

# Community Dentistry

## Lec. 1

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### Dental public health

**public health:** is the health of people (Efforts organized by society to protect, enhance and promote the health of the population).

**Dental public health:** The Science and practice of preventing oral diseases, promoting oral health and improving quality of life through the organized efforts of society.

**Dental public health:** Is the science & art of preventing & controlling dental diseases and promoting dental health through organized community.

It is that form of dental practice which serves a community as the patient rather than the individual.

### Dental Public Health Concerns

- ✱ Dental health education and motivation of the public
- ✱ Applied dental research( conducting field programs and research activities for dental students, dental professional)
- ✱ Administration of programs(promotion oral health programs as school dental health program)
- ✱ Prevention & control of dental diseases on a community basis (preventive measures such as water fluoridation)

### Factors Affecting Dental Health

Access to Care

- 1- Restriction of dental hygiene services
- 2- Shortage of Medicaid providers
- 3- Financial Situations
- 4-Transportation



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### Government Role

- Research
- Disease Prevention
- Disease Control
- Program Planning and Operation
- Funding for the Education of Dental Professionals
- Regulation

### Dental public health tools:

- 1- Epidemiology: study distribution and determinant of health related events in population. It is a branch of medical science dealing with epidemic.
- 2- Biostatistics: It is of statistic (the science of compiling, classifying and tabulating numerical data and expressing the results in a mathematical or graphical form. Biostatistics is concerned with mathematical fact and data related to the biological events.
- 3- Social Science: usually include sociology, culture anthropology and psychology.
- 4- Principle of administration: In public health program the dentist with a leadership role needs to know many of principles:
  - a-Organization
  - b-Management
- 5- Preventive Dentistry: It is procedure employed in the practice of dentistry and community dental health programs to prevent oral disease and abnormalities. Including three levels of prevention:
  - a- Primary prevention: (pre pathogenic stage) prevent the occurrence of the disease(health education, water fluoridation, immunization)
  - b- Secondary Prevention⊗(early pathogenic stage) prevent the prognosis and recurrence of disease by diagnosis and treatment of it.
  - c- Tertiary Prevention: ( pathogenic stage) restore the function, esthetic



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### Procedural steps in dental public health

1. Survey
2. Analysis
3. Program planning
4. Program operation
5. Financing
6. Program appraisal

#### 1. Survey

- based on chief complaint of the population
- surveys are methods for collection of data analyzing and evaluating them in order to determine the amount of disease problems in a community
- parameters included in survey:
  - assessment of socio-economic status of community
  - nature of distribution of community
  - resources available for elimination of problem
  - attitudes of community towards health providers

#### 2. Analysis

- to define characteristics of specific health problems in the community
- electronic data processing medias such as computers are resorted for analyzing data

#### 3. Program planning

- designed programme should be accepted by the community and the people should show an interest in it.
- it has to be sure that the community is well informed about the program and that they participate in all steps involved



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4. Program operation
  - a public health team constituting professionals in various disciplines
  - employed for executing the program
    - e.g.: water fluoridation in a community with higher prevalence of dental caries
  
5. Financing
  - through funds provided by the governments / by local or state authorities
  - public health personnel
    - identify source for securing funds
    - plan for the management of same
  
6. Program appraisal
  - effectiveness of program is assessed
  - dimensions: efficiency
    - appropriateness
    - adequacy
    - possible side effects



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### SIMILARITIES BETWEEN PERSONAL AND COMMUNITY HEALTH CARE

#### PATIENT

1. Examination
2. Diagnosis
3. Treatment planning
4. Treatment
5. Payment for service
6. Evaluation

#### COMMUNITY

1. Survey
2. Analysis
3. Program planning
4. Program operation
5. Finance
6. Approval

### DIFFERENCES BETWEEN PRIVATE DENTAL PRACTICE AND PUBLIC HEALTH DENTISTRY

Characteristic	Private Dental Practice	Public Health Dentistry
Target	Individual patient	community or group of individuals
Collection of information	History taking and oral clinical examination	Analysis of available health and morbidity records
Special investigations	Diagnosis	Situational analysis of oral health status and needs and utilization of services
Requirements for success	Patient's consent and co-operation	Community Participation
Service provider	Dentist alone, sometimes with an assistant	Health team professionals and para professionals, community volunteers
Evaluation & Results	Relief of symptoms and restoration of function	Formal programme evaluation



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Funding	Generally by the patient	Generally by Government or Local authorities
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## Epidemiology

### Epidemiology

- Epi = upon
- Demos = people
- Ology = science
- Epidemiology = the science which deals with what falls upon people
- Bridge between biomedical, social and behavioral sciences

**Epidemiology:** is the study of distribution and determinant of health-related state or event in a specified human population and the application of this study to the control of health problem.

