

NUTRITION

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- You are what you eat- Brillat Savarin
- If you eat wrongly, no doctor can cure; and if you eat rightly no doctor is needed

Classification of food, macro and micro nutrients in diet, function of protein, carbohydrate, fat and their dietary sources



INTRODUCTION

- Nutrition may be defined as “the science of food and its relationship to health”.
- It is concerned primarily with the part played by nutrients in body growth, development and maintenance.
- Good nutrition means “maintaining a nutritional status that enables us to grow well and enjoy good health.”

Why Nutrition?

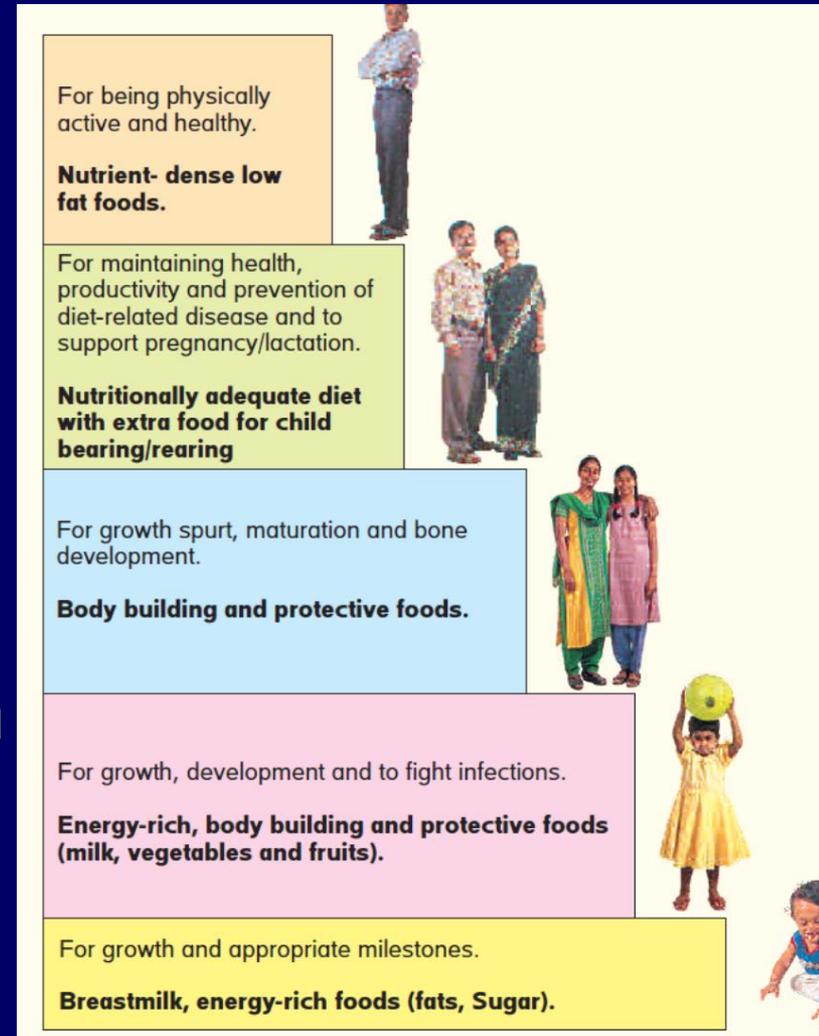
- Nutrition is an important component of the day to day lives of a person whether sick/ healthy.
- Food has an immediate effect (Satiety, Food poisoning, diarrheal diseases) as well as a long term effect (malnutrition, obesity, cancers etc.) on an individual's health
- Nutrition is a modifiable risk factor for diseases at the level of an individual.
- The prescription for drugs is invariably followed by the advice about diet in a sick person specially in certain chronic diseases like hypertension, diabetes, obesity and metabolic syndrome etc.

Why Nutrition?

- Epigenetics: Stream of science which deals with the effect of environmental and other factors on our genetic prototype.
- It proposes a control system of 'switches' that turn genes on or off, and suggest that nutrition, environment, toxins, our social environment, family bonds and stress- all have the ability to control these switches and cause heritable effects in humans.

Why Nutrition?

- Nutrition is also very important during certain periods of life
- Infancy
- Till 5 years of age
- Adolescence
- Pregnancy and lactation
- Elderly



INTRODUCTION contd...

- The word **nutrient** or “**food factor**” is used for specific dietary constituents such as proteins, vitamins and minerals.
- **Dietetics** is the practical application of the principles of nutrition; it includes the planning of meals for the well and the sick.

