Role of Dietary Habit on Oral Health

- Diet and nutrition are often used interchangeably
- However, according to the Taber's Medical Dictionary, they have distinctly different scientific meanings.
    - Diet is defined as what we eat and drink
    - Nutrition is the internal processing of foods and beverages, such as ingestion, digestion, absorption, assimilation, distribution and elimination (i.e. metabolism)
- Nutrition, according to Dr. Nizel, is a science that deals with study of nutrients and foods, their effects on nature and function of organisms under varied conditions of age, health and disease.
- According to WHO, "Nutrition is the science of food and its relationship to health"
- Clinical nutrition refers to macro-nutrient (protein, carbohydrate and fats/oils) and micro-nutrient (vitamins, minerals and water) deficiencies at a cellular and tissue (clinical) level that leads to organ/gland dysfunctions and eventually to disease.

Components of Diet:

- **Major Nutrients**
    - Carbohydrates
    - Proteins
    - Fats/lipids
- **Micro Nutrients**
    - Vitamins
    - Minerals
- **Trace Nutrients**

Recommended Dietary Allowance (RDA)

The average daily nutrient value considered adequate to meet the nutrient need of nearly all (97-98%) healthy people in a life stage and gender group"

Classification of Food by nutritive value:

1. Cereals and millets
2. Pulses
3. Vegetables
4. Nuts and oilseeds
5. Fruits
6. Animal foods
7. Fats and oils
8. Sugar and jaggery
9. Condiments and spices
10. Miscellaneous foods

Nutrients:

- Nutrients are organic and inorganic complexes contained in food. There are about 50 different nutrients which are normally supplied through the foods we eat.
- Each nutrient has specific functions in the body. Most natural foods contain more than one nutrient. These may be divided into macronutrients and micronutrients.

1. **Macronutrients:**

   Form the main bulk of food. In the Indian diet, they contribute to the total energy intake in the following proportions.

   -Proteins 7-15 percent

   -Fats 10-30 per cent

   -Carbohydrates 65-80 per cent

2. **Micronutrients: (mg to grams)**
   - Vitamins and Minerals

PROTEINS

- Proteins are complex organic nitrogenous compounds.
- Proteins are made up of smaller units called amino acids

Functions:

- ❖ Bodybuilding
- ❖ Repair and maintenance of tissues
- ❖ Synthesis of antibodies, haemoglobin, enzymes
- ❖ They provide 4 Kcal of energy per gram
- ❖ RDA for protein for adults is 0.8-1g of protein/day/kg body weight.

Oral manifestations of Protein deficiency

- Formation, eruption and alignment.
- Adversely affects periodontal cells –fibroblast, osteoblast, cementoblast
- Caries prone teeth
- Retarded cementum deposition
- Degenerative changes in gingival & PDL
- Poor calcification of dentin and matrix
- Reddening of tongue with loss of papilla.

FATS/LIPIDS

- Fats are solid at 20℃. They are called oils if they are liquid at that temperature.
- They are concentrated sources of energy.

Classification:

- ❖ **Simple lipid –**Triglycerides
- ❖ **Compound lipids –**Phospholipids
- ❖ **Derived lipids –**Cholesterol

Almost 99% of body fats are in the form of triglycerides.

Functions:

- They provide 9 Kcal of energy per gram
- Carry flavour of food
- Carry the fat-soluble vitamins A, D, E & K
- Fat supports viscera like heart, kidney and intestine.

- Omega-3 fats-linolenic acid-decreases cholesterol level and cardiac risk diseases by reducing blood pressure and preventing blood clots.

Effects on Oral Health

- Phospholipids are a structural component of cell membrane, tooth enamel and dentin.
- Research indicates that high-fat foods tend to be inhibitory towards dental caries
- Small quantities of nuts and cheese can be good between meal snacks for patients concerned with dental caries.

CARBOHYDRATES

- Carbohydrates provide the body's primary source of fuel for heat and energy. They also maintain the body's back up store of quick energy as glycogen (animal starch).
- The 3 main sources are starches, Sugars and Cellulose.
- The carbohydrate reserve of a human adult is about 500 gms, which is rapidly exhausted when a person is fasting.
- RDA for carbohydrates is 130g/day.

Functions:

- Fat metabolism
- They provide 4 Kcal of energy per gram
- Synthesis of ground substance of connective tissues
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- Synthesis of certain non-essential amino acids.
- Glucose is essential for erythrocyte and brain function.

Effects on oral health

- Dental caries is a local phenomenon caused by the diet, especially the carbohydrates.
- The most important among them is Sucrose, which is utilised by the bacteria to produce both intra and extracellular polysaccharides.

- The type, consistency, time of intake and frequency of the carbohydrates are major factors in causation of dental caries.

VITAMINS

- It is a substance which must be obtained by dietary means because of a lack of capacity in the human body to synthesise it.
- They are part of the enzyme system.

