

D Y PATIL DENTAL SCHOOL

DEPARTMENT OF
PUBLIC HEALTH DENTISTRY

EPIDEMIOLOGY OF DENTAL CARRIES

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Introduction

Dental caries may be considered a disease of modern civilization, since prehistoric man was rarely affected from dental caries.

Nowadays particularly no geographic area is free from dental caries, it affects both the sexes, in all the age groups, irrespective of socioeconomic status.

The cause is attributed to higher level of consumption of refined carbohydrates and change in dietary habits. Hence it is still considerable burden largely in developing countries and to a lesser extent in developed countries.

- There are two general approaches to understand the cause of disease, namely, etiology and epidemiology.
- Etiology is the approach that deals with identification and tracing the agents of disease after it has entered the host.

- Epidemiology is the approach to study the consideration of predisposing factors of the diseases as well as apparent existing cause concerned with the frequency of disease in the group

Dental caries occurs more frequently in cold, moist climate and it is considered as a chronic disease because of three factors:

- It takes a longer time to develop.
- It is a life long disease
- Manifestation persists throughout the life even though the lesion is treated.

There is a world wide variation in host, environment and agent factors which interact to produce a variety of oral or dental disease at various rate and intensity.

The cultural values, customary beliefs, climatic conditions, dietary habits and other factors contribute to the variation.

2) Definition:

It is the bacterial disease of the dental hard tissue characterized by localized progressive molecular disintegration of the tooth substance.

3) Dental caries in prehistoric man:

The pre historic man rarely suffered from this type of disease, the reason is attributed to the diet, it was raw, coarse and fibrous.

4) Modern concept of dental caries

Dental caries is considered as civilized disease because it started after beginning of civilization and invention of fire. Then the human beings started consuming cooked food.

Today the distribution of caries is world wide and varies from country. The cause is attributed to the higher level of consumption of refined carbohydrates and change in dietary pattern.

Nowadays practically no geographic area is free from dental caries, affects both the sexes in all places, in all age groups, in all socioeconomic strata.

The investigators have studied various aspects of dental caries problems over a period of time; in spite of these studies still many aspects of etiology of caries are not known, efforts to prevent this disease is partially succeeded by available preventive methods.

5) Epidemiological factors of dental caries

A) Host factor

a) Race :

Since a long time this was considered an important factor in frequency of dental caries. It is seen that certain races enjoy immunity or high degree of resistance to dental caries. Non European race such as those in Africa and India seem to enjoy greater freedom, from dental caries than the European race.

- These observations have faded in recent years. The observation that certain racial groups once thought to be resistant to caries seems to become more susceptible to the disease because when they migrated to socioeconomically developed countries and with different cultures and dietary habits.

- The data “NHANES” (National Health and Nutritional Survey) study which was conducted on representative sample of American population during 1971-1974. The study shows that the white race had more dental caries than the black race.

b) Age:

Essentially a disease of childhood. Children's teeth between age group 1-5 years are susceptible to dental caries. The caries experience increases with advancement of age.

It increases more sharply in youth and early adult life than gradually decrease in the later part of age.

- According to HOLLANDER AND DUNNING, the greater intensity of caries process lies between 15-25 years of age. Later it decreases as the age advances. However root caries or cervical caries are seen in old age groups.

c) Sex :

Many studies have shown higher caries experience in girls than boys during childhood period and also latter at adolescence period.

However, there are some studies which have shown no difference between girls and boys.

The increased susceptibility of girls may be explained by :

- Early eruption of teeth
- May be due to the morphological difference between the teeth of males and females.
- Increased fondness towards sweets among girls
- Due to hormonal changes.

d) Hereditary /Familial Factors:

Dental caries varies considerably in families and inheritance of characteristic of tooth structure is common to all.

According to studies of MANSBRIDGE there were greater resemblance in caries experience

between identical twins than between fraternal twins, unrelated pairs of children showed less resemblance than either type of kids.

This observation shows that to a lesser extent environmental factors (morphology, occlusion, salivary flow, composition etc) have greater influence than genetical factors.

e) *Variation in mouth:*

- This can be studied under two headings:

- Type of caries according to the surfaces involved
 - Smooth Surface Caries

 - Pit and Fissure Caries

- Frequency in which different teeth are attacked by caries.
 - Mandibular 1st and 2nd molars.
 - Maxillary 1st and 2nd molars
 - Maxillary 1st and 2nd premolars
 - Maxillary central and lateral incisors
 - Maxillary canines
 - Mandibular 1st premolar
 - Mandibular incisors and canines

f) Emotional Disturbances:

- Schizophrenics experience a reduced caries activity which may be attributed to increased salivation and higher pH of saliva. In all systemic diseases, emotional disturbances seems to be the common denominator leading to decreased salivary flow and increased caries rate.

g) Diet and Nutrition:

This is the only factor that can be included under the host, agent and environment factors. Nutrition can be host factors because the individual, according to his/her like and dislike instinctively selects specific foods from the array available to him. While some are natural protein feeders and some are carbohydrate feeders. The epidemiological evidence shows that severe chronic malnutrition during the development of teeth can result in hypoplastic condition and later predispose to dental caries.

h) Socioeconomic status :

- It is difficult to correlate caries pattern with socioeconomic status due to its complexity. It was noticed that low SES groups had more number of decayed and missing teeth but less number of filled teeth and vice versa in higher SES groups.