CLASSIFICATION OF FOODS

- **Classification by origin:**
 - Foods of animal origin
 - Foods of vegetable origin

- **Classification by chemical composition:**
 - ❖ Proteins
 - ❖ Fats
 - ❖ Carbohydrates
 - ❖ Vitamins
 - ❖ Minerals

CLASSIFICATION contd...

Classification By Predominant Function

- Body building foods:
 - meat, milk, poultry, fish, eggs, pulses etc
- Energy giving foods:
 - cereals, sugars, fats, oils etc.
- Protective foods:
 - vegetables, fruits, milk, etc

CLASSIFICATION contd...

Classification by nutritive value:

- Cereals and millets
- Pulses
- Vegetables
- Nuts and oilseeds
- Fruits
- Animal foods
- Fats and oils
- Sugar and jaggery
- Condiments and spices
- Miscellaneous foods

CLASSIFICATION contd...

Classification by food groups:

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

Food Pyramid



Abstain from drinking alcohol



Say NO to Tobacco

BALANCED DIET FOR ADULT MAN (SEDENTARY)

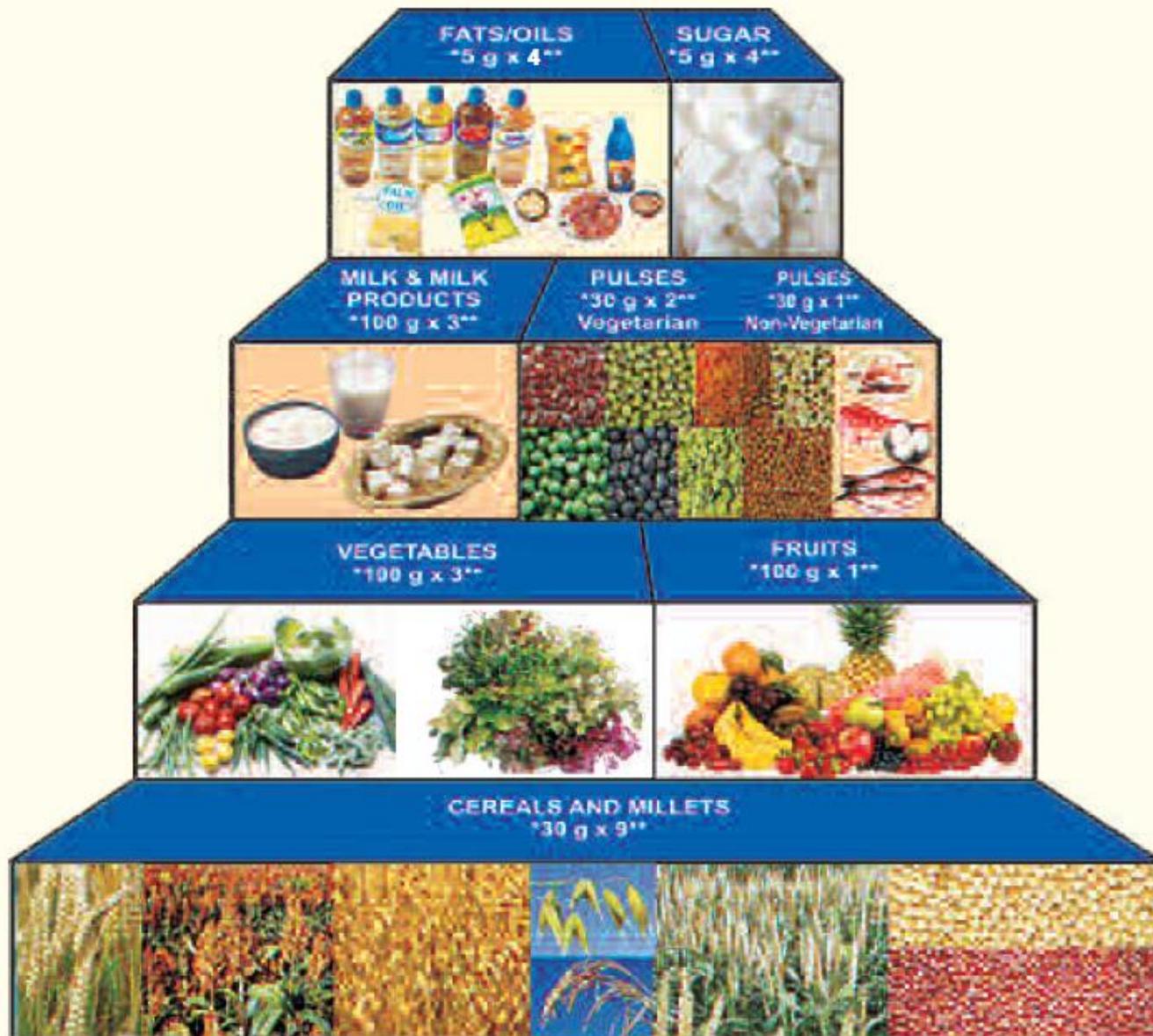


* Portion Size.

