Community dentistry

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lec(1) + lec(2)

Dental public health

Health is one of those terms, which most people find it difficult to define although they are confident of its meaning. One of the oldest definitions of health is "absence of disease". **Webster** defined health as "the condition of being sound in body, mind or spirit, especially freedom from physical disease or pain".

In 1948 WHO (world health organization) define health as" is the state of complete physical, mental and social well- being well, not merely the absence of disease".

Webster defined **disease** as "a condition in which body's health is impaired, a departure from a state of health, an alteration of the human body interrupting the performance of vital functions".

The simplest definition is that disease is just the opposite of health, any deviation from normal functioning or state of complete physical or mental well-being.

Public mean a general collection of people without regard to a specific geographic area in which they live.

Community used to indicate a collection of people who are located in a defined geographic area such as a city, nation, or state.

In 1920 **Winslow** developed a widely used definition of **Public Health**: The science and art of preventing disease, prolonging life, and promoting physical and mental efficiency through organized community effort. This definition shows great understanding in that Winslow recognized the impact of social, educational, and economic factors on health.

The American Board of Dental Public Health (ABDPH), which is the regulatory agency for the specialty, was established in 1954. Dental public it is a modification of the previously mentioned Winslow definition of public health.

The **ABDPH** defined **Dental Public Health** as: The science and art of preventing and controlling dental disease and promoting dental health through organized community efforts.

The **ADA** has recognized dental public health as one of nine specialties of dentistry.

The purpose of public Health:

- 1. Prevents epidemics and the spread of disease.
- 2. Protects against environmental hazards.
- 3. Prevents injuries.
- 4. Promotes and encourages healthy behaviors.
- 5. Responds to disasters and assists communities in recovery.
- 6. Ensures the quality and accessibility of health services.

Dental public health concerned with:

- 1. Dental health education of the public.
- 2. Research and application of the research finding.
- 3. Administration of programs of dental care.
- 4. Prevention and control of dental diseases.

The most common diseases of the mouth that the dental public health impact are:

1. Dental caries.

2. Periodontal diseases.

3. Oral cancer.

4. Developmental anomalies/acquired disorders of the oral structure.

Unique characteristics of these diseases are:

- 1. They have universal prevalence.
- 2. They do not undergo remission or termination if left untreated.
- 3. They usually require more time and cost for treatment.

Explanation of dental public health may be best achieved by giving specific examples:-

1-Dental public health is less tooth decay because of fluoridated water and school fluoride programs.

2- Less periodontal disease because of public education programs.

3- Greater access to high-quality early diagnosis and treatment of dental disease because of dental care delivery programs and research.

4- Less tooth damage among athletes because of mouthguard programs.

5- Less oral cancer because of tobacco cessation and cancer screening programs.

Tools of dental public health:

1-Epidemiology: It is a study of distribution and determinants of health related events in population. The word epidemiology is derived from-epi=on or upon, demos=people and logos=science. It is "the branch of medical science dealing with epidemics".

2-Biostatistics: Statistics is the science of compiling, classifying and tabulating numerical data and expressing the results in a mathematical or graphical form. Biostatistics is that branch of statistics concerned with mathematical facts and data relating the biological events.

3-Social Sciences: Social sciences usually include sociology, cultural anthropology and psychology. The public health worker, when he embarks upon organized community effort, is very dependent upon the group behavior of the individuals, determined by their culture.

4-Principles of Administration: The dentist with a leadership role in public health program needs to know many of the principles by which large enterprises are administered, these are:

1- Organization: which deals with the structure of the agency and the arrangement of working people within it.

2- Management: which is concerned with the handling of personnel and operations in such a way that the work of the agency gets done.

5-**Preventive Dentistry:** It includes those practices by individuals and communities that affect oral health status. There are three levels of prevention.

1. **Primary prevention:** This preventive measure is directed toward the prepathogenesis stage of the disease to prevent the occurrence of the disease (dental health education, oral hygiene measures, immunization, water fluoridation and fissure sealant).

2. **Secondary prevention:** It includes treatment of the disease to prevent the progression and recurrence of it (filling and pulp treatment).

3. **Tertiary prevention:** This preventive measure is directed toward the pathogenesis stage of the disease to restore the lost function, esthetics which has happened as a result of the disease (prosthesis).

Procedural steps in dental public health:

1. **Survey:** It is the first step in the public dental health procedure. Surveys are methods for collection of data, in order to determine the amount of disease problems in a community.

2. **Analysis:** Information collected through a survey is subjected to an analysis in order to define specific health problems in the community.

In the present modern world electronic data processing medias such as computers are resorted to for analyzing data. It is essential to obtain description of prevailing problem and their characteristics in order to achieve a correct diagnosis.

3. **Program planning:** After the problem and its characteristics are analyzed, the next step is program planning. The program must be accepted by the community and that the people show an interest in it or to partly accept it, or to find an alternative method which is comprehensive and cheaper. Hence it has to be ensured that the community is well informed about the program.

4. **Program operation:** When a specific public health program has to be adopted for a community, a public health team has to be employed for executing the program. This can be best illustrated with the example of water fluoridation in a community.

5. **Financing:** Financing in public health programs are usually through the funds provided by the government or by the local authorities.

6. **Program appraisal**: This is the final step in any public health program where the effectiveness of the program is assessed.

Similarities between personal and community health care:

The names of the activities carried out by both the personal and community health worker that varies while the aim of the procedure is basically the same:

1. **Examination/survey:** purpose of survey is to determine the nature and extent of the problem, just as an examination is done when a patient comes to a dental clinic with a complaint.

2. **Diagnosis/Analysis:** It is the procedure of converting data of survey by meaningful figures or statistics just as a dental clinician uses his examination data to guide him to an accurate diagnosis.

3. **Treatment Planning/programme planning:** Once diagnosis is made one can proceed to make plans for effective treatment. Public health professional would like to have the ideal programme plan.

4. **Treatment/programme operation:** Execution of the treatment or programme once the plan has been made.

5. **Payment/ programme funding:** The patient payment of the dental service can be in the form of cash payment or monthly billing and in community health care the government usually is responsible for funding.

6. **Evaluation/programme appraisal:** is assessing the effectiveness of the treatment or the health programme.

Characteristic	Personal dental	Dental public health
	health	
1.Target	Individual patient	Community or group of
		individuals
2.Visiting	The patient comes to the	The public health practitioner
	practitioner	goes to the group of individuals
3. Major emphasis	Restorative care	Preventive care
4. Service provider	Dentist alone, sometimes	Health team professionals
	with an assistant	
5. Supportive	Psychology	Sociology, psychology,
disciplines		education, epidemiology and
		biostatistics
6. Perspective results	Immediate	Long term

Difference between personal and community health care:

Community dentistry

Epidemiology of Dental Caries

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Dental Caries 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):

Dental caries is one of the most common microbe-mediated oral diseases in human beings. At present, the accepted etiology of caries is based on a four-factor theory that includes oral microorganisms, oral environment, host, and time. Excessive exposure to dietary carbohydrates leads to the accumulation of acid-producing and acid-resistant microorganisms in the mouth. Dental caries is driven by dysbiosis of the dental biofilm adherent to the enamel surface 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.

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 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 predispose 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: Teeth that are harder to clean are more susceptible to decay. That means teeth that are Malaligned, out of position, rotated teeth or located in the back 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.

-Calcium and phosphorus: The quantity of calcium and phosphorus is inversely related to the rate of flow. Its quantity is less in case of caries active individuals. -Ammonia: As the quantity of ammonia decreases, caries activity increases, because ammonia retards plaque formation and neutralizes acid.

-Urea: Urea gets hydrolyzed to ammonium carbonate by urease which has a neutralizing effect.

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 5 plaque which would have occurred is reduced or even eliminated. This salivary neutralization and buffering effect markedly reduces the cariogenic potential of foods. As the flow rate of saliva increases, the pH also increases. Saliva may be slightly acidic as it is secreted at unstimulated flow rates but it may reach a pH of 7.8 at high flow rates. Quantity of saliva secreted normally is 700 to 800 ml/day. As the viscosity of saliva increases, the caries activity also increases.

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 and deterioration of oral clearance ability.

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: It is defined as the types and amounts of food eaten daily by an individual. 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 ,UV light from sun is known to promote vitamin.D productions thus tend to reduce 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, magnesium, cadmium, lead and silicon are present in soil, whereas molybdenum, vanadium and phosphorus 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.

Community Dentistry

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م.م. ريم رعد علي Dental indices

Epidemiological methods of the study require the conditions be measured and quantified accurately based on sound scientific principles. One of the major problem in studying dental diseases and its factors is the development of a suitable, practicable method for recording the occurrence and severity of disease. Quantitative measurement of disease most commonly relies on "index". So, dental index is the main tool of epidemiological studies in dental diseases to measure incidence, prevalence and severity.

Definition of Index:- It is a numerical value, describing the relative status of a population, on a graduated scale with definite upper and lower limits, designed to Permit and Facilitate comparison with other populations classified by the same criteria and methods.

Prevalence = the **number of cases** of a disease in a **specific population** at a **particular time point** or over a **specified period of time**

Incidence = the **rate of new cases** of a disease occurring in a **specific population** over a **particular period of time.**

The purposes of an index:

1. To make accurate assessment of the extent and severity of the disease and to compare the disease status among individuals and communities.

2. To find out etiological and predisposing factors for the diseases.

3. For planning of oral health policy.

4. To assess the efficiency of measures undertaken to overcome the disease may be preventive or curative.

Uses of dental indices

1-To study oral health status of individuals and population.

2- To study prevalence and incidence of diseases.

3- To provide data for epidemiological studies.

4- For planning of oral health policy.

5- To evaluate the effectiveness of oral health programs.

6- To provide data for research to find out etiological and predisposing factors for the diseases.

7- To evaluate the success of various preventive programs.

8- To compare oral health status of individuals and population.

Ideal Requirements of dental index:

Ideally, an index should possess the following properties:

- Clarity-The examiner should be able to carry out the index rules in his mind.
- 2- Simplicity -The index should be easily to apply, so there is no undue time lost during examination.
- 3- Objectivity- The index criteria should be clear and unambiguous.
- 4- Validity: The index should be measure what it is intended to measure. So it should be correspond with clinical stages of the disease, ex. number of missing teeth in adults is not a valid measure of caries activity and number of bacteria in a sample of saliva is not a valid measure of bacteria of dental plaque.

5- Reliability: The index should measure consistently at different times and under a variety of conditions, by the same person or different persons.

4- Quantifiability: The index should be amenable to statistical analysis. So that the status of a group can be expressed by a number that corresponds to a relative position on a scale from zero to the upper limit.

5-Sensitivity: The index should be able to detect reasonably small shifts, in either direction in the condition.

6- Acceptability: The use of the index should not be painful or demeaning to the subject.

Recommended method of performance of an index:

- Explain procedure to patient.
- Drape patient.
- Give patient protective eyewear.
- Wash hands.
- Don PPE. (Personal protective equipment)
- Adjust Position of patient in dental chair.
- Adjust dental light for maximum illumination.
- Apply lubricant gel to patient lips.
- Dry teeth with compressed air using recommended sequence.
- Carry out the index.

Types of indices:

1-Simple index: It is the one which measures the presence or absence of a condition.

For example, an index which measures the presence of plaque without evaluating its effects on the gingiva

2- Cumulative index: It is the one which measures all the evidence of a condition (past and present).

