



Community Dentistry Third class





Epidemiology of Dental Caries 5th lecture

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Epidemiology

 Is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

Person – place ----time

Dental Caries

Dental caries is a progressive, irreversible, microbial chronic infectious, disease of multifactorial nature affecting the calcified tissue of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic portion of the tooth.

Studies have shown that dental caries remained low until the 17th century. The prevalence of dental caries increased dramatically toward the end of 17th century, and continued to increase until the early 1970. the only break in this increase came during the mid 40 and early 50s and this coincided with reduced availability of sucrose as a result of food rationing imposed during the World War II.

Dental is universal disease affecting all geographic regions, races, both the sexs and all age groups.

Current concepts of Dental Caries

- The development of dental caries is a dynamic process of demineralization of the dental hard tissues(enamel, dentine, and cementum) by the products
- of bacterial metabolism, alternating with periods of remineralization



Cyclic Process of Decay

Bacteria plus food makes the saliva very acidic within 5 minutes



factors affecting the epidemiology of dental caries:

Since the 1960s, the caries theory was depicted as three circle representing the three prerequisites for dental caries (**Keyes Triad**) were 1. carbohydrate (diet), bacteria (dental plaque), and susceptible teeth (the host). Since then, many modifying factors have recognized, includes saliva, the immune system, time, socioeconomic status, level of education, lifestyle behaviors, and the use of fluorides.

Etiology of Dental Caries



Development of dental caries:

Theoretically when these all factors are present dental caries develop. Dental caries is an inter action between pH, mineral flux and solubility at tooth surface.

Enamel Sieve Concept

After sugar consumption there will be an increase in hydrogen ions(lower pH) in dental plaque causing an increase in pressure ingredients, this will lead to dissolution of hydroxyapatite crystals to their ionic components. These ions will diffuse toward dental plaque leaving behind micro spaces.

By the increase of pH due to the action of buffer system and termination of carbohydrate, a remineralization episode will be started, calcium, phosphorous ions and others will diffuse back to enamel from dental plaque. The precipitations of ions will be in form of a variety of complex salt crystals. In a succession of demineralization and remineralization cycle, if the sum of the demineralization is greater than the remineralization there will be a continuous loss of minerals thus porosity then cavitations i.e dental caries.

GLOBAL DISTRIBUTION :-

During most of the 20th century

High prevalence \rightarrow developed countries

- (Western Europe, North America, Australia, New Zealand and Japan.
- Low prevalence \rightarrow developing world.
- (Central Africa)
- The most obvious reason is DIET :-
- High consumption of refined CHO .
- Poor societies, survived on hunting and on subsistence farming \rightarrow low CHO.

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BY THE END OF 20th CENTURY, PATTERN

WAS CHANGED

- Prevalence and intensity were increased in many developing countries, at least in urban areas → Health problem.
- marked decrease in caries experience among children and young adults in developed countries.

Factors affecting development of dental caries





Host and teeth Factors

A. Tooth

- **Composition** : there was no difference in the calcium, phosphorus, magnesium, and carbonate content of enamel from sound and caries teeth. But there was a significant difference in fluoride content. Also, the surface enamel is more resistant to caries than subsurface enamel.
- Morphology: presence of deep narrow occlusal fissure or buccal or lingual pits. attrition on other hands makes the tooth flattened, hence less food entrapment in fissures, so less caries.
- Position: malaligned, out of position, rotated teeth are difficult to clean which predisposed to development of caries

B. Saliva

- The complex nature of saliva and the great variation in its composition are premonitory of the difficulties involved in establishing which factors may directly influence dental health.
- There is no doubt that saliva significantly influences the carious processes evidenced by the animal experimenters in which salivary glands are surgically extirpated, results proved the one in which the salivary glands are removed developed more than 5 times caries as compared to controls in which the glands are not removed.

Quantity and Salivary flow

 Mild increase or decrease in flow may be of little significance, Any condition that results in xerostomia will predispose the person to increased risk for dental caries. (Stephen R 1971, Driezen et.al 1977)

Salivary composition:

- Saliva provides calcium, phosphate, proteins, lipids, and antibacterial substances and buffers, saliva buffering can revers the lo pH in plaque.
- Ammonia was found in higher concentration in saliva of caries immune persons than with those with caries (Turkheim 1925)

c. age :- caries is considered a childhood disease, it increase sharply in youth & early adults. Root caries is seen over 60 years.

d. GENDER :-

In young people caries has been seen to hiegher in the females but some studies show no significant difference between the sexes, root caries is seen more in males. Girls may be more prone to caries due to early eruption of teeth and hormonal changes during puberty and pregnancy, or ma be due to mor visiting to dental care.

E. Race and Ethnicity :-

Studies proved that differences among races, Certain races enjoy immunity or at least high degrees of resistance to caries. Number of studies indicate that black of comparable age and sex have a lower caries score than Caucasians, these differences are probably due to environment than they are of inherent racial attributes.

Certain racial groups when moved to another areas → show differences.

F. Socio-economic status (SES)

There is an inverse relationship between SES and dental carries experience in primary dentition. The relation has not been established in adults.

Low SES groups had high values of D, M teeth and lower values of filled teeth.

High SES groups had lower mean number of D teeth and M. while F component ballooned so much that lifted so much the whole DMF

Studies noted that although fluoridation reduce differences between the social classes, it does not remove it SES is powerful determinant.

SES differences means differences in :-

- Education.Self care practices.Attitudes.Values.
- Available income. Access to health care.
- <u>Urbanization</u> was found to be accompanied by an 11 percent increase in caries.

G .Familial and genetic pattern

Familial tendencies are seen, may be due to genetic basis or bacterial transmission or continuing familial dietary or behavioral traits.

Microbial agent

Dental caries is a bacterial disease. Regardless of any other factor, caries cannot occur in the absence of bacteria.

Dental caries is a transmissible infectious disease as cariogenic bacteria usually passed along from mother to infant.





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Strep. Mutans has the ability to:

• 1- Implantation on tooth surface by synthesis of adhesive extra- cellular polysaccharides (glucans) from sucrose which they use to stick and colonize on tooth surface.



2- Store intra-cellular polysaccharides which act as a transient reserves of fermentable carbohydrates.

3- Fermentation of dietary carbohydrates as an energy source for its metabolic activity and produces lactic acid.

Environmental factors

1. Diet: carbohydrate, especially the sucrose has been universally accepted as one of the most important factor in the dental caries process. Dietary fat may help prevent caries in humans, it acts by coating the surface of the tooth, high concentration of fatty acid may interfere with growth of cariogenic bacteria, and increased dietary fat will decrease the amount of dietary fermentable carbohydrate.

Lactose is least cariogenic.

The physical nature of the food may be significant by affecting food retention, food clearance, solubility, and oral hygiene.

climate: low caries was observed near the equator
 temperature: in turn, act to vary the calorie requirement and water intake of the individual.

4. relative humidity: the data fro Australian states show a higher correlation between caries an relative humidity

Prevalence of Dental Caries in children

- 5 times more common than bronchial asthma
- 7 times more common than hay fever

Caries Rate

- 18% in children aged 2 to 4 years
- 52% in children aged 6 to 8 years
- 67% in children aged 12 to 17 years



High-Risk Groups for Caries

- Children with special health care needs
- Children from low socioeconomic and ethnocultural groups
- Children with suboptimal exposure to topical or systemic fluoride
- Children with poor dietary and feeding habits
- Children whose caregivers and/or siblings have caries







Root caries

Occlusal caries

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Smooth surface







acute

arrested

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