Classification:

- Fat soluble: A, D, E, K
- Water soluble: B, C

Nutrient	Dietary source	function	Oral sign of deficiency
Niacin (Vit B3)	Dairy products, Eggs, liver, meat, Pulses.	Nucleotide coenzyme involved in energy metabolism	Mucosal atrophy and stomatitis, Glossitis, Angular cheilitis
pyridoxine (Vit B6)	Liver, meat, fish, Whole grains, milk, peanuts.	Coenzyme involved in amino acid metabolism	Glossitis, Cheilitis, Burning mouth syndrome, Ulceration, Lip fissures.
Folate folic acid	Liver, kidney, green leafy veg, oranges, pulses	Purine and pyrimidine synthesis	Glossitis, stomatitis, Recurent apthae, Dysplasia, Angular Cheilitis, Candidosis

cyanocobalamin (Vit B12)	**Meat, fish,eggs, dairy products,**	**Purine and pyrimidine synthesis**	**Atrophic glossitis, stomatitis, recurrent aphthae, dysplasia, angular cheilitis, candidosis**
Ascorbic acid (Vit C)	Citrus fruits, berrries, potatoes, green veg,	Antioxidant involved in redox reactions	Recurrent aphthae, angular cheilitis, gingivitis/ periodontitis
Calcitriol (Vit D)	Oily fish,eggs,sunlight	Calcium homeostasis	Hypoplasia
Vit E	Veg oils, sunflower seeds, whole grains, eggs	antioxidant	none
Vit K	Veg,pulses,liver	Formation of clotting factors	Gingival bleeding, postextraction haemorrhage

MINERALS

- Minerals make-up 4% of body weight.
- Minerals are divided into 3 major groups.

Major: Calcium, Phosphate, Sodium, Potassium, Magnesium (these are required from dietary sources in amounts greater than 100 mg/day)

Trace elements: Iron, Iodine, Fluorine, Zinc, Copper, Cobalt, Chromium, Manganese, Molybdenum, Selenium, Tin, Silicon, Vanadium, Nickel (these are elements required by the body in quantities of less than a few mgs per day).

Trace contaminants: With no known function: Lead, Mercury, Barium, Boron and Aluminium.

Effects on Oral Health

- Calcium in association with vitamin D and Phosphorus is essential for proper development and maintenance of mineralized tissues like teeth and bones.
- Fluorides have anticaries effect on teeth.
- Iron deficiency anaemia manifests in the oral cavity by the pallor of oral tissues, especially the tongue.
- Zinc deficiency can inhibit collagen formation and reduce cell-mediated immunity.

Trace elements in Dental caries;

- Trace elements in human dental enamel are derived from the environment during mineralization and during and after maturation of teeth.
- Navia JM (1972) has probably best summarised the cariogenic effect of many of the minerals.
- Cariostatic elements: F, P
- Mildly cariostatic: Mo, V, Cu, Sr, B, Li, Au
- Doubtful: Be, Co, Mn, Sn, Zn, Br, I
- Caries inert: Ba, Al, Ni, Fe, Pd, Ti
- Caries promoting: Se, Mg, Cd, Pt, Pb, Si.

Effect of Nutrition on Oral Tissues:

Dental Caries:

- The demineralization of the enamel and of the dentine is caused by organic acids that form in the dental plaque because of bacterial activity, through the anaerobic metabolism of sugars found in the diet.
- The evidence linking dietary sugar to caries comes from a number of different types of study, namely; human intervention studies, human observational studies, animal studies, enamel slab experiments, plaque pH experiments and incubation experiments.

- Human intervention studies in the field of diet and dental caries are rare owing to ethical problems and the difficulty of placing groups of people on strict dietary regimens for long periods of time.
- The only two studies from which conclusive evidence can be drawn are the Vipeholm study and the Turku study.

Vipeholm Study:

- Described by Gustaffson et al in 1954, summarised by Davies in 1955.
- It was a five year investigation of 436 adult inmates of Vipeholm hospital, Sweden, an institution for the mentally challenged.
- The institutional diet was nutritious, but contained little sugar, with no provision for between meal snacks.

Turku Sugar Study

- Scheinin a Mäkinen
- This study was carried out in Turku, Finland (1975) to study the effect of total substitution of sucrose in a normal diet with either fructose or xylitol on dental caries increment.
- 125 subjects were allocated to 3 groups; Sucrose, Fructose and Xylitol
- Baseline scores were the same in all the 3 groups.

Periodontal Diseases:

- One of the oldest observations on nutrition and periodontal health is James Lind's account of scurvy in the first controlled therapeutic trial conducted in 1747.
- Patients with severe scurvy can have healthy gingiva, but a deficiency of vitamin C can exacerbate an existing gingivitis.

- Deficiencies of vitamin A, C, E and folate have detrimental effects on periodontal health.
- Evidence exists from early animal studies which has shown that deficiency of nicotinic acid, pantothenic acid, riboflavin and folic acid results in gingival inflammation.
- The ratio of calcium to phosphorus in the diet is also important since secondary hyperparathyroidism causes marked loss of alveolar bone.