An example is DMFT index for dental caries.

3-Irreversible index: An index which measures the conditions that will not return to the normal state. Once established cannot decrease in value on subsequent examinations.

For example, a dental caries index DMF

4-Reversible index: One that measures conditions that can be changed or reversed as gingival index (GI).

5-Composite index : Index that measures conditions that can be return to the normal state and conditions will not return to the normal state as periodontal index(PDI).

6- Full mouth indices: These indices measure the patient's entire periodontium or dentition e.g. Russell's periodontal index and Dean fluorosis index. 3

7-Simplified indices: These indices measure only representative samples of dental apparatus e.g. Green and Vermillion's simplified oral hygiene index (OHI-S). 8-Indices are also classified in general categories according to the entity which they measure

a. Disease index: e.g. 'D' (Decay) portion of the DMF index is the best example for disease index.

b. Symptom index: e.g. measuring gingival or sulcular bleeding are essentially examples for symptom indices.

c. Treatment index: e.g. the 'F' (Filled) portion of DMF index is best example for treatment index.



Community Dentistry

Dental caries indices





Dental Caries indices:

Dental Caries is the most prevalent chronic disease affecting the human race. Once it occurs, its manifestations persist throughout life even the lesion is treated. It is a post eruptive disease. It affects both genders, all races, all ages, all socioeconomic groups



Ideal caries detection method :

- It should be accurate.
- It should be precise.
- It should be easy to apply.



- It should be useful for all surfaces of the tooth including caries adjacent to restorations.
- It should assess the activity of the lesion.
- It should be sensitive, allowing lesions to be

detected at early stages.



Conventional examination for caries:

1- visual inspection: It is one of the most common diagnosis methods implemented by dentists. In order to make an accurate assessment, the teeth should be clean, dry and examined under a light source.



In visual examination, changes in tooth structure such as; enamel dissolution, white spot lesions, discoloration, surface roughness and presence of cavitation are assessed. 2-Tactile sensation and The visual-tactile method

has been a mainstay of clinical dentistry for more than 100 years and is based on the use of a dental mirror, sharp probe, and a 3-in-1 syringe and clean and dry tooth surface.





The explorer and the dental floss are used for tactile examination but the use of an explorer is not preferred because

1. Sharp tip of the explorer can produce traumatic defects on the enamel surface,

- 2. The cariogenic bacteria may be transferred from one tooth surface to another,
- 3. Probing may cause cavitation and fracture in the incipient lesions,
- 4. Explorers have low sensitivity resulting in undetected lesions.

3-Radiographs







Dental caries indices:

- 1- Indices used for coronal caries.
- A.Permanent teeth.
- B- Primary teeth.
- 2- Indices used for root caries.

Decayed-Missing-Filled Index (DMF): This index was developed by Henry Klein, Carrole E Palmer and Knutson JW in 1938 and modified by WHO, it is simple, rapid and universally accepted. The instruments used in the examination procedure are plane mouth mirror and CPI(community periodontal index) probe,

• This is an index of caries incidence (**prevalence**) not severity



This index is of two types:

1-DMF teeth index (DMFT) which describe the amount (**prevalence**) of dental caries in an individual. DMFT numerically expresses the caries prevalence and is obtained by calculating the number of teeth.

2- DMF surfaces index (DMFS) which measures **the severity** of dental caries and is obtained by calculating the number of surfaces.

- D- Component for "Decayed".
 - M- Component for "Missing "due to caries.
- F- Component for "filled."
- T- Mean tooth.

The components of DMFT index as below:-

D component: Used to describe (Decayed teeth) which include:

1. Carious tooth.



- 2. Filled tooth with recurrent decay.
- 3. Only the root are left.
 - 4. Defect filling with caries.







6. Filled tooth surface with other surface decayed.

7. Deciduous teeth are not included in DMFT count.


M component: Used to describe (missing teeth due to caries) other cases should be excluded these are :

- 1-Orthodontic treatment.
- 2-Impaction.
- 3-Periodontal disease.
- 4-. Unerupted teeth.
- 5-Congenitally missing.





6- Avulsion teeth due to trauma or accident.

F component: Used to describe (Filling teeth) which include:

- 1. Filled teeth due to caries without recurrent caries.
- 2. A tooth with a crown placed because of previous decay.
- 3. Fissure sealant and other Preventive filling should be excluded.

4. Composite filling or crown due to Trauma (fracture) should be exclude.

NOTE: A tooth with a crown placed because of previous decay was recorded in this category.

Calculation of DMFT:

For individual $\mathbf{DMF} = \mathbf{D} + \mathbf{M} + \mathbf{F}$

2- For population Mean DMF =Total DMF / Total No. of the subjects examined. Maximum score:



28 if the wisdom teeth are excluded.

DMFT

Minimum score = Zero.

- The DMFS index provides a finer measurement of caries of each tooth (measure severity).
- ✤ D- component for "Decayed , "
- ✤ M- component for "Missing "due to caries.
- ✤ F- component for "filled.
- ✤ S- mean "Surface"

- Retained root was recorded as <u>4 D</u> for anterior teeth, <u>5 D</u> for posterior teeth.
- 4 Missing tooth was recorded as <u>4 M</u> for anterior teeth, <u>5 M</u> for posterior teeth.
- 4 Tooth with crown was recorded as <u>4 F</u> for anterior teeth, <u>5 F</u> for posterior teeth.



Total surface count for a DMFS Index:-

✤ If 28 teeth are examined (third molars are exclude):

- -16 posterior teeth $(16 \times 5) = 80$ surfaces.
- -12 anterior teeth $(12 \times 4) = 48$ surfaces.

total = 128.

✤ If third molars are included : (4×5)

=20surfaces total = 148 surface.

Advantages of DMFS Index:



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The DMFS Index provides a finer measurement of caries of each tooth than DMFT index. Each tooth may score up to 5 points, one for each surface D,M,F.

It is useful in clinical trial where detailed information is required.





1-A tooth is considered to be erupted when just the cusp tip of the occlusal surface or incisor edge is exposed .The excluded teeth in the DMF index are:

- Supernumerary teeth.
- The third molar according to Klein, Palmer and Knutson only.

2-The examination should proceed in an orderly manner from one tooth or tooth space to the adjacent tooth or tooth space starting from upper right second molar and ending with lower right second molar.

3-If a permanent and primary tooth occupy the same tooth space, the status of the permanent tooth only should be recorded.

4-Limitations - DMF index can be invalid in older adults or in children because index can overestimate caries record by cases other than dental caries.

*Primary teeth index:

1- dmft / dmfs Maximum scores: dmft = 20 , dmfs = 88

2-deft / defs , which was introduced by Gruebbel in 1944.

d- decayed tooth .

e- decayed tooth indicated for extraction .

f- filled tooth.

3- dft / dfs In which the missing teeth are ignored, because in children it is difficult to make sure whether the missing tooth was exfoliated or extracted due to caries or due to serial extraction.

***Mixed dentition:** Each child is given a separate index, one

for permanent teeth and another for primary teeth.



Information from the dental caries indices can be derived to show the:

1. Number of persons affected by dental caries (%).

 Number of surfaces and teeth with past and present dental caries (DMFT / dmft -- DMFS / dmfs).

3. Number of teeth that need treatment, missing due to caries, and have been treated (DT/dt, MT/mt, FT/f t).

Differentiation between tooth missing due to caries and due to exfoliation:

- 1. By age of the patient if it is near to exfoliation time or not
- 2. The shape of ridge is concave in carious missing tooth and straight in exfoliated one and permanent successor may be seen.

- DMF/dmf index is higher in association with carious missing tooth especially adjacent and the contra lateral teeth.
- 2. Bad oral hygiene mainly associated with carious teeth.

Differentiation between tooth missing due to

caries and due to orthodontic treatment:

- By type of teeth, in ortho. treatment most teeth should be extracted are 4,5/c, d while in carious missing teeth any teeth may be involved.
- 2. Bilateral and /or opposing missing generally associated with ortho. treatment, while in carious missing teeth it is not necessary.
- 3. DMF/dmf index is higher in association with carious missing tooth especially adjacent and the contra lateral teeth with bad oral hygiene mainly associated with carious teeth.

The Root Caries Index:-

was calculated for each subject (only root surfaces exposed to the oral environment are at risk; the data are recorded) as follow:

(R-D)+(R-F) RCI = ------ x 100 (R-D)+(R-F)+(R-N) R-D: recession with decay root surface. R-F: recession with filled root surface. R-N: recession with a sound root surface.



Example:

R-D: recession with decay root surface =5 R-F: recession with filled root surface=3 R-N: recession with a sound root surface=4 (R-D)+(R-F)RCI = ----- x 100(R-D)+(R-F)+(R-N)(5)+(3)RCI = ----- x 100 (5)+(3)+(4)

Root Surface Caries Severity Index (Billing et al. 1985)

• Grade 1: Is characterized by an incipient lesion, the surface texture is soft and irregular and can be penetrated with a dental explorer, there is no surface defect and pigmentation variable light tan to brown.

• Grade 2 : It is characterized by a shallow lesion, the surface texture is soft, irregular and rough and can be penetrated with a dental explorer, there is surface defect (less than 0.5 mm in depth) and pigmentation variable from light tan to dark brown.

• Grade 3 : It is characterized by cavitation of the surface texture which is soft and can be penetrated with a dental explorer. There is a penetrating lesion and cavitation is present (greater than 0.5 mm in depth) however there is no pulp involvement, pigmentation is variable ranging from light brown to dark brown.

• **Grade 4 :** It is characterized by pulpal involvement, there is a deeply penetrating lesion pulpal or root canal involvement, pigmentation is variable ranging from brown to dark brown.





Community Dentistry Lec-6 -

Epidemiology of periodontal disease

The **periodontium** is the supporting structure of a tooth, helping to attach the tooth to surrounding tissues and to allow sensations of touch and pressure.

The word comes from the Greek terms *peri*, meaning "around" and *odons*, meaning "tooth." Literally taken, it means that which is "around the tooth".

The periodontium consist of:

- Gingiva.
- Periodontal ligament.
- Root cementum.
- Alveolar bone (alveolar process).



Periodontal diseases range from gum inflammation (gingivitis) to serious disease (periodontitis).

Gingivitis is a mild form of gum disease that can usually be reversed with daily brushing and flossing, and regular cleaning by a dentist or dental hygienist.

This form of gum disease does not include any loss of bone. When gingivitis is not treated, it can advance to Periodontitis that result in major damage to the soft tissue and bone that support the teeth.

Genetic Classification of periodontal disease:

-Gingival diseases:

✤ Plaque induced

4 Non plaque induced.

-Chronic periodontitis:

Localized .

\rm Generalized .

-Aggressive periodontitis:

4 Localized.

 Generalized .

-Periodontitis as a manifestation of systemic disease :

↓ -Necrotizing (periodontal disease).

+ -Abscess of the periodontium.

+ -Periodontitis associated with endodontic lesions.

4 -Developmental or acquired deformities.

Etiological factors: It is well established that the periodontal disease is initiated by bacterial plaque, but other etiologic factors exist- those which predispose to plaque accumulation and those which modify the inflammatory response.