- Epidemiology is the study of the determinants, distribution, and frequency of disease.
- Who gets disease and why?
- Epidemiologists study sick and well people to determine the crucial difference between those who get disease and those who are spared

### Uses of Epidemiology

- 1-To study the etiology of diseases or conditions, disorders, disabilities, etc.
- 2-determine the certain causative factors
- 3-determine the characteristics of the agent or causative factors
- 4-define the mode of transmission
- 5- determine contributing factors
- 6-To aid in the planning and development of health services and programs.

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### Purpose of Epidemiology

1. To investigate nature of health-related problems in the community
2. To study natural history and prognosis of health-related problems
3. To identify causes and risk factors
4. To provide foundation for public policy

### Basic Triad of Descriptive Epidemiology

The Three Essential Characteristics of disease we look for in descriptive epidemiology are:

- Person
- Place
- Time

#### Personal Characteristics (whom)

- Age
- Gender
- Socio-economic status (education, occupation, income)
- Marital status
- Ethnicity/race/genetic profile
- Behavior / habits

#### Place (where?)

- Geographically restricted or widespread (outbreak, epidemic, pandemic)?  
Off-shore (tsunami...)
- Climate effects (temperature, humidity, combined effects .. )
- Urban / sub-urban-squatter / rural
- Relation to environmental exposure (water, food supply, etc)
- Multiple clusters or one

#### Time (when?)

- Changing or stable?
- Clustered (epidemic) or evenly distributed (endemic)?

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### Epidemiology measurements:

**Morbidity:** is the term used to describe the percentage of a population which is suffering from a disease at a given point in time.

The principle measurements of Morbidity used in epidemiology are **incidence** and **prevalence**

**Incidence rate:** the number of new cases occurring in a defined population during a specific period of time.

### An example of incidence:

- The number of new cases of arthritis in Australia in the year 2010

This can be calculated from the following formula:

**Incidence** = No. of individuals experiencing a new event during a time period/No. of all individual

### Example

The 510 children who did not have tuberculosis on 15th April, 1994 were re-examined for the presence or absence of disease after three months, 12 of them had developed the disease. The incidence of tuberculosis during the three months can be calculated as follows:

Incidence of tuberculosis =  $\frac{12}{510} = 0.0235$  or 2.35% Over three months period 510 or 23.5 per thousand.

### Uses of Incidence rate:

- 1- To control disease.
- 2- For research in to etiology, pathogenesis and distribution of disease and efficacy of preventive and therapeutic measure.

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**Prevalence:** Number of people in a defined population who have a specified outcome (e.g: disease) at a point in time.

### **Example of prevalence:**

Proportion of people with lung cancer in Australia  
Proportion of people with arthritis in Australia

This can be calculated from the following formula:

Point Prevalence (or) Prevalence = Total No. of persons with attribute at a given time/  
Total population at risk at the same time

### **Example**

On 15th April, 1994 all the 530 children enrolled in a school were examined for tuberculosis, 20 of them were found to have disease at the time of examination. Prevalence (of tuberculosis in school children on 15th April, 1994) =  $20/530 = .038$  or 3.8 percent or 38 per thousand.

### **Uses of prevalence rate:**

- 1-To estimate the magnitude and health/disease problems in community and identify potential high-risk population.
- 2-For administrative and planning purposes.

**Mortality:** is the number of deaths per 1000 population per year in given community

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### Tools Measurement of epidemiology

#### 1-Counts

Refers to the number of cases of a disease or other health phenomenon being studied  
i.e. Number of cases of influenza in Astana in January 2012

<u>Location</u>	<u>New Cases of Disease</u>	<u>Year</u>	<u>Population</u>
City A	20	2008	100
City B	100	2008	1000
<u>Annual Rate of Occurrence</u>			
City A:	20 / 100	=	1 / 5
City B:	100 / 1000	=	1 / 10

