 1 medium cup

Proteins: 3

Calories: 150

Diet and Nutrition Counselling

Diet counselling is the heart of diet therapy. It is a combination of nutrition expertise and psychological skills used to rationally convince the clients to adopt healthy eating behavior. Educating people on implications of poor lifestyle and pattern prevalence of communicable and non communicable diseases in society and providing them with the solutions which can be easily accommodated into their routine is the most important factor for achieving goals. Nutrition advice can be provided on individual basis or programs can be conducted to create awareness. This can also be done in hospitals through group discussion for patients suffering from similar problems.

Challenges faced by the Nutrition expert while counselling

- Non acceptance to changes in dietary and other lifestyle habits.
- Lack of education on importance of nutrients and their role in body.
- Non- cooperation of family members especially in case of housewives.

- Genetic characteristics require long term and persistent lifestyle modification.
- Festivals and parties can create obstacle in scheduled plans.
- For people working for long hours in offices, non-compliance to follow diet at work place can be factor of consideration.
- Psychological factors like stress, depression, mania and other psychiatric illnesses can have major impact on non-compliance to healthy lifestyle.
- Personality traits like impatience, dominating and dictatorial personalities and people with low esteem need continuous motivation throughout till goals are achieved.

While educating a patient with severe illness counsellor must treat existing depression through proper counselling by establishing good rapport.

Responsibilities of Nutrition Expert:

- To formulate most appropriate nutritional therapy for each patient by individualizing the client/ patient through individual nutrition

requirement, body metabolism, bio chemical data and anthropometric analysis.

- Prescribe appropriate diet depending on age, gender, activity levels, body weight, ethnicity, culture, location etc.
- Avoid discrimination on foods on basis of cultural differences.
- Counselling on food preservation and hygienic practices should be done.
- Consult with healthcare team concerning the nutritional care for patients.



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