** No. of Portions

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

BALANCED DIET FOR ADULT WOMAN (SEDENTARY)



* Portion Size.

** No. of Portions

Extra Portions

- **Pregnant women** : Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2.
- **Lactating women** : Cereals-1, Pulses-2, Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2
- **Between 6-12 months of lactation**, diet intake should be gradually brought back to normal.
- **Elderly women** : Fruit-1, reduce cereals and millets-2.

NUTRIENTS

- Organic and inorganic complexes contained in food
- They are broadly divided into:

Macronutrients:

- ▲ Proteins
- ▲ Fats
- ▲ Carbohydrates

Micronutrients:

- ▲ Vitamins
- ▲ Minerals

PROTEINS



PROTEINS

- Proteins are complex organic nitrogenous compounds.
- They also contain nitrogen and sulfur and in some cases phosphorous and iron.
- Proteins are made of monomers called amino acids.
- There are about 20 different amino acids which are found in human body.

PROTEINS

- Of these, 10 AA are termed “essential” as they are not synthesized in human body and must be obtained from dietary proteins.
(AVHILL MPTT)

Sources of Proteins

Animal Sources: milk, meat, eggs, cheese, fish etc.

- These proteins contain all the essential amino acids .
- They have high biological value and digestibility
- They are referred as “reference protein”.

Sources of Proteins contd...

Vegetable Sources: pulses, cereals, beans, nuts, oil-seed cakes.

- These proteins are poor in essential amino acids.
- They have low biological value and digestibility
- They are cheap, easily available and consumed in bulk

Supplementary action of Proteins

- Cereal proteins are deficient in lysine and threonine; pulses are deficient in methionine.

Functions of Proteins

- Body building
- Repair and maintenance of body tissues
- Maintenance of osmotic pressure
- Synthesis of bioactive substances and other vital molecules- hemoglobin, enzymes, hormones, antibodies etc.
- Boost Immune mechanism

Evaluation of proteins

The parameters used are:

- Biological value (BV): absorbed/ intake
- Digestibility coefficient (DC): retained/ absorbed
- Protein efficiency ratio (PER)
- Net protein utilization (NPU):

$$= \text{BV} \times \text{DC} / 100$$

Nitrogen retained by the body \times 100

Nitrogen intake

Assessment of protein nutrition status

- Arm muscle circumference
- Serum albumin
 - ▲ s/b > 3.5 g/dl
 - ▲ 3.5 g/dl - mild malnutrition.
 - ▲ < 3.0 g/dl - severe malnutrition.
- Serum transferrin
- Total body nitrogen

Protein requirements

- 1 g/kg of body weight assuming a NPU of 65

FATS



Fats

- Fats are solid at 20° C; oils are liquid.

Classification:

- ❖ Simple lipids: triglycerides
- ❖ Compound lipids: phospholipids
- ❖ Derived lipids: cholesterol
- Fats yield fatty acids and glycerol on hydrolysis
- Essential fatty acids (EFA) are those that cannot be synthesized by humans: LA & ALA

Sources of Fats

- Animal Fats: ghee, butter, milk, cheese, eggs and fat of meat and fish.
- Vegetable fats: from seeds e.g groundnut, mustard, sesame, coconut
- Other sources: Invisible fat

Fatty acid content of different fats (in %)

Fats	SFA	MUFA	LA	ALA
High SFAs				
Coconut oil	92	6	2	-
Butter/ Ghee	68	29	2	-
High SFAs & MUFAs				
Palmolein	39	46	11	<0.5
High MUFAs & Mod. LA				
Groundnut oil	19	41	32	<0.5
Rice bran	17	43	38	1
Sesame	16	41	42	<0.5

Fatty acid content of different fats (in %)

Fats	SFA	MUFA	LA	ALA
High LA				
Cotton seed oil	24	29	48	1
Corn	12	35	50	1
Safflower	9	13	75	-
Sunflower	12	22	62	-
High LA & ALA				
Soyabean	14	24	53	7
Canola	6	60	22	10
Mustard/ Rapeseed	4	65	15	14
Flaxseed	10	21	16	53
High TFAs				
Vanaspati	46	49	4	-

Functions of fats

- They are high energy foods, providing as much as 9 kcal for every gram.
- Fats serve as vehicles for fat-soluble vitamins
- Fats in the body, support viscera such as heart, kidney and intestine
- Fat beneath the skin provides insulation against cold.