#### 2-Proportions:

- Persons included in the numerator are always included in the denominator:

$$\text{Proportion: } \frac{A}{A + B}$$

#### Proportions - Example

A	B	Total(A+B)
Person with hypertension	Without hypertension	Total study population
1400	9650	11050

$$P = A / (A + B) = (1,400 / 11,050) = 0.127$$

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### 3-Ratios:

- Like a proportion, is a fraction, BUT without a specified relationship between the numerator and denominator
- Example: Occurrence of Major Depression

$$\begin{array}{r} \text{Female cases} = 240 \\ \hline \text{Male cases} = 120 \end{array} = \frac{240}{120} = 2:1 \text{ female to male}$$

### 4-Rate:

Measure of some particular event (development of disease) in population during a given time period. E.g. death rate is calculated as

$$\text{Death rate} = \frac{\text{Number of event (death or disease) in specific period}}{\text{population}} \times 1000$$

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## Epidemiological studies

Epidemiological studies are organized into two divisions. These types of epidemiological studies complement one another, which are:

### **1- Observational epidemiology.**

- 1- Descriptive study.
- 2- Analytical study.
  - a- Case-control study.
  - b- Cohort study.

### **2- Experimental epidemiology (clinical trials).**

- 1- Randomized control trials.
- 2- Field trials.
- 3- Community trials.

### **1- Observational epidemiology**

#### **1- Descriptive study:**

It is one that attempts to do no more than describe the pattern of occurrence of a condition relative to other characteristics of the population. For example, a study that attempted to measure the degree of dental caries in a school relative to the age, gender, and socioeconomic characteristics of the children without attempting to explain why those particular distributions were found. Descriptive studies are usually the first phase of any epidemiological investigation.

It would also be a prevalence study (all current cases; both old and new at a given point in time) which is commonly used for comparisons between two or more populations, or between the same population at different time.



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### **2- Analytical study:**

It is one that attempts to explain the distribution of a condition relative to some other factor. It is most often used in studies to determine the etiology of the disease. For example, measuring the influence of water fluoridation on the distribution of dental caries in a population. Such a study could also be called an incidence study (new cases of a condition over a given period of time).

### **Types of analytical studies:**

- a- **Case-control study:** it is often called retrospective study used to test hypothesis. The case- control studies have the following distinct features:
1. Both exposure and outcome of the disease have occurred before the start of the study.
  2. The study proceeds backward from effect to cause.
  3. It uses a control group for comparison.

Case-control studies are basically comparison study. Cases and controls must be comparable with respect to known factors such as age, sex, occupation etc. One can use cases for children with local fluoride application, and control for children who have not been given such applications.

### **There are four basic steps in conducting a case control study:**

1. Selection of cases and controls.
2. matching: is the process by which one selects controls in way that they are similar to cases with regard to certain pertinent selected variables(eg.age) which are known to influence the outcome of the disease and if not matched could distort the results.
3. Measurement of exposure: this may be obtained by interviews, questionnaire or studying past records.
4. Analysis and interpretation



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### b. Cohort study:

cohort means group of people who share the same characteristics or experience, For instance, a birth cohort includes all people born within a given time frame, this type of analytical study which is usually undertaken to refute or support the existence of an association between suspected causes and the disease, it has the following features:

1. The cohorts are identified prior to the appearance of the disease under investigation.
2. Study groups are followed through time to see which members develop the disease.
3. The study proceeds forward from cause to effect (prospective study).

**Cohort studies have been called by a variety of names including:**

- a- Incidence studies.
- b- Prospective studies.
- c- Follow-up studies.
- d- Longitudinal studies.

### **Elements of cohort study:**

1. Selection of study subjects.
2. Obtaining data on exposure.
3. Selection of comparison groups.
4. Follow up
5. Analysis.



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The differences between Case-control and Cohort studies:

<u>Case-control study</u>	<u>Cohort study</u>
1- Retrospective	1- Prospective
2- Disease has already occurred	2- Disease is expected to occur in future
3- Presence of exposure in cases and controls compared	3- Development of disease in exposed and nonexposed compared
4- Relatively easy to carry out	4- Time consuming and difficult to carry out
5- Useful for rare cases	5- Suitable for common disease
6- Relatively less costly	6- Expensive
7- No dropouts	7- Dropout rate higher

## 2- Experimental epidemiology.

Experimental studies are ones where researchers introduce an intervention and study the effects. Experimental studies are usually randomized, meaning the subjects are grouped by chance. Clinical trials are designed to bring out the most appropriate intervention for patients suffering from a given condition. When a new treatment has been developed, it is important to provide the answers to two questions:

- 1- Does it work?
- 2- Is it better than the existing treatment?



