Epidemiology of dental caries

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Learning objectives

- **By the end of this lecture, the students will be able to:**

1. Understand the concept of epidemiology

2. Realize the epidemiologic triad

3. Differentiate between the concepts of disease etiology and epidemiology

4. Analyze epidemiologic factors related to dental caries

Epidemiology

- Epi= upon

- Demo =people

- Ology= study or science
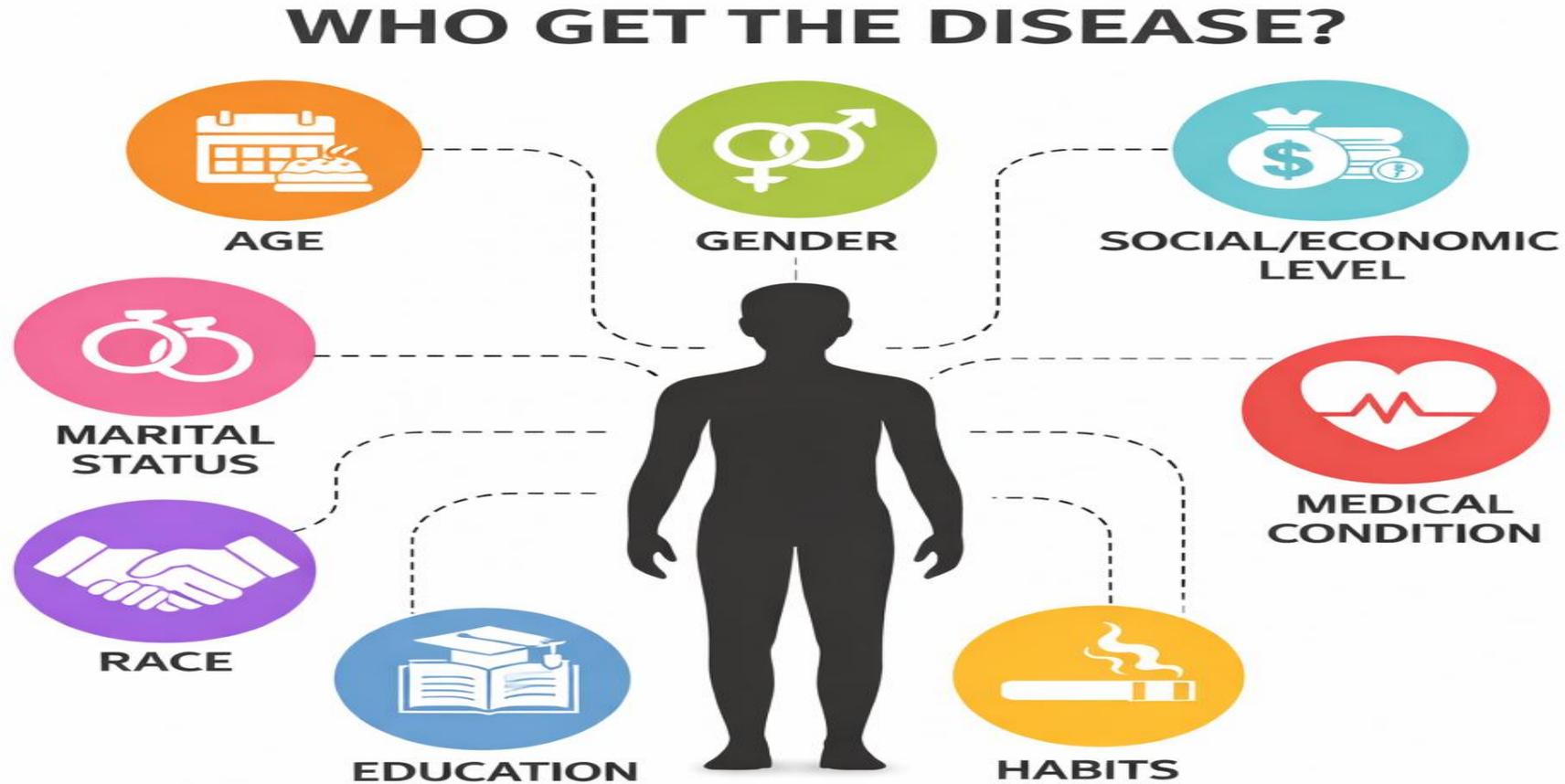
A STUDY UPON PEOPLE