\rm Local factors:

A. Deposits on teeth:

1. Mucinous plaques: soft, non-mineralized, bacterial deposit which forms on teeth.

2. Calculus: Mineralized dental plaque .

3. Protein pellicle: It is a structure less film of salivary glycoproteins selectively adsorbed to the surface of hydroxyapatite crystals.

B. Abnormal Habits:

1. Unilateral mastication.

2. Clenching and bruxism.





Clenching: is simply holding the teeth together and tightening the jaw muscles.

Bruxism: is a condition of grinding of teeth as the jaw moves forcefully either from side to side or back and forth. They occur unconsciously during wake up or sleeping.

3. Abnormal biting habits: Habits like thread biting by tailors and holding of nails between teeth by carpenters cause trauma to the periodontium leading to periodontitis. Miscellaneous habits like pipe smoking, pencil biting, nut biting, finger nail biting produces traumatic injury to periodontium (gingiva,periodontal ligament,cementum and alveolar bone proper).

<u>C. Food Impaction:</u> is the forceful wedging of food against the gingiva between teeth. Where teeth have drifted apart food wedging can take place specially in the presence of an opposing 'plunger cusp'

<u>D. Non detergent diet:</u> sticky foods like cakes ,breads ,chips soft drinks and candies.

<u>E. Factors of occlusal function:</u> (excessive stress on teeth. non occlusion) <u>F. Abnormal Anatomy:</u> tooth form and proximal contact .

<u>G- tooth position (crowding)</u>: Gingivitis is more common and more severe around malaligned teeth because predisposes to plaque retention and interferes with proper plaque removal .

<u>H-Improper brushing technique:</u> besides resulting in inadequate plaque removal, can also cause gingival recession.

Other irritants :(Iatrogenic (Overhang restoration), cigarettes, mouth breather).

4 Systemic factors

• Faulty Nutrition (deficiency of vitamin C and A , Protein , Zinc , Iron, Calcium)

• Debilitating diseases (GI disorder, TB, nephritis)

• Blood dyscrasias (leukemia)

• Endocrine dysfunction(hyperthyroidism and hyperparathyroidism, diabetes)

• Radiation (dose).

<u>Risk Factors</u>: are variables associated with an increased chance of disease development.

• Smoking: Smoking is one of the most significant risk factors associated with the development of gum disease. Additionally, smoking can lower the chances for successful treatment.

• Hormonal changes in girls/women: These changes can make gums more sensitive and make it easier for gingivitis to develop. gingivitis is seen at the time of menstruation and pregnancy.

• Oral contraceptive: studies report increased gingival inflammation and increased periodontal destruction.

• Diabetes:People with diabetes are at higher risk for developing infections, including gum disease.

• Other illnesses and their treatments:Diseases such as AIDS and its treatments can also negatively affect the health of gums, as can treatments for cancer.

• Medications: Some drugs, such as dilantin sodium, anti-depressants, and certain heart medicines, can affect periodontal health.

• Genetic susceptibility: Some people are more prone to severe gum disease than others.

• Race: Blacks had more periodontal disease than Whites. .Obesity: research has shown that obesity may increase the risk of periodontal disease.

• Socio-economic Status :High income group have lower periodontal disease rate than the lower income group, probably because they have the means and can afford dental treatment.

• Restoration : Bacteria accumulate more readily on filled surface, than on tooth surface. A smooth and highly polished filling is easier to clean than a rough surface and hence there is lesser degree of plaque accumulation.

Epidemiology of periodontal disease:

1. Interproximal areas are the most severely affected by gingivitis followed by buccal and lingual surfaces.

2. Gingivitis is more severe in the upper arch than lower arch for interproximal and buccal areas. For the lingual areas, gingivitis is found to be more sever in the lower arch.

3. the most severely affected teeth by periodontal disease are upper molars and lower incisors whereas the least affected are lower premolars and upper canines.

4. Higher tendency toward gingivitis is on the right half of the area than on the left half. This may be because of difficulty that right-handed person has in brushing the right half of the mouth.

5.Gingivitis has been observed in children younger than 5 years of age In general prevalence and severity of gingivitis increase with the age ,beginning at approximately5 years of age ,reaching their highest point in puberty and then very gradually decreasing but remaining relatively high throughout life.

6-gender: Periodontal disease is more common in males. The reasons for these gender differences are not clear, but it is thought to be related to poorer oral hygiene level, which is usually observed among males.

Elements of prevention of periodontal disease:

- a) Oral health education for individuals and community.
- b) Tooth brushing .
- c) Oral hygiene aids .
- d) Chemotherapy of dental plaque infection.
- e) Dietary factors in plaque control.
- f) Disease control by professional.

Community Dentistry

Lec-7-



Periodontal disease Indices

There categories in periodontal disease for which indices are needed:

A. Dental plaque \rightarrow primary etiological factor in periodontal disease, it is a soft deposit resulting from the colonization and growth of microorganism on the tooth surfaces.

B. Calculus \rightarrow A hard deposit of inorganic salts (minerals) mixed with food debris, bacteria and desquamated epithelial cells.

Two main types of dental calculus can be identified according to the location:

supra gingival calculus: It extended occlusal to the free gingival margin and visible in oral cavity.

► sub gingival calculus: deposit apical to the free gingival margin, found in periodontal pockets and not visible on oral examination.

C. Gingival inflammation \rightarrow inflammatory process of the gingiva. Most form of gingivitis is plaque induced.

D. Periodontitis \rightarrow also it is an inflammatory condition of the gingival tissues, characterized by loss of attachment of periodontal ligament and the bone support of tooth

1-Plaqe Index which was introduced by Silness and Löe in 1964:

- ✓ Dental plaque is the main pathological cause of periodontal diseases and it must be removed mechanically by means of hand instruments, the toothbrush or other oral hygiene aids.
- ✓ Supragingival plaque and subgingival plaque represent two distinct morphologic and microbiologic entities.
- ✓ Disclosing agent: Tablet or liquid containing a dye that is used to color and reveal plaque in a patient's mouth.

-Used together with GI, and should be preceded the gingival examination.

-Wisdom teeth are excluded.

-Used on all teeth (28) or selected teeth (six index teeth).

-No substitution for any missing tooth.

- Four surfaces: distal, facial or buccal, mesial, and lingual, are examined. Each of the four surfaces of the teeth is given a score from 0 to 3

-This index measures the thickness of plaque on the gingival one third.

-This index is widely used with good validity and reliability, but its disadvantage is the subjectivity in estimating plaque, therefore, it is recommended that a single examiner be trained and used throughout clinical trial.



Scores Criteria

0: No plaque.

1: A thin film of plaque adhering to free gingival margin and adjacent area of the tooth .The plaque could be seen only by using the disclosing agent or the probe.

2: Moderate accumulation of soft deposits within the gingival pocket or the tooth and gingival margin that can be seen with naked eye.

3: Abundance of soft matter within gingival pocket, on the tooth and gingival margin.

Calculation of scores:

A – To determine PI for an individual: Total scores/ number of surfaces examined.

B- To determine PI for population: Total scores for subjects / number of subjects examined.

C- Suggested nominal scale for patient may be assigned:

0 = excellent oral hygiene.

0.1-0.9 = good oral hygiene.

1.0-1.9 =fair oral hygiene.

2.0-3.0 = poor oral hygiene.

2-Oral Hygiene Index (OHI) by Green and Vermillion (1960):

This index has 2 components: The debris index (DI) +calculus index (CI).

The scores for each are added to give the total score for the OHI.

Debris index: measures plaque areas.

Selection of teeth and scoring: The DI is then determined by dividing the score (36 maximum) by the number of segments scores (6). The maximum score for the DI is thus (6).

Criteria of DI: (debris is removed with the aid of the probe along the tooth).

0: No debris or stain.

1: Soft debris covering up to 1/3rd of the tooth surface or the presence of extrinsic stains without debris regardless of surface area covered.

2: Soft debris covering 1/3rd - 2/3rd of the tooth surface.

3: Soft debris covering over 2/3rd of the tooth surface.



3-Hygiene Index simplified (OHI - S) by Green and Vermillion (1964): This index was devised because the OHI was found to be very time consuming as all teeth to be examined.

This index has 2 components: the debris index simplified (DI-S) and the calculus index simplified (CI-S).

The scores for each added to give the total score for the OHI-S.

Oral Selection of teeth and Scoring: The surface examined are the buccal surface of 16, and 26, the lingual surface of 36 and 46, and the labial surface of 11 and 31.

If the first molar is absent the first standing molar is substituted. The DI-S for individual is calculated by dividing the total score by the number of surface examined which gives a range of 0-3.



The maximum score for OHI-S is 6 not 12 as in the OHI.

Criteria of DI-S: The same as DI.

0: No debris or stain.

1: Soft debris covering up to 1/3rd of the tooth surface or the presence of extrinsic stains without debris regardless of surface area covered.
2: Soft debris covering 1/3rd - 2/3rd of the tooth surface.

3: Soft debris covering over 2/3rd of the tooth surface.

4-Patients Hygiene Performance Index by Podshadley and Haley (1968):

This index was the first developed for the purpose of assessing an individual performance in removing debris after tooth brushing instruction.

Selection of teeth and Scoring: Same as OHI-S index teeth. The surface examined are the buccal surface of 16, and 26, the lingual surface of 36 and 46, and the labial surface of 11 and 31.

If the first molar is absent, the First standing molar is substituted.

The scoring is preceded by use of a disclosing agent (tablet or solution).

The tooth is divided into five areas: Three longitudinal thirds (distal, middle, mesial) with the middle third subdivided horizontally into (incisal, middle, gingival thirds). The assess of debris presence or absence is 1 or 0.



Calculation of score: The patient hygiene performance index score per person is obtained by totaling the five subdivision scores of each teeth surface and dividing the total by the number of tooth surface examined.

Advantages of Patients Hygiene Performance Index:

- 1- Patients Hygiene Performance Index is relatively more sensitive than OHI-S because it divides each tooth surface into five areas.
- 2- It can be used in group studies of dental health education .
- 3- Its chief value lies in its application as an education aid.

5-WHO System (1977):

This is a simple prevalence index. That teeth are not dried or stained, and no probe is used.

Selection of teeth and scoring: The mouth is divided into 6 segments: posterior right and left, and anterior, in each jaw.

This system is used for all the periodontal indices advocated by WHO.

All surface are examined; each segment is scored as one unit. The maximum score for an individual is 6.

Criteria of WHO system:

- **0:** no soft deposit visible.
- **1:** any soft deposit on any surface clearly visible by the naked eye.

Lec-7-

Community Dentistry

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Indices of periodontal diseases

Indices for measurement of calculus I.

1- Oral Hygiene index (OHI) by Greene and Vermillion (1960) Calculus index.

-Selection of teeth and scoring: The same as DI. The mouth is scored in 6 segments: Anterior and right and left posterior in each jaw.

The teeth are examined buccally and lingually in each segment, giving 12 scores in all.

The score for the buccal of an entire segment is the highest score for the buccal surface of an individual tooth in that segment. The lingual surface scored similarly and not necessarily be on the same tooth.

Score Criteria of CI:

0: no calculus.

1: supra gingival calculus covering not more than 1/3rd of surface.

2: supra gingival calculus covering 1/3rd - 2/3rd of surface or flecks of sub gingival calculus.

3: supra gingival calculus covering 2/3rd of surface or continuous heavy blend of sub gingival calculus.

2- Oral Hygiene Index-Simplified (OHI-S) by Greene and Vermillion (1964) Calculus index.