B) Agent Factors:

a) Microflora:

A variety of microbial flora are associated with dental caries. The causative organism's response for causation of caries. They are Streptococcus Mutans, Lactobacillus Acidophilus and Actinomyces Viscosus.

Dental caries is a serious infection that attack hard tissues of teeth and caries can't be produced in germ free animals.

A carious lesion can duly occur when mass of cariogenic organisms colonize on the surface of the tooth and form plaque.

(Food and beverages taken by individual serves as a substrate for fermentation by plaque microflora)

The organism response for almost all carious lesions in adult is the destructive group of Streptococcus Mutans. Gibber found that Streptococcus Mutans were an important group of bacteria in the initiation of dental caries.

The Streptococcus mutans appear in oral environment at any time from infancy to advanced age.

It is a destructive organism and deeply invasive in nature in the younger group, it acts more slowly and intermittently in adults, older age groups.

- The Streptococcus Mutans can be isolated from human dental caries and causes caries in experimental animals because it has the ability to adhere to the surfaces where sucrose is available as substrate. Hence Streptococcus Mutans must be considered as an important agent for carious lesions on the enamel surface.

- *Lactobacillus Acidophilus* organism initiates pit and fissure caries. Orland and others found that the lactobacillus were unable to produce caries in germ free rats in spite of feeding them with diet which was highly cariogenic.

Under normal circumstances lactobacilli can't form dextran from sucrose as streptococci do because it does not form plaque on smooth surfaces, instead they enter the retentive sites such as pits, fissures and leaky margins of restorations where biodegradable lipoprotein are available in which the organisms can grow and produce acids.

- *Actionmyces Viscosus* is commonly seen in elderly persons and is responsible for the causation of root caries.

3) ENVIRONMENTAL FACTORS

■ Geographical variation :

- There is geographical variation in occurrence and prevalence of dental caries. The recognizable variation in dental caries experience is present throughout the world. The investigators have studied the influence of climatological factors as well as non climatological factors.

- The climatological factors such as sunshine, rainfall, relative humidity and temperature are influenced by latitude by greater distance from sea coast. The above mentioned factors are often related to one another either directly /indirectly.

To support the relationship existing between the climatological factors the 1951 year book for the common wealth of Australia gives the intersecting climatological data for the Australian capital.

CITIES	DENTAL CARIES		MEAN		MEAN TEMP		MEAN REL	
	DMFT	RANK	SUNSHINE	HR/D RANK	DG	RANK	%	RANK
PERTH	17.56	1	7.8	6	64.3	5	62	2
ADILAKE	18.57	2	7.0	4	63.1	3	52	1
SYDNEY	18.66	3	6.8	3	63.7	4	68	4
BRISBANE	19.72	4	7.5	5	69.0	6	67	3
MELBOURNE	19.74	5	5.6	1	58.8	2	69	6
HOBART	21.98	6	5.2	2	54.4	1	65	5

- In the above mentioned table, it is interesting to note that mean annual hours of sunshine relative humidity and temperature all vary more/ less together. When sunshine and temperature are increased the relative humidity declines. Thus all 3 climatological factors are related fairly well to the variation in dental caries.

b) Climatological Factors

The interpretation of geographical variation of climatological factors :

1.Sunshine: It varies with the latitude and measurement of sunshine is difficult. The actual hours of sunshine in the absence of clouds decreases. The investigators have taken into consideration the longer days and shorter days.

The US weather Beaurau plotted the mean sunshine on the graph paper and it was resembling the map of dental caries of occurrence in US.

This shows that there is relationship between sunshine hours in dental caries (because Vitamin D requires sunshine for it's synthesis

2. Temperature :

Temperature always varies with the latitude, temperature acts to vary calorie requirement and water intake by human. The carbohydrates food is a relative source of energy.

Hence this indicates the way in which the disease dental caries may be related to temperature. It has to be kept in mind that lower the temperature higher is the caries prevalence.

3. Relative Humidity :

It is the ratio of the amount of moisture in the atmosphere. When the mean annual relative humidity was plotted on a graph over a period of years, it showed the relative humidity is greatest along the sea coast.

This is due to the distance from the latitude by sea coast giving an appearance much more like dental caries map of US. It is observed that higher the humidity more moisture in the atmosphere which blocks the UV rays and sunlight, hence increased caries activity.