Definition of Epidemiology

The study of the distribution, determinants (factors), and occurrence (frequency) of health-related states in a specified population, and the application of this study to control health problems."
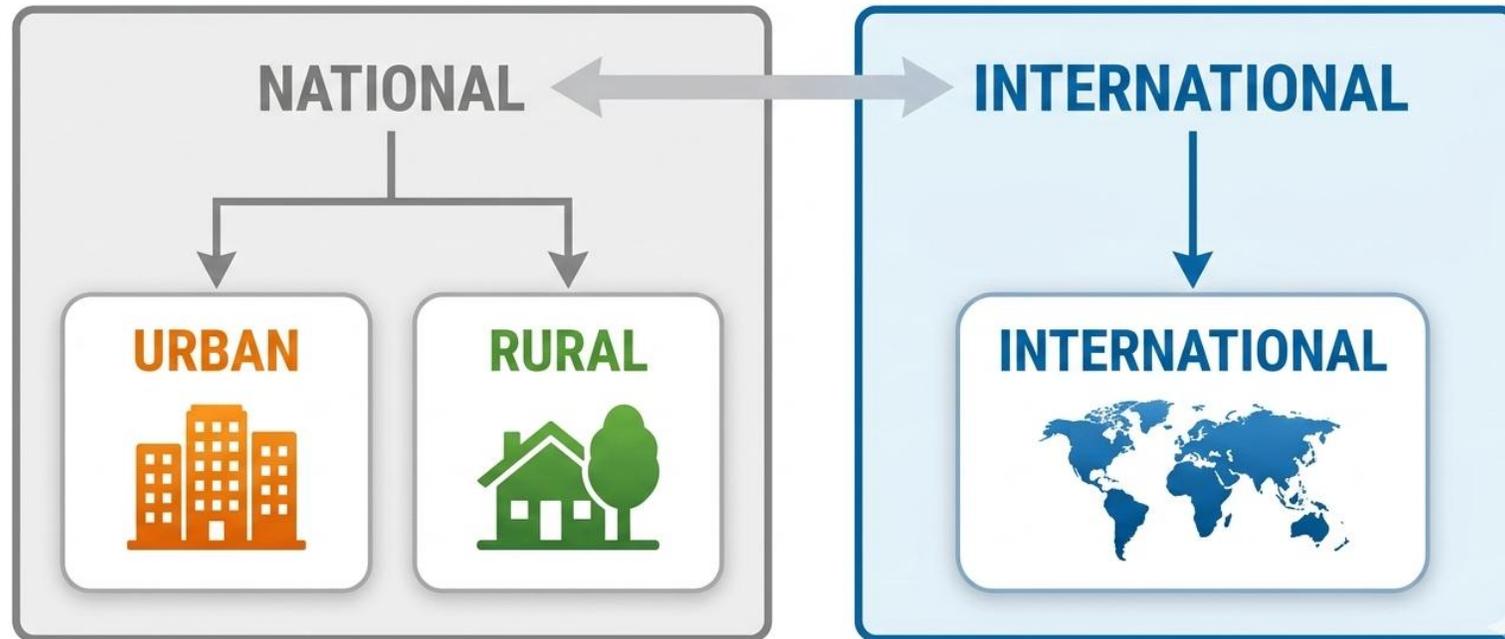
Factors in Epidemiology of A Disease

1. Distribution
2. Determinants
3. Frequency

Distribution: Who gets the disease?

Distribution: Where?