Selection of teeth and scoring: The same as DI-S. The surface examined are the buccal surface of 16, and 26, the lingual surface of 36 and 46, and the labial surface of 11 and 31.



Score Criteria

0 no calculus.

- 1 supra gingival calculus covering not more than 1/3rd of surface.
- supra gingival calculus covering 1/3rd 2/3rd of surface or flecks of subgingival calculus.
- **3** supra gingival calculus covering 2/3rd of surface or continuous heavy blend of sub gingival calculus.

3-Calculus Surface Index (CSI) BY Sturzenberger and Radike (1961).

-Selection of teeth and scoring: Teeth selected are 31, 32, 41, 42.



All surfaces of each tooth are examined, Therefore the maximum score is 16.

Score criteria

0: no calculus present on surface.

1: any calculus present on surface.

4-Ramfjord Periodontal Disease Index- calculus component (1959):

Only six selected teeth are scored for assessment of the periodontal status of the mouth; 16, 21, 24, 36, 41 and 44.

The score for an individual is the total score divided by number of teeth. There is no substitution for missing teeth.



Score criteria

0: no calculus.

C 1: supra gingival calculus extending not more than 1 mm below gingival margin.

C 2: moderate amount of supra gingival and sub gingival calculus or sub gingival calculus alone.

C 3: heavy accumulation of both supra and sub gingival calculus.

5-WHO System (1977) :

-Selection of teeth and scoring: The mouth is divided into 6 segments posterior right and left, and anterior in each jaw. All surfaces are examined each segment is scored as one unit. The maximum score for an individual is 6.

Criteria:

0: if the deposit is soft, or there is no suspected calculus.

1: if there is calculus clearly present on visual examination on at least one tooth in the segment.

If a deposit is suspected of being calcified, a probe may be used to confirm this.

6-Calculus surface Severity index (CSSI) by Ennever et al. (1961).

-Selection of teeth and scoring: Same as Calculus Surface Index CSI. Score Criteria:

0: no calculus.

1: less than 0.5 mm width thickness of calculus .

2: 0.5-1mm width thickness of calculus .

3: over 1mm thickness of calculus.





Indices for measurement of gingival inflammation and periodontal destructions (loss of attachment)

Gingival Index (GI) of Löe and Silness (1963):

• This index measures the severity of gingivitis based on color, consistency, and bleeding on probing.

• Each tooth is examined at the mesial, lingual, distal and buccal surface.

• Teeth and gingiva are dried and are examined under adequate light, using a mouth mirror and blunt probe.



• A blunt probe is used to press on the gingiva to determine its degree of firmness, and to run along the soft tissue wall adjacent to the entrance to the gingival sulcus to evaluate bleeding.

• The excluded teeth are partially erupted, teeth with periapical lesion and retained roots.

-The index teeth are:





The interpretation:



- **—** -0.1 1 **Mild gingivitis.**
- □ -1.1 2 **Moderate gingivitis** .
- **\Box** -2.1 3 **Severe gingivitis.**

Calculation:



1-Individual GI = Total scores/ No. of surfaces exa.

2-Population GI = Total scores No. /No. of subjects exa.

-The maximum score for gingival index is :

GI = Total scores /No. of surfaces.

$$GI = \frac{3 \times 6 \times 4}{24} = 3$$

2-Modified gingival index(MGI):



The MGI is the most widely used index in clinical trials of therapeutic agents. As, with its predecessors, MGI doesn't assess the presence of periodontal pockets or attachment loss, thus these indices cannot identify gingivitis in absence of periodontitis.

Scoring Criteria



0: Absence of inflammation.

1: Mild inflammation, slight change in color, little change in texture of any portion of but not the entire marginal or papillary gingival unit.

2: Mild inflammation ,criteria as above but involving entire marginal or papillary gingival unit



- **3** : Moderate inflammation :glazing ,redness edema and /or hypertrophy of marginal or papillary gingival unit.
- 4 : Sever inflammation :marked redness ,edema and /or hypertrophy of the marginal or papillary gingival unit ;spontaneous bleeding congestion

3-WHO index 1977:



-This is a simple prevalence index . the teeth are not dried and no probe is used.

-Selection of teeth and scoring:

The mouth is scored in 6 segments: Anterior and right and left posterior in each jaw. All surface are examined each segment is scored as one unit. The maximum score for an individual is 6.

Criteria Score



0: There is no or only minor alteration in gingival colour and form, and no bleeding after digital palpation.
1: There is a marked change on colour ,bleeding on firm digital palpation and marked general loss of stippling.

4-Ramfjord Periodontal Disease



(Gingival sulcus measurement):

- Selection of teeth and scoring: The indexed teeth are
 16, 21, 24, 36, 41 and 44.
- The four surfaces of each tooth are examined .
- The examination done by narrow graduated periodontal probe (Michigan O).



 Use the cemento – enamel junction as baseline from which to measure the loss of attachment.

 The score for an individual is the total score divided by the number of teeth examined.

No replacement of missing teeth.

A- If gingival margin is on enamel:

- ✤ 1- Measure distance from gingival margin to CEJ.
- ✤ 2- Measure distance from gingival margin to the base of the pocket (when the pocket is apical to CEJ).
- \clubsuit Loss of attachment = 2-1 Pocket depth = 2



B. If gingival margin is on cementum:

- I- Measure distance from CEJ to gingival margin (minus score).
- ✤ 2- Measure distance from CEJ to bottom of pocket.
- Loss of attachment = 2
- Pocket depth = 1+2.

5-Ramfjord periodontal disease index (pocket depth):

- Selection of teeth and scoring: The indexed teeth are 16,21,24,36,41 and 44.
- The four surfaces of each tooth are examined. The score for an individual is the total score divided by the number of teeth examined. No replacement of missing teeth.

Criteria:

4: if the base of pocket is up 3mm apical toCEJ .

5: if the base of pocket is 3-6 mm apical toCEJ .

6: if the base of pocket is more than 6 mm apical to CEJ.

6-Ramfjord periodontal disease index (Mobility of the teeth):

- Selection of teeth and scoring: The indexed teeth are 16,21,24,36,41 and 44.
- The four surfaces of each tooth are examined. The score for an individual is the total score divided by the number of teeth examined.
- ✤No replacement of missing teeth.

Score Criteria :

M0: physiological movement only.

M1 : slightly increase mobility .

M2 : definite to considerable increase mobility. No impairment in function.

M3 : severe mobility . Normal function is impossible.

7-Community Periodontal Index of

Treatment Needs (CPITN):

- Developed by WHO (World Health Organization) and F.D.I (Federation Dentaire International) 1982.
- The CPITN is recommended for epidemiological surveys of periodontal health.
- The examination done by special probe (CPITN probe).
- The mouth is divided in to 6 parts (sextant).



Criteria of Community Periodontal Index

(CPI) index

- **0:** No need for care.
- **1:** Gingival bleeding on gentle probing.
- **2:** Presence of calculus and other plaque retentive factors.
- **3** : Presence of 4 or 5 mm pocket.
- **4**: Presence of 6mm or deeper pocket.

Criteria of Treatment Need (TN) index

- **0** : no treatment need.
- **1** : A need for improving of personal oral hygiene.

2: A need for professional cleaning (scaling and polishing) and requirement for oral hygiene instruction. And for shallow pocket4-5mm need scaling and root planning.

3: Deep pocket 6mm or deeper need deep scaling , root planning and more complex procedure.









تقديم م-م- ريم رعد علي

1. Zsigmondy and Palmer System

• The oldest known tooth designation system was designed by Zsigmondy in 1861 and modified by Palmer in 1891. The primary teeth have letters designation from A to E. The permanent teeth have numbering designation from 1 to 8.

1. Zsigmondy and Palmer System

The Palmer notation consists of a symbol (J $^{\Gamma}$) designating in which quadrant the tooth is found and a number indicating the position from the midline.

Hence the left and right maxillary central incisor would have the same number, "1", but the right one would have the symbol, "^J", underneath it, while the left one would have, "^L"
1. Zsigmondy and Palmer System

Left

For Primary Teeth <u>EDCBAABCDE</u> <u>EDCBAABCDE</u> *Right*

1. Zsigmondy and Palmer System

For Permanent Teeth

Q. According to Zsigmondyand Palmer System, whichtooth has the lettercEA

2. American Dental Association(ADA) System, Universal System

In 1968, the Council of Dental Education published a statement on standardization tooth numbering

2. American Dental Association (ADA) System, Universal System For Primary Teeth A B C D E F G H I J T S R Q P O N M L K Right Left

2. American Dental Association (ADA) System, Universal System

Fo	r Pe	erm	ane	ent	Tee	eth		I							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Right

Left

2. American Dental Association (ADA) System, Universal System

The disadvantage of this system is **difficult to remember** the number of this system and if there is extraction we **make mistake** in sequence of numbers Q. According to American Dental Association (ADA) System,name this tooth



Q. According to American Dental Association (ADA) System,name this tooth **3. Two Digit System, International System, Fédèration Dentaire Internationale (FDI) System**

For Permanent Teeth



48, 24, 36, 15

3. Two Digit System, International System, Fédèration Dentaire Internationale (FDI) System

For Primary Teeth



Q.According to Tow Digit System, which tooth has the letter

74, 55, 84, 62

Q.Write tooth number according to **Two Digit** System

Upper left Primary first Molar.
 Lower right permenant central lateral.
 Lower right primary canine

Thank you



Lec- 10- Community Dentistry

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Fluoridation mechanism and effects

History:

The history of fluorides in dentistry is over 100 years old. The man who had the greatest impact on the early history of water fluoridation was Dr. Frederick McKay who arrived in Colorado Springs in 1901, the year following his graduation from the University of Pennsylvania Dental School. He soon noticed that many of his patients had a permanent stain on their teeth, which was known to the local inhabitants as 'Colorado stain'.

McKay checked his lecture notes, but found nothing to describe such markings, nor could he find any reference to it in any of the available scientific literature. He called the stain 'mottled enamel'. The chief chemist Churchill in 1931 identified a significant amounts of fluoride in water samples from other different endemic area with mottled enamel.

In 1939, Trendley Dean made a survey on the relationship between water fluoride concentration and severity of mottled enamel. He showed conclusively that the severity of mottling increased with increasing fluoride concentration in drinking water.

In 1942, Dean's survey demonstrated inverse relationship between fluoride concentration and dental caries in a way that the mottled enamel was no more susceptible to decay than normal enamel. Although the widespread of fluoride and the updated knowledge about its mechanisms of action, the general opinion about effectiveness and risk of systemic methods of fluoride are completely different from decades ago. Nevertheless, these methods are still recommended in many countries and receive support from recognized international committees and associations. In contrast, many dental 2 practitioners have conflicting opinions about the safety and benefits of having a water fluoridation program in their city.

Fluoride in Environment: Fluorine is never seen in nature in the elemental form because it's the most electro negative of all chemical elements. Its belongs to the group of chemical elements called halogens, which refers to their ability to form salts in union with a metal. Halogens, and in particular fluorine, are highly reactive being one electron short of a full outer shell. This electron can be gained by reacting with, for example, calcium, forming calcium fluoride (ionic compound CaF2). Thus, fluoride is the term used when fluorine is combined chemically with a positively charged counterpart. The complexes often consist of crystalline ionic salts such as fluorapatite (Ca10[PO4]6F2).] Fluorine is one of 118 chemical atomic elements in the periodic system. In its pure form, it is a poisonous pale yellowish brown gas.