The “non-calorie” roles of fat

- EFA are needed for growth, structural integrity of the cell membrane and decreased platelet adhesiveness.
- Cholesterol is an important component of membranes and is a precursor of steroid hormones and bile acids.

The “non-calorie” roles of fat

- PUFA are precursors of prostaglandins- the local hormones responsible for :
 - ❖ Vascular homeostasis
 - ❖ Kidney functions
 - ❖ Acid secretion in the stomach
 - ❖ GI motility
 - ❖ Lung physiology
 - ❖ Reproduction.

Hydrogenation

Oils

(Liquid)

Unsaturated
FA

Hydrogenation



Temp, Pressure,
Catalyst

Vanaspati

(Semi solid &
solid)

Saturated FA

EFA content ↓

Trans Fatty Acids

- Geometrical isomers of cis – unsaturated fatty acid
- Saturated fatty acids
- Obtained by partial hydrogenation
- Removes critical double bond in EFA
- Make the plasma lipid profile even more atherogenic than the saturated fatty acids -
↓HDL, ↑LDL - Increases the risk of CHD
- **Sources:** Deep fried fast food, cake mixes, energy bars, chips, packaged cookies, pies and cakes.

Refined oils

- Usually done by treatment with steam, alkali etc.
- Refining and deodorization of raw oils is done mainly to remove the free fatty acids and the rancid materials.
- It only improves the quality and taste of the oils.

Choice of cooking oil

- Variety of oil instead of a single source
- Mix 2 or more oils with different composition (equal mixture of PUFA rich and MUFA rich oil supplemented with occasional use of mustard oil)
- Mustard oil contains erucic acid, which is bad for health therefore it should not be used as a sole cooking medium.

Fats and disease

- **Obesity:** In fat people adipose tissue can increase upto 30%
- **Phrenoderma:** Deficiency of Essential fatty acids leads to rough and dry skin – “toad skin”
- **Coronary heart Disease:** High saturated fat
- **Cancer:** Colon cancer and breast cancer
- **Others:** skin lesions in Kwashiorkor

Fat requirements

- In developed countries, dietary fats provide 30 to 40% of total energy intake.
- The WHO Expert committee on Prevention of CHD has recommended only 20 to 30% of total dietary energy to be provided by fats.
- At least 50% of fat intake should consist of vegetable oils rich in essential fatty acids.

CARBOHYDRATE



CARBOHYDRATE

- Main source of energy (4 Kcals/ gram)
- Carbohydrate is also essential for the oxidation of fats and for the synthesis of certain non-essential amino acids

Sources of carbohydrates

- 3 main sources - starches, sugar and cellulose.
- The carbohydrate reserve (glycogen) of a human adult is about 500g.
- If the dietary carbohydrates do not meet the energy needs of the body, protein and glycerol from dietary and endogenous sources are used by the body to maintain glucose homeostasis.

Dietary fibre

- Mainly non-starch polysaccharide.
- Found in vegetables, fruits and grains.
- Divided into
 - Cellulose
 - Non-cellulose polysaccharides (hemicellulose, pectin, storage polysaccharides like inulin, and the plant gums and mucilage.)

Dietary fibre

- Can also be classified as
 - Insoluble fibres: cellulose, hemi-cellulose and lignin.
 - Soluble fibres: pectins, gums and mucilages

Dietary fibre - Functions

- Absorbs water – increases bulk of stool – reduces constipation.
- By reducing intestinal transit time of food it drastically reduces the possibility of putrefaction and formation of gases and toxic substances.
- Inhibits faecal mutagen synthesis by changing colonic pH and bacterial metabolism.

Dietary fibre - Functions

- Reduces the incidence of CHD – by binding to the bile salts and preventing its reabsorption and thus reducing cholesterol level in circulation.
- Gum and pectin reduce post prandial glucose level in the blood.
- **Disadvantage** – Too much of fibre can decrease the absorption of valuable micronutrients.

Dietary fibre - Requirements

- 40 gms of dietary fibre per day.
- Indian diet provides 50 – 100 gms/ day

Total fibre g/100g

High (>10)	Medium (1-10)	Low (<1)	Nil
Wheat	Rice	Refined and processed foods	Sugars
Jowar	Most vegetables		Fats/ oils
Bajra			Milk
Ragi	Most Fruits		All types of meat
Maize	Coconut		
Legumes	Sesame		
Fenugreek	Almonds		
Dals	Dates		