GEOGRAPHIC SCOPE CLASSIFICATION
OF DISEASE DISTRIBUTION

NATIONAL ⟷ INTERNATIONAL

URBAN   RURAL

INTERNATIONAL

Distribution: When does the disease occur?
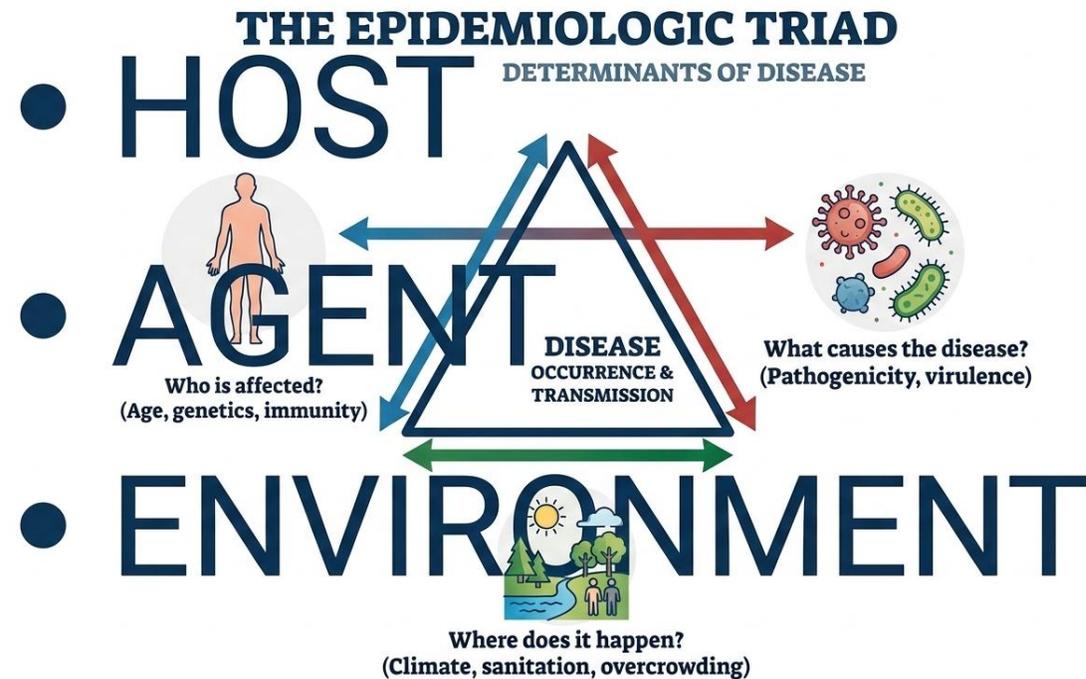
- Months
- Seasons
- Years.

Determinants: why???

Epidemiologic Triad

A. Host

B. Agent

C. Environment

Dental caries

Dental caries is defined as a progressive, irreversible microbial disease of a 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.

- **Dental caries is a multifactorial disease and results from a combination of four principal factors**

1. Host and teeth factors

2. Microorganisms
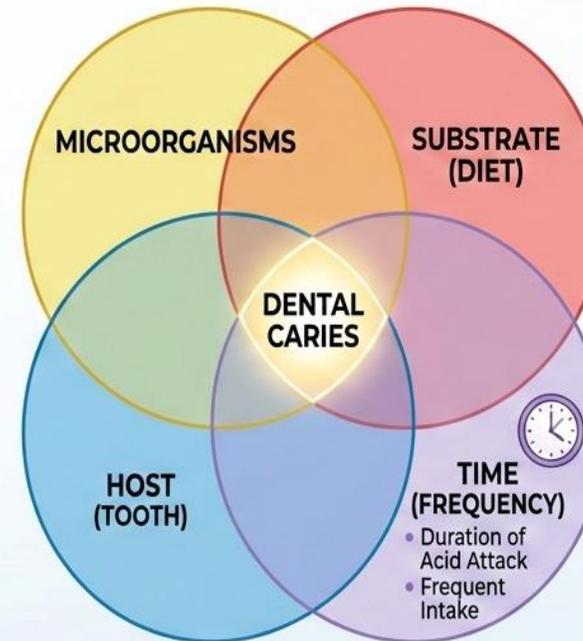
3. Substrate [diet]

4. Time

THE MULTIFACTORIAL ETIOLOGY OF DENTAL CARIES

KEYES' TRIAD (3-FACTOR MODEL)

AGENT: MICROORGANISMS
- Streptococcus mutans
- Lactobacilli

SUBSTRATE: DIET
- Fermentable Carbohydrates, Sucrose

DENTAL CARIES

HOST: TOOTH SURFACE
- Susceptible Tooth
- Enamel
- Saliva variation

Classic model showing three essential biological factors. Disease occurs only at their intersection.