Fluoride content is commonly expressed in parts per million (ppm) which is equivalent to 1mg fluoride per kilogram or liter of water. Thus,1ppm fluoride equal to 1mg fluoride per liter of water.

Mechanisms of Fluoride Action:

Scientists have proposed that fluoride has several functions

1. Increased enamel resistance or reducing enamel solubility [acid dissolution].

2. Interferes in the formation and functioning of dental plaque microorganisms.

3. Increases the rate of post-eruptive maturation.

4. Remineralization of incipient lesions.

5. Improves tooth morphology.

Metabolism of fluoride

The metabolism of fluoride can be divided into :

• Absorption of fluoride:

Approximately 75 -90 % of the fluoride ingested each day is absorped from the alimentary tract. Fluoride may also be inhaled from air borne fluoride. Readily soluble fluoride compounds such as NaF tablets or aqueous solution of NaF are completely absorbed whereas compound with solubility such as CaF2, MgF and A1F3, are less completely absorbed. So the presence of Ca may lead to formation of insoluble salts with fluoride and absorption reduced to 70% and in food rich with Ca to 60%. The ingestion of fluoride with food retards its absorption. Absorption from stomach occurs readily and is inversely related to the pH of the gastric content. The absorption process occurs by passive diffusion. The absorption of fluoride is unusual in that it can occur from the stomach to a considerable extent. The rate of gastric absorption is directly related to the acidity of the contents so that, for any given dose, the peak plasma level is higher and occurs sooner when the contents are more acidic. Most of the fluoride that escapes absorption from the stomach will be absorbed from the proximal small intestine.

• Distribution of Fluoride in the Body:-

1. Fluoride in Plasma: Plasma is the biological fluid into which and from which fluoride must pass for its distribution elsewhere in the body and for its elimination from the body. There are two general forms of fluoride in human plasma. The ionic form (also called as inorganic fluoride or free fluoride) and the non ionic or bound fluoride. Ionic form is of significance in dentistry and public health and is detected by ion-specific electrode. Together the ionic and non ionic fraction is called "total" plasma fluoride. Ionic fluoride is not bound to proteins, to other components of plasma or to soft tissue. The concentration of ionic fluoride in soft and hard tissue is directly related to the amount of ionic fluoride intake. Since plasma fluoride levels are not homeostatically regulated, there is no normal physiologic concentration. Plasma fluoride levels increase with age. Fluoride balance in infants can be positive or negative during the early months of life, depending on whether intake is sufficient to maintain the plasma concentration that existed at the time of birth.

2. Fluoride in Soft Tissues :The intracellular fluoride concentrations are from 10–50 % lower than those of plasma, but they change simultaneously and in proportion to those of plasma . The tissue-to-plasma ratios of radioactive fluoride are consistent with the hypothesis that hydrogen fluoride (HF) is the form in which fluoride migrates and establishes diffusion equilibrium across cell membranes. Since the pH gradient across the membranes of most cells can be decreased or increased by altering extracellular pH, it is possible to promote the net flux of fluoride into or out of cells. This is the basis for the suggestion that alkalinization of the body fluids is a useful adjunct in the treatment of acute fluoride toxicity.

3. Fluoride in Calcified Tissues: Approximately 99 percent of the body burden of fluoride is associated with calcified tissues. The fluoride concentration in bone is not uniform. In long bones, for example, the concentrations are highest in the periosteal region. They decline sharply within a few millimeters of the periosteal surface and increase slightly as the endosteal region is approached.

Cancelous bone has higher fluoride concentrations than compact bone. Dentine and bone appear to have similar fluoride concentrations which increase with age, while that of enamel is markedly lower. Surface enamel fluoride concentrations tend to decrease with age in areas subjected to tooth wear but increase in areas that accumulate plaque . Dentine fluoride levels decline progressively from the pulpal surface to the dentine-enamel junction (DEJ). Enamel fluoride concentrations are highest at the surface and decline progressively toward the DEJ Bulk enamel (all the enamel from a tooth) fluoride concentrations mainly reflect the level of fluoride exposure during tooth formation, while dentine and bone fluoride concentrations are generally proportional to the long-term level of intake.

• Fluoride Excretion :

1. In Urine :-Fluoride is excreted primarily via urine. Fluoride is freely filtered through the glomerular capillaries and then undergoes a variable degree of tubular re-absorption. The percentage of the filtered fluoride reabsorbed from the renal tubules can range from about 10 to 90 percent. The degree of reabsorption depends largely on the pH of the tubular fluid, urinary flow and renal function.

Urinary fluoride clearance increases with urine pH due to a decrease in the concentration of HF. Among the halogens, the renal clearance of fluoride is unusually high. Numerous factors (e.g. diet and drugs) can affect urine pH and thus affect fluoride clearance and retention. The renal clearance of fluoride in the adult typically ranges from 30 to 50 ml/min, whereas clearance rates of the other halogens (chloride, iodide and bromide) are usually less than 1.0 ml/min. The excretion of fluoride in urine is reduced in individuals with impaired renal function.

2. In Feces:- It is generally accepted that most of the fluoride in the feces is not absorbed. Fluoride present in faeces results from two sources: the ingested fluoride that is not absorbed and the absorbed fluoride that is reexcreted into the gastrointestinal tract. Fecal fluoride usually accounts for less than 10 percent of the amount ingested each day.

3. In Sweat :-Usually, only a few percent of the fluoride intake is excreted in the sweat. However, under excessive sweating as much as 50 percent of the total fluoride excreted may be lost via perspiration.

4. In Saliva :- Less than 1 percent of absorbed fluoride is reported to appear in the saliva. The concentration of fluoride in saliva is about twothirds of the plasma fluoride concentration and seems to be independent of flow rate, in contrast to the situation for most electrolytes. In fact, saliva does not represent true excretion, because most of the fluoride will be recycled in the body. However, the fluoride content of the saliva is of major importance for maintaining a fluoride level in the oral cavity.

Lec-12- Community Dentistry

Fluoridation as a public health measure

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Sources of Fluoride :

- 1- Ground waters: water with high fluoride content are usually found at the foot of high mountains. All water contains fluorides in varying concentrations .As many of the minerals in the soil are soluble in water, fluoride is found in varying concentrations in the groundwater, Sea water contains significant quantities of fluoride at levels 0.8–1.4 mg/lt. In water from lakes, rivers, and artesian wells the fluoride content is usually below 0.5 mg /L although concentrations as high as 95 mg /L have been recorded in Tanzania. The highest natural fluoride concentration ever found in water was 2800 mg/L, recorded in Lake in Kenya. Rain water, Sea water &river water.
- 2- Atmosphere: fluoride originating from dust of fluoridecontaining soils from gaseous industrial waste, the burning of coal fires in populated areas and from gases emitted in areas of volcanic activity in nature. The principal source of pollution are industries and mining of phosphate and fluorspar, where fluoride rich dust travel long distances by wind and enter food chain by depositing on plants. Pesticides containing fluoride can have a similar effect. fluoride- containing soils and gas, underground coal fires and volcanic activities.
- 3- Food: present to some extent in nearly all foods. fluorides in the soil are absorbed by plants to a degree determined mostly by the type of plant and secondarily by the fluoride compounds in soil and the

moisture conditions. Plants are selective in the amount of fluoride they absorb. Certain foods contain more F than others, e.g. tea & some sea foods.

- 4- Drugs & fluoride-containing dental products: An increasing number of pharmaceutical products contain fluorides in organic and inorganic form. The products such as sodium fluoride tablets, vitamin pills, fluoride dentifrice, fluoride gels and solution are widely used for caries prevention.
- 5- Pollution: in vicinity of industries involved in production of aluminum from cryolit & phosphate fertilizers.

Goals of Fluoride (F) Administration

- 1. Do not harm the patient.
- 2. Prevent decay on intact dental surfaces.
- 3. Arrest active decay.
- 4. Remineralize decalcified tooth surfaces.

Methods of fluoride delivery

1. Systemic fluorides – circulates through blood stream & incorporated into developing teeth; low concentration of fluoride over long period of time (ex. Fluoridation – addition of fluoride to public water supplies)

2. Topical fluorides – placed directly on the teeth; high concentration of fluoride over short period of time (ex. dentifrices)

3. Both systemic & topical – ex. Oral rinse – swished for topical effect – swallowed for systemic effect.

Types of systemic fluorides:

1. Community water fluoridation.

- 2. School water fluoridation.
- 3. Salt fluoridation.
- 4. Milk fluoridation.
- 5. Fluoridated tablet.

1-Community water fluoridation: Water fluoridation is defined as "controlled adjustment of the concentration of fluoride in a communal water supply so as to achieve maximum caries reduction and clinically insignificant level of fluorosis". It can also be defined as "the upward adjustment of the concentration of fluoride in public water supply in such a way that the concentration of fluoride ion in the water may be consistently maintained at 1 parts per million (ppm) by weight to prevent dental caries with minimal possibility of causing dental fluorosis."

Advantages:

1. Most effective, practical, feasible and economical public health measure for preventing caries.–continuously

- 2. .large number of people are benefited.
- 3. consumption is regular

4. fluoridated drinking water not only acts systemically during tooth formation to make dental enamel more resistant to dental decay, but also has topical effect through the release in saliva after ingestion.

5. fluoridation of community water is the least expensive way to provide fluoride to a large group of people.

Disadvantages of water fluoridation:

- 1. interfere with human right
- 2. common source of water supply may not present
- 3. other modes are not considered

2.School Water Fluoridation: – Fluoridated with levels of three to seven times the optimum for communal water fluoridation resulting to reduction in caries incidence. The amount of fluoride added In school drinking water should be greater than normal must be between (2.2-5 ppm) because children have to stay in the school for a short period of time and to compensate for holidays and vacations. It is the suitable alternative where water fluoridation is not feasible. School water fluoridation is one of the possible areas to be explored. This programme helps in limiting caries in school children who are the prime concern.

Advantages :

1. There has been around 35 to 40 % decrease in dental caries with this program.

- 2. good results in reducing caries.
- 3. Minimal equipment.
- 4. Not expensive/person/year \$ 1.5.

5. Safe .

6. Accepted by child .

7. Technically feasible.

8. No effort required by children.

Disadvantages:

1. Children do not receive the benefit until they go to school.

2. Not all children go to the school in poor countries and towns and villages.

3. Amount of water drunk can"t be regulated.

3.Fluoridated salt: Salt fluoridation is a controlled addition of fluoride ,usually sodium or potassium fluoride ,during the manufacture of salt for human consumption.

Advantages:

1. Fluoridated salt is safe.

2. Theoretically fluoridated salt prevents dental caries by both systemic as well topical action.

3. It does not require community water supply as in case of water fluoridation.

4. It permits individual to accept it or reject it.

5. Low cost

6. Fluoridated salt and iodized salt can be made available to the population.

Disadvantages:

1. Fluoridated salt and iodized salt can be made available to the population. No precise control over indicated consumption, since salt intake varies greatly among people

2. Infants do not start administration from birth.

3. Less sodium (Na) intake to help control hypertension.

4. Milk fluoridation. Milk is a reasonable vehicle for fluoride since it is a food used universally by infants, pregnant women and children. Milk is an excellent source of calcium and phosphorous and when fortified with vitamin D, contains all essentials for the development of bones and teeth.

