**ا.م.د. نبال محمد Dentistry Community Lec.2**

**Epidemiology of Dental Caries**

*Dental Caries* is defined as progressive, irreversible microbial disease of multifactorial nature affecting the calcified tissue of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic portion the tooth.

***The caries process (pathogenesis)***: Plaque on the surface of the tooth consists of a bacterial film that produces acids as a byproduct of its metabolism. To be specific, certain bacteria within the plaque are acidogenic that is, they produce acids when they metabolize fermentable carbohydrates. These acids can dissolve the calcium phosphate mineral of the tooth enamel or dentine in a process known as demineralization. If this process is not halted or reversed via remineralization (the redeposition of mineral via saliva) it eventually becomes a frank cavity. The critical pH value for demineralization is in the approximate range of 5.2 to 5.5. Conversely, tooth remineralization can occur if the pH of the environment adjacent to the tooth is high. Whether dental caries progresses, stops, or reverses is dependent on a balance between demineralization and remineralization.

***Areas prone to dental caries***

Bacterial plaque is the essential precursor of caries. Hence, sites on the tooth surface which encourage plaque retention and stagnation are particularly prone to progression of lesions. These sites are:

• Enamel in pits and fissures on occlusal surfaces of molars and premolars, buccal pits of molars, and palatal pits of maxillary incisors.

• Tooth surfaces adjacent to dentures and bridges which make cleaning more difficult, thus encouraging plaque stagnation.

• Approximal enamel smooth surfaces just cervical to the contact point.

• In patients where periodontal disease has resulted in gingival recession, caries occur on the exposed root surface

• The enamel of the cervical margin of the tooth just coronal to the gingival margin.

• The margins of restorations, particularly those that are deficient or overhanging.

**Classification of dental caries** : Various Clinical Classification Systems for Caries

i. According to location:

(a) Pit and fissure (b) Smooth surface (c) Root surface

ii. According to clinical appearance:

(a) Incipient (b) Cavitation (c) Gross destruction

iii. According to rate of disease progression

(a) Acute (b) Chronic (c) Arrested (d) Rampant

iv. According to history: (a) Primary (b) Secondary or recurrent

**Susceptibility of different teeth**: The Hagerstown Study ranks the order of susceptibility of teeth to caries as:

1. Mandibular 1st and 2nd molars.

2. Maxillary 1st and 2nd molars.

3. Mandibular 2nd bicuspids, maxillary 1st and 2nd bicuspids, maxillary central and lateral incisors.

4. Maxillary canines and mandibular 1st bicuspids.

5. Mandibular central and lateral incisors, mandibular canines.

**Factors affecting development of dental caries**

*-Host and Teeth Factors*

A. Tooth • Composition • Morphology • Position.

B. Saliva • Composition • Buffering capacity of saliva • Quantity.

C. Sex

D. Age

E. Race and ethnicity

F. Socioeconomic status

G. Heredity

H. Emotional disturbances

*Agent Factors -*

A. Microorganism

B. Plaque

- *Environmental Factors*

A. Diet • Total consumption of carbohydrate • Frequency and form of carbohydrate

B. Geographic variation

C. Climate

D. Oral hygiene

E. Soil

F. Fluoride

*Host and Teeth Factors*-

A. Tooth

i. Composition:. It was noted that surface enamel is more resistant to caries than subsurface enamel. Surface enamel is more highly mineralized and tends to accumulate greater quantities of fluoride, zinc, lead and iron than the underlying enamel. The surface dissolves at a slower rate in acids.

ii. Morphology: morphologic features which may pre dispose to the development of caries are the presence of deep, narrow occlusal fissure or buccal or lingual pits. These fissure trap food, bacteria and debris leading to development of caries.

iii. Position: Malaligned, out of position, rotated teeth are difficult to clean, favoring the accumulation of food and debris. This may predispose to the development of caries.