4. Rainfall : It leaches minerals from the soil and blocks sunlight. This is how it has been related. However the mechanism by which the relative humidity and rainfall may lead to dental caries may require further studies.

c) Non climatological factors :

The influence of non climatological factors have been studied by the investigators in relation to dental caries.

a) Soil: The population largely depends upon locally grown food. The soil contains trace elements such as Molybdenum, vanadium etc. When these trace elements are present in food stuff, there are less chance of the dental caries because these trace elements are known as 'caries inhibitors'.

According to the studies LUDWIG , HEALY and others the soils of NAPIRE (place in New Zealand) had higher pH, higher Molybdenum, Vanadium contents and children of that place had less dental caries.

b) Total hardness of water :

The presence of trace element such as Molybdenum, vanadium, Fluoride in food stuffs or water, decreases dental caries and they are very well known caries inhibitors. The presence of trace element Selenium in food stuff increases caries activity and is very well known as caries promoter

c) Urbanization :

It is due to rapid industrialization that people migrate from rural areas to urban areas and change in dietary habits (higher consumption of refined foodstuffs) and lifestyles results in increase in dental caries.

7) INTRA-ORAL ETIOLOGICAL FACTORS

In 1960 Keyes demonstrated intra oral etiological factors as follows:

HOST –

- Tooth factors
 - Morphology of tooth
 - Composition of tooth
 - Position of tooth

■ Saliva Factors -

- Composition

- Quantity

- Viscosity

- pH

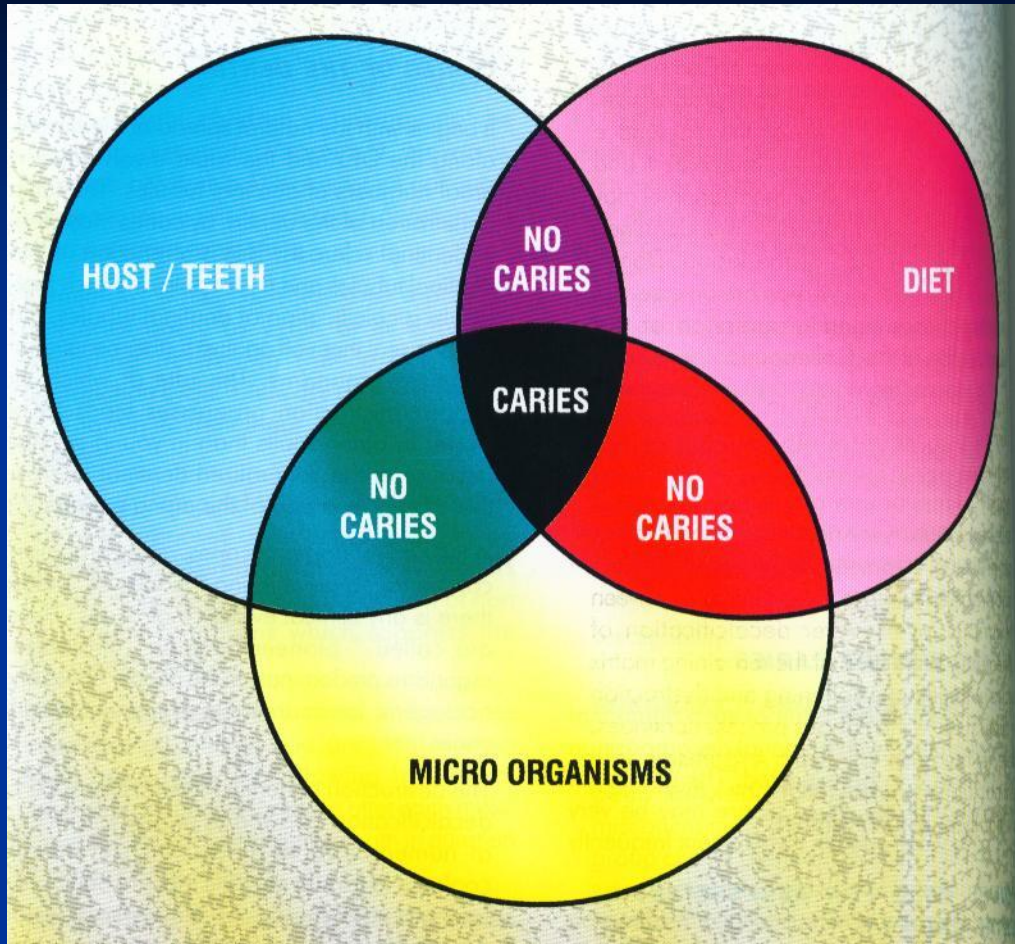
- Antibacterial properties

AGENT

- Microflora
 - Streptococcus Mutans
 - Lactobacillus Acidophilus
 - Actinomyces Viscosus

ENVIRONMENT

- Substrate (carbohydrate)



KEYES CIRCLE