Advantage:

Staple food for children and infants.

Disadvantages

- 1. Cost of fluoridated milk would be considerably higher.
- 2. Centralized milk supply should exist.
- 3. Variation in intake and quantity of milk.

5. Fluoridated tablet. Fluoride tablets provide systemic effect before mineralization of primary and permanent dentition and a topical effect thereafter.

Advantages

- 1- Ready for use.
- 2- Requires a little time to dispense.

3- Some tablets have a flavour that enhances child motivation to participate in the daily ingestion of fluoride tablet.

	Concentration of Fluoride in Water (ppm)							
Age	<0.3	0.3-0.7	>0.7					
6 mo–3 yr	0.25	_	_					
3-6 yr	0.50	0.25	_					
6-16 yr	1.00	0.50	-					

Topical Fluorides

Topical fluoride therapy refers to the use of systems containing relatively large, concentrations of fluoride that are applied locally, or topically, to erupted tooth surfaces to prevent the formation of dental caries.

Advantages of topical fluoride:

- 1. Does not cause fluorosis.
- 2. Cariostatic for people of all ages.
- 3. Available only to people who desire it.
- 4. Easy to use.

Disadvantages of topical fluoride:

- 1. Person must remember to use
- 2. High cost compared to water fluoridation.

3.More concentrated professional use products can cause short-term side effects like nausea immediately after use.

The efficacy of topical fluoride depends on:

- a. The concentration of fluoride used.
- b. The frequency with which it is applied and the duration of application.
- c. The specific fluoride compound used.

Topical Fluoride administration could be applied through:

1. Those applied by professional.

- a. Topical solutions and gels.
- b. Fluoride containing varnishes.
- c. Fluoride prophylaxis paste.
- d. Restorative materials containing fluoride.
- e. Fluoride containing devices (Slow Release).

2. Self applied fluoride agents.

- a. Fluoride dentifrices.
- b. Fluoride rinses.
- c. Fluoride gels.

Fluorides Applied by Dentist/Professionally

- A. Aqueous solutions:-
- Sodium fluoride 2 %
- Stannous fluoride 8%

B. Fluoride Gels:

• Acidulated phosphate fluoride - 1.23 %

Application:

- **4** Teeth are cleaned first (scaling and polishing).
- **4** Teeth are isolated using cotton roll and saliva ejector.
- The head of the patient tilted forward to avoid accidental swallowing of the materials.
- These can be applied using special tray. Applied for 1 or 4 minutes, then expectorate
- Patients advised not to rinse by water or eat or drink for at least
 30 minutes.

C. Fluoride varnishes

Fluoride varnish is a thin coating of resin that is applied to the tooth surface to protect it from decay. The fluoride coating will work best if it is painted on the teeth 3-4 times a year.

Indication: Infants and children with a moderate or high risk of developing cavities.

Contraindications: Children with a low risk of cavity formation who consume optimally fluoridated water or children who receive routine fluoride treatments through a dental office

Applications: (better in afternoon)

1. Clean teeth by rotating brush or tooth brush.

2. Isolate the teeth and keep them dry.

3. Applied a thin layer of the varnish immediately with cotton swab or small brush, painting and dapping repeatedly until whole surface of teeth covered in one minute.

4. Once the varnish is applied, you need not worry about moisture (saliva) because the varnish hardens in saliva and they continue to adhere to the treated sites.

5. Instruct patient to take fluid food for 12 hours, not brush during this period.

6. The varnish then removed by brushing with tooth brush after duration of action of varnish end

E. Restorative materials containing fluoride (composite resin).

F. Fluoride containing devices (slow release).

2-Self-Applied

- Fluoride dentifrices
- Fluoride mouth rinses.

• Fluoride gels.

Community Dentistry

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Side effects of fluoride:

Fluorosis which affects the teeth and bones. Moderate amounts lead to dental effects, but long-term ingestion of large amounts can lead to potentially severe skeletal problems. Paradoxically, low levels of fluoride intake help to prevent dental caries. The dental effects of fluorosis develop much earlier than the skeletal effects in people exposed to large amounts of fluoride.Fluoride is a hazardous substance when large doses are taken acutely or when lower doses are taken chronically, it could cause:

Fluoride Toxicity

The term toxicity refers to the symptoms manifested as a result of over dosage or excessive administration.

Acute toxicity: Due to single ingestion of large amounts of fluoride. Chronic toxicity: Due to long-term ingestion of smaller amounts.

Acute Fluoride Toxicity :The acute lethal dose of fluoride for man = 34– 64 mg F/kg body wt, that is probably 5g. The probable range is 2-10 g. Acute fluoride intoxication is rare and is not well described as the chronic intoxication. A lethal dose is the amount of drug likely to cause death. Acute fluoride poisoning have been recorded as a result of accidents or attempts to suicide.

Symptoms:

- Vomiting, nausea, diarrhea
- Pain abdomen extremities.
- Difficulty in speech.
- Thirst
- Perspiration.
- Weak pulse .
- Coma .
- Convulsions.
- Cardiac arrhythmia \rightarrow death.

Death will occur within 4 hours. If the patient survives for 24 hours, the prognosis is good.

Pathological Changes

- Corrosive changes in the mouth, throat, esophagus, and stomach.
- Haemorrhagic stomach contents.
- Changes in the duodenum, small intestine, and large intestine.

Treatment

• Milk or egg can be given: This serves 2 purposes:

a) Protects upper gastrointestinal tract from chemical burns. b) Provides calcium that acts as a binder for fluoride.

- Lime water.
- Aluminium hydroxide gels.
- Vomiting Majority of ingested fluoride is expelled.

In the hospital

- Cardiac monitoring.
- Gastric lavage.
- Oral or IV calcium gluconate (10 ml of 10%).
- Urine output to be maintained.
- General supportive measures.

Chronic Fluoride Toxicity

- 1. On Enamel :The influence of chronic fluorine intoxication on the structure of enamel during tooth formation is the development of mottled enamel (dental fluorosis) which is a developmental hypoplastic enamel defect occur due to excessive use of fluoride "Characterized by minute white flecks, yellow or brown spot areas, scattered irregularly over the tooth surface". Fluorosis occurs symmetrically with in dental arches. Permanent teeth are particularly affected, while occasional mottling of primary teeth may be seen due to
 - Shorter maturation period; in addition enamel maturation and calcification of primary teeth take place in the intra uterine life.

• Placenta regulates the amount of F reaching to the fetus where F concentrated in bones of the mother and the fetus more than teeth.

Treatment of Mottled Teeth:

- Milder forms diminish with time.
- Removing minor stains by grinding or polishing and etching by acid.
- Bleaching with H2O2.
- Use of composite.
- Use of veneers and crowns.

2. On Skeletal System

Clinical features

• Vague pains in small joints of hand and feet, knee joints, joints in the spine.

- Stiffness of spine.
- Difficulty in walking.
- Rigidity of thoracic cage (dyspnea).

Radiographic

Features Stage

Stage 1:: Spinal column and pelvis show roughening and blurring of trabecule.

Stage 2: Trabecule are merge together and bone has a diffuse structure.

Stage 3: Bone appears as marble white shadows.

Variables Affecting Prevalence and Severity of Dental Fluorosis:

1. Fluoride concentration in drinking water: When fluoride concentration in drinking water increase lead to increase in dental fluorosis.

2. Total amount of fluoride ingested: Which include amount of fluoride in water, food, drugs, dentifrices.....etc.

3. Temperature: Water requirement increase in hot temperature which increase possibility of fluorosis. Studies showed that there are more dental fluorosis in tropical climate than temperate climate.

4. Duration of exposure: Fluorosis increased with the longer time teeth are exposed to fluoride. So the teeth erupt earlier in life develop less dental fluorosis this explain why posterior teeth like premolar, 2nd molar and also 3rd molar are effected more than anterior except for the 1st molar. In other words, teeth mineralized early in life develop less dental fluorosis, for the same reason dental fluorosis in primary teeth is less than in permanent, this is because:

Have short period of enamel maturation (before erupt).

4 Calcification start before birth and placenta act as barrier.

5. Malnutrition: In some studies showed that malnourished children develop more dental fluorosis than well-nourished and it is still not well understood.
Dental fluorosis index Dean's Index – 1934 Dean's:

Normal 0: The enamel surface is smooth, glossy and usually a pale creamy-white color.

Dean's 1 Questionable: The enamel shows slight aberrations from the translucency of normal enamel, which may range which may range from a few white flecks to occasional spots.

Dean's 2 Very mild: Small opaque white area scattered irregularly over the tooth, but not involving more than 25% of the tooth surface, for posterior teeth it is an area of 1 - 2 mm white opaque area at the tips of the cusps of molars and premolars.

Dean's 3 Mild: We have white opaque area in the enamel more extensive than for code 2 but involving not more than 50% of the tooth surface.

Dean's 4 Moderate: All enamel surface are effected, surfaces are subjected to attrition, it showed there is a marked wear brown stain.

Dean's 5 Severe: When the all enamel surface are badly affected and the hypoplasia is so marked that the general form of the tooth may be affected, There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance.

Code 6 : All 4 anterior teeth absent.



Enamel Mottling by AL – Alousi et al . (1975)

Selection of teeth and scoring: Labial surface of permanent incisor teeth. Calculation of the prevalence of different types of opacities in both individual and teeth.

Diagnosis and criteria:

Type A : White area less than 2 mm in diameter.

Type B: White area of , or greater than 2 mm in diameter. 6

Type C : Colourd (brown) area less than 2 mm in diameter, irrespective of there being white area.

Type D: Colourd (brown) area of, or greater than 2 mm in diameter, irrespective of there being any white area.

Type E : Horizontal white lines , irrespective of there being any white non-linear lines.

Type F: Colourd (brown) or White area or lines associated with pits or hypoplastic area .

Simplified Fluoride Mottling Index (FMI) (1985):

Selection of teeth: Only facial surfaces of the six upper and lower anterior teeth are examined which are esthetically important.

Criteria:

- 0. No involvement of facial surface.
- 1. Less than one third of the facial surface show evidence of lesion.
- 2. About 1/3 but less than 2/3 of the surface affected.
- 3. Over 2/3 of facial surface involved.
- 4. Brownish, black discoloration of entire facial surface.

Community Dentistry

Infection Control

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In utero the oral cavity is sterile but after birth within a few hours to 1 day a simple oral flora develops. As the infant grows, there is continuing introduction of microorganisms normal for an adult oral cavity. Most of the salivary bacteria come from the dorsum of the tongue, but some are from other mucous membranes. Much higher counts of microorganisms are found in bacterial plaque, periodontal pockets and carious lesions than in saliva. The intact mucous membrane of the oral cavity protects against infection to a degree. However, when the gingival tissues are inflamed and are manipulated during instrumentation, microorganisms can be introduced into the underlying tissues by way of the gingival sulcus or periodontal pocket.

The infectious process: A chain of events is required for the spread of an infectious agent.

Infection Control : It refers to a comprehensive and systemic program that, when applied prevents the transmission of infectious agents among persons who are in direct or indirect contact with the health care environment.

Why is Infection Control Important in Dentistry?

• Both patients and dental health care personnel (DHCP) can be exposed to pathogens .

• Contact with blood, oral and respiratory secretions, and contaminated equipment occurs .