B. Saliva It can be considered as an environmental factor also as teeth are constantly bathed by it. This influences the process of dental caries.

i. Saliva composition: It has a critical role to play in the development of caries or its prevention. Saliva provides calcium, phosphate, proteins, lipids and antibacterial substances and buffers. Saliva buffering can reverse the low pH in plaque.

ii. Buffering and neutralization: Saliva is alkaline and is an effective buffer system. These properties protect the oral tissues against acids and plaque. After eating a sugary food if saliva is stimulated by chewing substances such as wax or sugar free chewing gum, the drop in pH in plaque which would have occurred is reduced or even eliminated. This salivary neutralization and buffering effect markedly reduces the cariogenic potential of foods.

iii. Quantity: reduction in salivary flow adversely affects dental caries. There is an inverse relation between salivary flow and dental caries.

C. Gender: In young people caries has been seen to higher in the females but some studies show no significant difference between the sexes. Girls may be more prone to caries due to early eruption of teeth and hormonal changes (puberty and pregnancy).

D. Age although present in all ages, it was believed that dental caries was disease of childhood. WHO global data bank has shown a decline in DMFT values in 12-year-old children. Root caries is seen in over 60 years age group people, mainly due to denuded root surface because of gingival recession.

E. Race and Ethnicity: A number of studies indicate that blacks [Negroes] of comparable age and sex have a lower caries scores than Caucasians. Chinese population has shown to have a lower caries rate than corresponding white population. These differences are probably more due to environmental factors.

F. Socioeconomic Status :There is an inverse relationship between socioeconomic status and dental caries experience.

G. Heredity: Environmental factors have a greater influence than genetic factors but latter also contributes to the causation of caries.

H. Emotional Disturbances :Emotional disturbances, particularly transitory anxiety states tend to increase the incidence of dental caries.

-Agent factors:

A. Microorganisms: The mouth has a diverse resident microbial flora. The normal inhabitants become established early in life. There have been a few epidemiological studies to investigate the link between oral flora and dental caries. Streptococcus mutans and Lactobacillus acidophilus ( acid producing bacteria) were found to be associated with the formation of dental caries.

B. Dental Plaque: Bacterial plaque is a dense non-mineralized, highly organized mass of bacterial colonies in a gel-like intermicrobial substances. It can be supragingival, coronal to the gingival margin on the clinical crown of the tooth and subsgingival, apical to the margin of the gingiva.

- Environmental factors:

A. Diet: According to acidogenic or chemoparasitic theory, dental caries occurs when acid is produced by bacteria in dental plaque when refined carbohydrates are eaten. The presence of refined carbohydrate as sugar is essential for the majority of caries development and sucrose is the most cariogenic of all sugars. In human consumption, sucrose accounts for 60 percent of all sugars eaten.

B. Geographic Variation It is well documented that dental caries experience has been decreasing in children in developed western countries.

C. Climate: Sunshine and high temperature areas seem to have lower dental caries [inverse relationship]. Whereas areas with more relative humidity and rainfall have shown increase dental caries.

D. Oral Hygiene: Inverse relationship has been seen between oral hygiene and dental caries. Poor oral hygiene increases the rate of dental caries.

E. Soil: Trace elements in soil have shown a relation with caries. An increase in dental caries is seen in areas where selenium is present in soil, whereas molybdenum and vanadium are said to decrease dental caries.

F. Fluoride: Fluoride in water and soil decreases incidence of dental caries.

**Common Factors Contributing to the Decline of Dental Caries in developed countries:**

1. Fluoridation of water supplies

2. Use of fluoride supplements

3. Use of fluoride dentifrices

4. Availability of dental resources

5. Increased dental awareness

6. Adoption of preventive approach by the practitioner

7. Changes in diagnostic criteria

8. Decrease in sugar consumption.

**Reasons for Rise in Dental Caries in underdeveloped countries:**

1. Increase in sugar consumption .

2. Lack of dental resources

3. Socio economic factor

4. Lack of water fluoridation

5. Lack of preventive dental health programs