NEWBRUN'S TETRAD (4-FACTOR MODEL)

MICROORGANISMS

SUBSTRATE (DIET)

DENTAL CARIES

HOST (TOOTH)

TIME (FREQUENCY)
- Duration of Acid Attack
- Frequent Intake

Modified model emphasizing that dental caries is a chronic process, requiring the integration of time.

Epidemiology of Dental Caries

The study of the distribution, determinants (factors), and occurrence (frequency) of dental caries in a specified population, and the application of this study to control health problems.

Factors Affecting The Epidemiology Of Dental Caries

Host, Agent, and Environmental factors

I. Host and Teeth Factors

A. *Tooth*

B. *Saliva*

C. *Sex*

D. *Age*

E. *Race and ethnicity*

F. *Socioeconomic status*

G. *Heredity*

H. *Emotional disturbances*

II. Agent Factors

A. *Microorganism*

III. Environmental Factors

A. *Diet*

B. *Geographic variation*

C. *Climate*

D. *Oral hygiene*

E. *Soil*

F. *Fluoride*

I. Host and Teeth Factor

A. Tooth

i. *Composition:*

❖The surface enamel is naturally more resistant to decay than the layers underneath it (subsurface enamel). *WHY??*

❖The surface enamel acts as a sponge for trace elements from our diet and water. It accumulates higher quantities of **fluoride**, **zinc**, **lead**, and **iron** than the underlying tissue.

ii. Morphology:

- Morphologic features that may predispose to the development of caries are: deep and narrow occlusal fissures, retentive buccal and lingual pits. **Why????**

- They trap food, bacteria, and debris, leading to the development of caries.

iii. Position:

- Malaligned and rotated teeth are difficult to clean, favoring the accumulation of food and debris. This may predispose to the development of caries.

B. Saliva

Salivary composition: it contains calcium, phosphate, proteins, lipids, antibacterial substances, and buffers. Saliva buffering can reverse plaque's low pH.

I. Buffering and neutralization:

- Saliva is **alkaline** and is an effective **buffer** system. These properties protect the oral tissues against acids.

- After eating a sugary food, the salivary buffering system could reduce or even eliminate the drop in plaque pH.

II. Quantity (salivary flow rate):

- There is an inverse relation between salivary flow rate and dental caries.

C. Sex

- Females may be more susceptible to caries due to the early eruption date of their teeth and hormonal changes during puberty and pregnancy.

D. Age

- Although present in all ages, it was believed that dental caries was a disease of childhood.

- The greatest intensity of dental caries occurs in 15 to 25-year-olds.

- Root caries is seen in people over 60 years of age, mainly due to gingival recession.

E. Race and Ethnicity

• Blacks of comparable age and sex have lower caries scores than whites.

• These differences are probably due to environmental factors.

F. Socioeconomic Status

• There is an inverse relationship between socioeconomic status and dental caries experience.

G. Hereditary and genetic factors

- Environmental factors have a greater influence than genetic factors.

H. Emotional Disturbances

- Emotional disturbances, particularly anxiety, tend to increase the incidence of dental caries.

II. Agent Factors

Microorganisms

- *Streptococcus*

- These acid-producing bacteria are associated with the initiation of dental caries.

- *Lactobacillus*

- Able to produce caries by themselves, or they may be able to act synergistically with *Streptococcus mutans*.

- *Actinomyces*

- Have been associated with root caries.

III. Environmental Factors

A. Diet

- The presence of refined carbohydrates, such as **sugar**, is essential for dental caries development. Sucrose is the most cariogenic sugar.

B. Geographic Variation

- Dental caries have decreased among children in developed countries due to the utilization of preventive measures and regular access to dental care.