• Proper procedures can prevent transmission of infections among patients and DHCP.

The principles of infection control are:

1. Stay healthy: This principle emphasizes the need for dental personnel to be and stay healthy. Strategies include immunizations; post exposure management and medical follow-up by a qualified health care professional; routine hand hygiene procedures; and maintaining hand health.

2. Avoid contact with blood and body fluids: The primary methods to avoid contact with blood and other potentially infectious materials are—handle sharp instruments with care, use safety devices when appropriate, correctly manage occupational exposures to blood, and wear personal protective equipment (PPE) (gloves, protective clothing, and face and eye protection).

3. Limit the spread of contamination: This principle is accomplished by— covering surfaces using surface barriers or cleaning and disinfecting surfaces that are likely to become contaminated; minimizing sprays and splashes to reduce contamination (high volume evacuation, dental dams); and properly disposing of medical waste.

4. Make objects safe for use: The primary methods to make objects safe for use are—cleaning and heat sterilizing patient care items that contact bone, enter previously sterile tissues, or touch mucous membranes before use; monitoring sterilization processes; and following manufacturer's instructions for use and sterilization.

Transmission Of Infection

The two principle modes of disease transmission in which infectious diseases are acquired in dentistry are:

1. Contact

a. Direct contact: Human-human touch. Contact with microorganisms at the source.

b. Indirect contact: Human-object/animal-human touch. Contact with contaminated items such as surfaces especially dental office equipment and/or instruments including contaminated sharps.

2. Droplet Infection

a. Splatter of blood, saliva or nasal secretions onto broken mucosa or skin.

b. Airborne by aerosols of microbes.

The three principle routes of entry of microorganisms into the body are:

1. Inhalation

a. Direct inhalation: Inhalation of small particles of moisture (spatter) generated when a person coughs or sneezes, or when water is aerosolized to a fine mist during dental procedures. Risk of disease transmission is usually limited to persons in close proximity to the droplet source.

b. Indirect inhalation: Inhalation of particles.

2. Ingestion: Whereby droplets of saliva/blood or particles from instruments are swallowed.

3. Autoinoculation/percutaneous injury: Autoinoculation occurs as a result of the operator touching his/her own mucous membrane or nonintact skin surface with contaminated patient care items or contaminated personal protective barriers. Percutaneous injuries are those that occur as a result of breaking the skin especially with a contaminated sharp instrument.

Components Of Infection Control

- 1. Immunization.
- 2. Patient screening.
- 3. Hand hygiene.
- 4. Barrier techniques.
- 5. Needle and sharp instrument safety.
- 6. Instrument sterilization and disinfection.
- 7. Surface disinfection and general operatory asepsis.
- 8. Radiographic asepsis.
- 9. Laboratory asepsis.
- 10. Disposal of contaminated wastes.

Basic infection control procedures :

1. Personal barrier techniques:

A-Hand Hygiene:- Hand hygiene in health care facilities is the most important aseptic procedure in the prevention of health care associated

infections. Hand hygiene significantly reduces microbes on the hands and protects both patients and the dental staff.

Handwashing products include plain soap and agents with antimicrobial activity. The wearing of gloves does not replace handwashing, but is an adjunct providing consistent protection from blood-borne pathogens. Hand hygiene is important because:

• Hands are the most common mode of pathogen transmission.

• Reduce spread of antimicrobial resistance.

• Prevent health care associated infections.

B-Gloves :-Gloves used for:

1. Protect the dental team members from direct contact with patient microbes.

2. Protect patients from contact with microbes on the hands of the dental team members.

Gloves should be:

1. Changed between patients and are not to be washed with detergents at any time.

2. Torn or punctured gloves should be removed as soon as possible .

C-Masks:- Facemasks should be worn to \rightarrow

1. Prevent spatter from patients' mouths or splashes of contaminated solutions and chemicals from contacting the mucous membranes of the mouth and nose.

2. The reduction in the inhalation of airborne particles .

D-Eyewear:

► The eyes due to limited vascularity and lower immune abilities are susceptible to macroscopic and microscopic injury(risk from the herpes simplex virus and hepatitis .

▶ Protective eyewear should be available to the patients as well as the dental personnel. The supine position 'renders the patient susceptible to falling objects in the head and neck area.

► All protective eyewear should be cleansed after every appointment. Eyewear should be washed with soap first, then rinsed with water and a surface disinfectant can be used later.

D-Protective clothing :- Protective clothing is the outer layer or covering of garments that would first be contacted by the contaminating droplets, generating sprays, splatter, splashes or spills of body fluids, contaminated solutions or chemicals. This protection can be provided by high neck, long sleeve, knee length garments.

2.Immunization :All dental health care workers should be Immunized by taken a vaccine against the most prevalent infectious disease because they are at risk of infection.

3.Medical history of patient: Complete screening of patient medical history must be taken.

4. Intraoral Barrier Technique:

1. Rubber dam . It should be used whenever possible for improved vision and access and to reduce dental personnel's exposure to microorganisms in patient's blood and saliva.

2. Pre-procedural mouthrinse Patient's use of an antimicrobial mouthwash of 0.12 percent chlorhexidine gluconate solution for 30 seconds prior to intraoral procedures reduces the number of viable oral organisms.

Instrument processing(sterilization of instruments):-

Instrument processing involves:

A- Presoaking and cleaning.

• Presoaking of contaminated instruments keeps them wet until a thorough cleaning can occur. This procedure prevents blood and saliva from drying on the instruments and facilitates cleaning of instrument which is achieved by;

•Hand scrubbing of contaminated instruments.

•Ultrasonic cleaning is a mechanical cleaning system that reduces handling of contaminated instruments and has been shown to be effective in removing dried blood and saliva.

B- Packaging : After cleaned instruments have been rinsed and dried, they are to be packaged in functional sets before sterilization.

C-Sterilization.

- Sterilization: It is a process of removing or killing all viable micro-organism including substaintial No. of resistant bacterial spores using physical &chemical procedure.
- Disinfection: It is a process of removing or killing most, but not all, viable organism (e.g bacterial spores) using physical &chemical procedure.
- Sanitization: The process of removing organic debris in order that disinfection can occur.
- **Bacteriostatic:** An agent that will inhibit increases in the number of bacteria.
- **Bactericidal:** An agent that will destroy (kill (bacteria, fungi or viruses.

D-Drying, cooling, storage and distribution of instruments.

•Drying \rightarrow Instrument packages sterilized in steam become wet and must be allowed to dry before handling so that the packages do not tear.

• Cooling \rightarrow of warm packages must be done slowly to avoid formation of condensation on the instruments. Using fans to cool down items should also be avoided as, it causes undue circulation of potentially contaminated air around the packs.

•Storage \rightarrow sterile instrument packages are stored in a cool, dry, protected area, up off the floor, a few inches away from the walls and ceilings and away from sinks, heat sources, and overhead pipes.

• Use of disposables For patients :

Using of disposable items to prevent patient-to-patient crosscontamination Numerous disposable items are available in dentistry which include : Gloves, masks, gowns, surface covers, patient bibs, saliva ejector tips, air water syringe tips, high volume evacuator tips, prophylaxis angles, prophylaxis cups, some instruments, impression trays, fluoride gel trays and high speed hand pieces.

• Asepsis of Operatory Surfaces:

It is essential to maintain a "disinfected environment" within the working area. There are two general approaches to surface asepsis :

1. To clean and disinfect contaminated surfaces.

2. To prevent the surface from becoming contaminated by the use of surface covers. Environmental cleaning Contaminated worktops must be disinfected between patients. The surgery (dental chair, dental unit, worktops and floors) must be thoroughly cleaned at least every day and more frequently if there is obvious contamination. All cleaning agents must be used in accordance with the manufacturer's instructions.

Dental auxiliary or ancillary

Community dentistry م مريم رعد



• The term Dental Team is used to identify the persons who provide dental care, all of whom perform different roles and function. They undergo different training and work together to provide care to dental patients.

A dental auxiliary or ancillary:

Is a person who is given responsibility by a dentist so that he or she can help the dentist render dental care, but who is not himself or herself qualified with a dental degree. A dentist is a person licensed to practice dentistry under the law of the appropriate state.



The need for dentist and dental auxiliary (personal) is depending on many factors which are:

1.Rate of population growth.

2. Types of healthcare systems that evolve.

3. Economic developments.

4. Consumers demands, governmental action will all be major factors in shaping the future of the dental care system. or nation. World Health Organization (WHO) can classify dental auxiliary according to:

a. The training they have received.

b. The task they are expected to undertake.

c. Legal restrictions placed upon them.

Classification

1. Non-Operating Auxiliary

1- Clinical: This is a person who assists the professional in his clinical work but does not carry out any independent procedures in the oral cavity.

a. Dental surgery assistant.

b. Dental secretary/receptionist.

c. Dental health educator.

2-Laboratory: This is a person who assists the professional by carrying out certain technical laboratory procedures.

- Dental laboratory technician



2. <u>Operating Auxiliary</u>: This is a person who, not being a professional is permitted to carry out certain treatment procedures in the mouth under the direction and supervision of a professional.

a. School dental nurse.

b. Dental therapist.

c. Dental hygienist.

d. Expanded function dental ancillaries.

1. Non-Operating Auxiliary.

a. Dental Surgery Assistant:- The dental assistants are assisting the dentist in performing certain tasks which are non-technical in nature and do not require any or much training.





1. Sterilization care and preparation of instruments.

2. Reception of the patient.

3. Preparation of the patient for any treatment he or she may need.

4. Preparation and provision of all necessary facilities such as mouthwashes and napkins.

5. Preparation and mixing of restorative materials including both fillings and impression materials.

6. Preparation of the surgery for next patient.

7. Presentation of documents to the surgeon for his completion and filing of these.

8. After care of persons who have had general anesthetic.

9. Assistance with X-ray work and the processing and mounting of X-rays.

10. Instruction of the patient, where necessary, in the correct use of the toothbrush.

11. Care of the patient after treatment until he or she leaves, including clearing away of instruments and preparation of instruments for reuse. *b. Dental Secretary/Receptionist* :- This is a person who assists the dentist with his secretarial work and patient reception duties.

c. The Dental Health Educator:- is a person who instructs in the prevention of dental disease and who may also be permitted to apply preventive agents intraorally.



Dental Laboratory Technician

A non-operating auxiliary who fulfills the prescriptions provided by dentists regarding the extra oral construction and repair of oral appliances and bridgework. This category of personnel have also been known as dental mechanics. The functions of dental technician in addition to the casting of models from impression made by dentists, include the fabrication of dentures, splints, orthodontic

appliances, inlays, crowns and special trays.



Denturist: is a term applied to those dental lab technicians who are permitted in some states in the US and elsewhere to fabricate dentures directly for patients without a dentist's prescription. That is, if the patient is in need of a denture, the process of fabricating a denture, from the impression onwards, is done by the technician in direct relationship with the patient.

Services provided by a denturist include:

- Examinations and consultations including checking your medical and dental history, analyzing your oral cavity, and examining the hard and soft tissues of your mouth to determine your denture requirements accurately.
- Complete upper and lower dentures to replace all missing teeth.
- Partial dentures to replace a few lost teeth in the lower or upper arch to fill the spaces left by the missing teeth and protect your remaining teeth.

- Immediate dentures to help in the healing process while your permanent dentures are being made.
- Denture implants support and provide a foundation for your partial or full dentures.
- Repairing and relining dentures as required.



OPERATING ANCILLARY

Community Dentistry

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2. <u>Operating Auxiliary</u>: This is a person who, not being a professional is permitted to carry out certain treatment procedures in the mouth under the direction and supervision of a professional.

a. School dental nurse.

b. Dental therapist.

c. Dental hygienist.

d. Expanded function dental ancillaries.

a. School Dental Nurse :-

School dental nurse is a person who is permitted to diagnose dental disease and to plan and carry out certain specified preventive and treatment measure, including some operative procedures in the treatment of dental caries and periodontal disease in defined groups of people, usually schoolchildren.

They are expected to provide care for the children at nearly 6-month intervals. They are under general supervision of a district principal dental officer. The training is for a period of two years.



The duties of the school dental nurses :-

- 1. Oral examination.
- 2. Prophylaxis.
- 3. Topical fluoride application.



- 4. Advice on dietary fluoride supplements.
- 5. Administration of local anaesthesia.
- 6. Cavity preparation and placement of amalgam filling in primary and permanent teeth.



8. Extraction of primary teeth.

9. Individual patient instruction in tooth brushing and oral hygiene.

10. Classroom and parent - teacher dental health education.

11. Referral of patient to private practitioners for more complex services, such as extraction of permanent teeth, restoration of fractured permanent incisors and orthodontic treatment.
b. The Rental Therapist:-

This is a person who is permitted to carry out to the

prescription of a supervising dentist, certain specified

preventive and treatment measures including the preparation of

cavities and restoration of teeth. The training is for a period of

two years..

Their training includes :

- 1. Clinical caries diagnosis.
- 2. Technique of cavity preparation in deciduous and permanent teeth.
- 3. Material handling and restorative skills.
- 4. Vital pulpotomies under rubber dam in deciduous teeth.
- 5. Extraction of deciduous teeth under local anesthesia.

They have a little training in interpretation of X-rays.

They are not trained to provide endodontic care. The

dental therapists are widely used in the public dental

service.



c . *Dental Hygienist* :-A dental hygienist is an operating auxiliary licensed and registered to practice dental hygiene under the laws of the appropriate state or nation. The dental hygienists work under the supervision of dentists.



The usual functions of dental hygienists are:

1.Cleaning of mouths and teeth with particular attention to calculus and stains.

2.Topical application of fluorides, sealants, and other prophylactic solutions.





3.Screening or preliminary examination of patients as individuals or in group (school children or industrial employees) so that they may be referred to dentists for treatment.

4. Instruction in oral hygiene.

5. Resource work in the field of dental health.

d.Expanded Functions Dental Auxiliary:-

EFDA is a dental assistant, or a dental hygienist in some cases, who has received further training in duties related to the direct treatment of patients, though still working under direct supervision of a dentist.

Duties of dental assistant in extended function:

1. Retraction of gingiva.

2. Impressions for cast restoration, space maintainers, orthodontic appliances.

3. Etching of teeth.

4. Determine root length and fitting of trial endodontic filling points.

5. Pit and fissure sealants.

Duties of dental hygienist in extended

function:-

- 1. Retraction of gingiva.
- 2. Temporary stabilization procedures.
 - 3. Debridement of the periodontal surgical site.
 - 4. Suture placement.

5. Impressions for cast restoration, space maintainers, orthodontic appliances.



Four handed relationship: the term is given on art of seating both the dentist and the dental assistant in such away that both are within easy reach of the patient's mouth .the patient is in a fully supine position, the assistant will hand the dentist, particular instrument he needs, in addition to retraction and aspiration. This will decrease the fatigue of dentist and increase FOUR HANDED DENTISTRY efficiency.





DENTAL HEALTH EDUCATION

Community Dentistry

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● Health Education is a process that informs,
motivates, and helps people to adopt and
maintain healthy practices and life style. dental
professional's play important role in promoting
oral health through health education.

It is therefore important that dental health professionals understand the principles of health education and the most effective ways of delivering it within clinical settings. It is very important that the health education messages given to the public are consistent and scientifically correct.

Education involves the transfer of knowledge and skills from the educator to the student or learner, and through which an individual informs and orients himself to develop skills and intelligent action.



WHO define health education" It is concerned with change in knowledge, attitude and behavior of people. It concentrated on developing such health practices as are believed to bring about the best possible stat of well being".

• **Knowledge**: It is the information given about oral health and how to get benefit from it.



• Attitude: It is changing in the believes that should influence to change the behaviour effectively.



• **Behaviour**: Voluntary movements and purpose acts arising out of decisions taking by individual. Information, motivation and guidance are the objectives of health education in behaviour changing.



Aims of Health Education:

1. To inform the general public of hygiene principles and methods at both individual and community level of preventing illness.

2. To create an informed body of knowledge among the community leaders such as teachers, social and health workers.

3. To facilitate the acceptance and proper usage of the medical and medico social measures available for the benefit of the community.

Objective of Health Education:

• Informing people→ the first objective of health education is to inform people about prevention of disease and promotion of health.

• Motivating people→ informing of people is not enough , they must be motivated to change their habits and ways of living, also human behavior alteration which are detrimental to health e.g. water pollution, drug addiction,..etc.

• Guiding into action→ encouraging of people to wisely use the health services and facilities available to them, in order to improve the health status.

Objective of Dental Health Education:

- To review the dental health education status in relation to high priority dental need and problems.
- To develop broad guidelines for planning and evaluating dental health education programmes.
- To consider needs for manpower, facilities and research in dental health education.

Health education principles:

- Interest : If the programs and topics of health education not interest to the listeners(people), it will fail to guide the people to goal (improve health education).
- Participation of people in health education programmes should be encouraged by health educator.
- * Known to unknown: the educator should start in health programme where the people are and with what they understand and then give the new knowledge.

Comprehension: It is refers to the level of understanding, education and literacy of people to whom the teaching is directed.

* **Reinforcement:** It is the repetition in health education in different ways, people are more likely remember it.

- Learning by doing: learning of health education by doing the new practice not only by hearing and seeing.
- Soil, Seed and Sower: the people is the soil, the health facts the seed and transmitting media of health programs the sower.
- Good humen relation: it is the sharing of information, ideas and feelings between health educator and people.
- Community leaders: leaders are agents of change and they can be used in health education work to educate people as they understands the needs and demands of the community (ex. Teacher).

The most dental problems need education are :

- Dental caries and periodontal diseases.
- 4 Trauma.
- Tumors in oral cavity.
- Misalignments of teeth and dentofacial anomalies.
- Oral manifestation of systemic disease.

Dental health education should be done by:

• Dentists : they are the most important educators for all dental health programme in their clinics or dentistry institution.

• Dental auxiliaries: training of dental assistant and dental hygienist to get practical experience in a variety of educational procedure.

• Leaders in any communities also aids in dental health education ex. Teachers in schools.

Educational Aids:

1. Auditory aids: radio, microphones, amplifiers.



2. Visual aids: chalk board, posters, photographs, specimen etc..





3. Combined Audio- Visual aids: television, multimedia computer, DVD-CD players





Planning a health education programme

1. Background information: collection of data about the

- a. Epidemiology of disease.
- b. Etiology of disease.
- c. Effective control factors.

2. Target population: their knowledge , attitude, literacy.

3. Facilities.

- 4. Developing programme plan.
- 5. Operation of programme.
- 6. Programme evalution.
- 7. Follow up.





Biostatistics

Community dentistry



Statistics: It's a method of describing, summarizing or displaying a set of data.


Biostatistics: is the branch of statistics responsible for the proper interpretation of **scientific data generated** in clinical medicine, biology, public health and other health sciences (i.e., the biomedical sciences). Biostatisticians use mathematics to enhance science and bridge the gap between theory and practice

Use of statistics in dentistry:-

-To assess the state of oral health (define & quantify the diseases) in the community and to determine the availability & utilization of dental care facilities.

-To indicate the basic factors and causation of oral diseases by diagnosing the community & solutions to such problems.

- -To plan oral health measures.
- -To determine success or failure (evaluate) of specific oral health care program or measures
- specific oral health care program or measures.
- -For comparison & researches.

Population: The whole collection of individuals that one intends to study.



Sample: representative part of the population, makes by Randomization.



Data: are any information can be collected like:
age, gender, height & weight...etc.

Variable: It is an attribute that describes a person, place, thing or phenomenon which can

take different values.



Types of data:-

1) Numerical Data (Quantitative Data) :-The variable describe the characteristic of individuals quantitatively.

Divided into :-

A-Continuous data:- A continuous variable is a random variable that can take on a range of values on a continuum; its range is uncountably infinite.

• For example:- treatment time, pocket depth, amount of new bone deposition

B- Discrete data : A discrete variable is a random variable that can take on a finite number of values or a countably infinite number of values.

For example:- the number of teeth with restorations, the number of patients with premalignant lesions, the number of patients requiring ART.

2) Categorical Data (Qualitative Data):- The variable describe the category of individuals according to a characteristic of individuals.

Divided into:-

A-Nominal.

B- Ordinal.



Data presentation :-

The collection of numerical information often leads to large masses of data which, if they are to be understood, or presented effectively, must be summarised and analysed in some way. • This is the purpose of the subject of "Statistics". Various methods are seen in presentation of data but the most common are tabular and graphical methods.

1-The Tabulation of Data:-

The presentation of data in form of table is called tabulation.

4 Simple tables.

Frequency distribution table.

2-The graphical representation of data:-

Graphical representation is the visual display of data using plots and diagrams or charts. Graphs are used to better understanding of data and make trends in data easy to see .There are different types of graphical representation and which is used depends on the nature of the data and the nature of the statistical results.

Disadvantages:-

• Lots of details of the original data may be lost

in charts and diagrams



Advantages Diagrams:-

- Are better retained in the memory than statistical tables.
- If the diagrams are drawn simple, the impact on the reader is much higher.

a-Histogram: A "histogram" is a diagram consists of a collection of rectangles whose height represents the class frequency and whose extent represents the class width. This type of graph is used with quantitative data. No gaps between the bars, the classes with greater frequencies have taller bars.



b-Bar graph: the variable is plotted in the form of bars. A bar graph will have two axes, one axis will describe the types of categories being compared and the other will have numerical values that represent the values of the data. So the height of the bar is equal to the frequencies or percentage. It is used for qualitative type of data. Bars can be plotted horizontally or vertically.

1-Simple bar graph: It represents only one

variable.



2-**Multible bar graph**: used for data which are made of two or more components, different color is given for each component.



Chart 5.2.4 Campbell High Triathlon, percentage of time spent on each event, by competitor



c-The Frequency Polygon: Using the fact that each class interval may be represented by its class midpoint, we may plot the class mid-points against the class frequencies to obtain a display of single points so it is an area diagram of frequency distribution over a histogram, obtained by joining the mid points of the histogram block.



d- Pie Diagram: Pie charts are used to show the contribution of each item to the whole in which graphical description of data as slices of a pie and the total represents the complete pie. The values are commonly given as a percent or a proportion. It is used for qualitative type of data



e-Line Graphs: Line graph is a graph that uses line segments to connect data points and shows changes in data over time. Each quantitative data value becomes a dot or point that is placed above the appropriate class values.



g-Statistical maps or dot map : It is used when statistical data refers to geographic or regional distribution of a variable. The areas are shaded with different color and used to present data of varying size.