C. Climate

- Sunshine and high-temperature areas have lower dental caries [inverse relationship]. Whereas areas with more relative humidity and rainfall have shown an increase in dental caries.
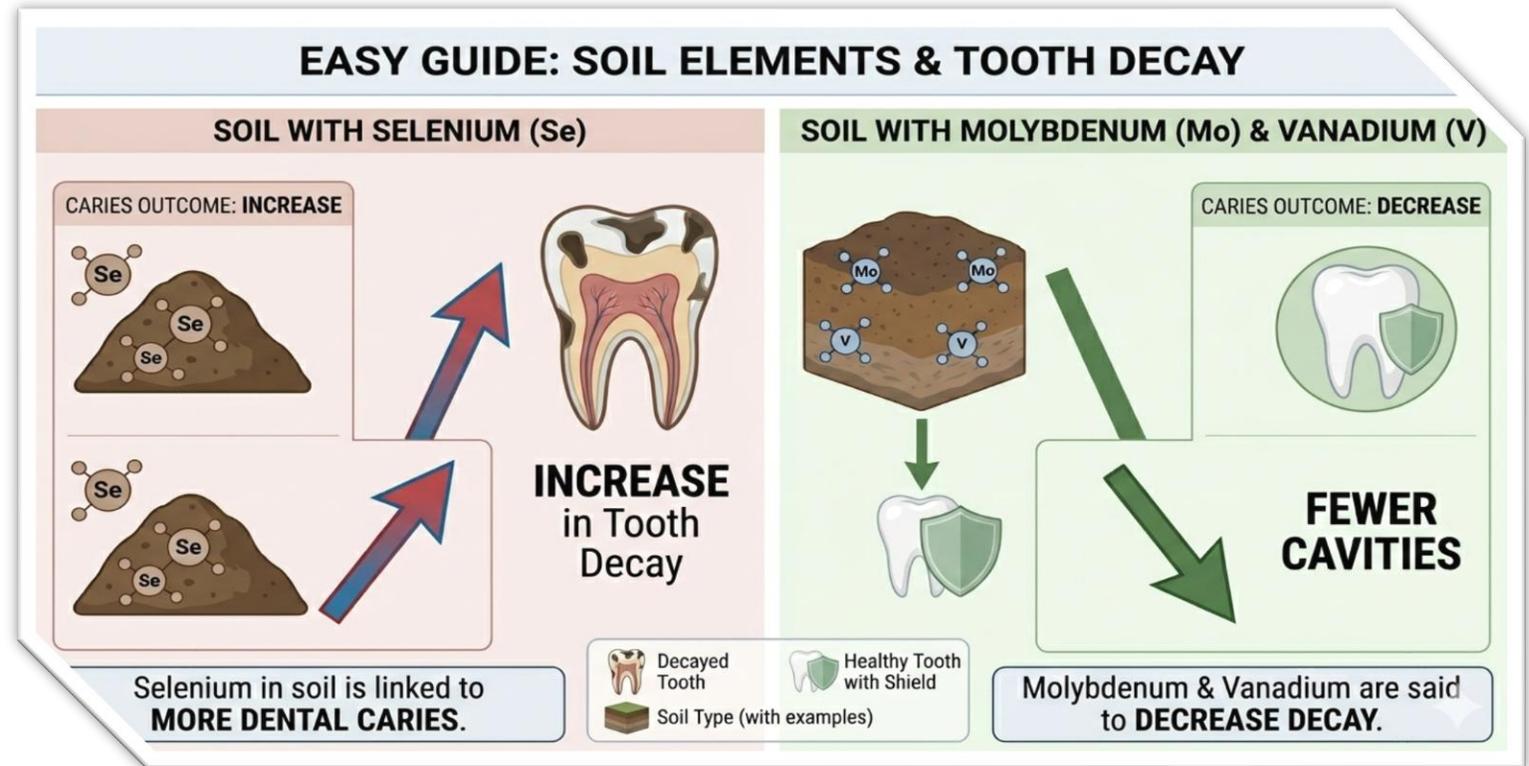
D. Oral Hygiene

- An inverse relationship has been seen between oral hygiene and dental caries. Poor oral hygiene increases the rate of dental caries.

E. Soil

a. **Selenium**

b. **Molybdenum & Vanadium**

F. Fluoride

• **Fluoride in water and soil decreases the incidence of dental caries.**

Thanks