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The studies under this category are as follows:

### 1- Randomized control trails:

When the investigation is to be carried out in a group of individual, a parallel group not exposed must also be studied in the same way; this called the control group and should be matched the group under study. It is important to supply the control group with a substance similar in appearance and other properties to that being test; this is called a placebo.

It is always desirable that the investigator should not know whether a subject is a member of test or a control group, which is the study should be blind. If the subject is also in ignorance of whether he is using a test product or placebo, the study is termed double blind. This is to avoid unconscious bias in the diagnosis.

### 2- Field trials (randomized uncontrolled):

a- Preventive trials: It is used to estimate the effect of preventive techniques like vaccination.

b- Risk factor trials: It is used when specific risk factors are averted in groups of population, like dietary pattern.

**Both randomized control trials and field trials involve individual units of population.**

### 3- Community trials (non-randomized controlled):

Such studies are the only way in which a general intervention like fluoridation has to be tried out for reducing dental caries. Control communities in the neighborhood can be selected for comparison.



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Other related terms used to describe types of epidemiological studies are:

### 1- Cross-sectional study:

It is one in which a sample of a population is assessed at one time. It is a

prevalence study.	$P =$	No. of cases Total population	* 100%
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### 2- Longitudinal study:

It is one in which the same group of people is studied on two or more occasions. So, it should be an incidence study, it is usually (not always) an analytical study.

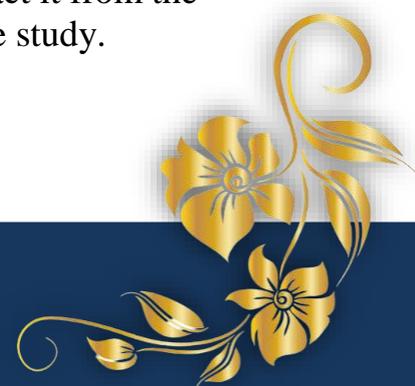
Other classifications:

#### 1- Prospective study.

It is one in which the planning of the entire study is carried out before the data are to be collected. For example, measurement the effect of a fluoridated dentifrice in reducing the incidence of dental caries. Measurement of caries at the beginning and the end of the study period allows the incidence of the disease to be determined.

#### 2-Retrospective study.

It is one in which the planning for the study takes place after the data have been collected. For example, to find out what type of feeding was used for the patient over the year, the information could be collected is to abstract it from the clinical records. It is easier and cheaper than planning a prospective study.



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### **Ethical issues**

The practice of epidemiology requires basic principles of ethics, these are:

1. People who have been exposed to a health hazard should know that the studies carried out on them may not improve their personal situation but may help to protect thousands of other people.
2. Informed consent must be obtained from participants in studies and they must retain the right to withdraw at any time.
3. Epidemiologists must respect personal privacy and confidentiality at all times.
4. All proposals for epidemiological studies should be submitted to institutional ethics committees before work begins.



## Epidemiology of Oral diseases

### 1-Dental caries:

Dental caries is defined as a progressive irreversible microbial disease affecting the hard parts of tooth exposed to the oral environment, resulting in demineralization of the inorganic constituents and dissolution of the organic constituent, thereby leading to a cavity formation.

The relationship between diet and dental caries Bacterial enzymes + fermentable carbohydrates = acid  
Acid + enamel = dental caries

### Current Trends in Caries Incidence

-In developed countries, caries prevalence declined in last decade, causes are multifactorial. E.g.: communal water fluoridation

- In developing countries increase in caries prevalence, cause is increased use of refined carbohydrates.

### CARIES SUSCEPTIBILITY OF INDIVIDUAL TEETH

- Upper and lower first molar → 95%
- Upper and lower second molar → 75%
- Upper second bicuspid → 45%
- Upper first bicuspid → 35%
- Lower second bicuspid → 35%
- Upper central and lateral incisor → 30%
- Upper cuspids and lower first bicuspid → 10%
- Lower central and lateral incisor → 3%
- Lower cuspids → 3%

**Teeth farthest back in the mouth are more frequently carious**  
**Caries susceptibility of individual tooth surface**

**occlusal > mesial > buccal > lingual**

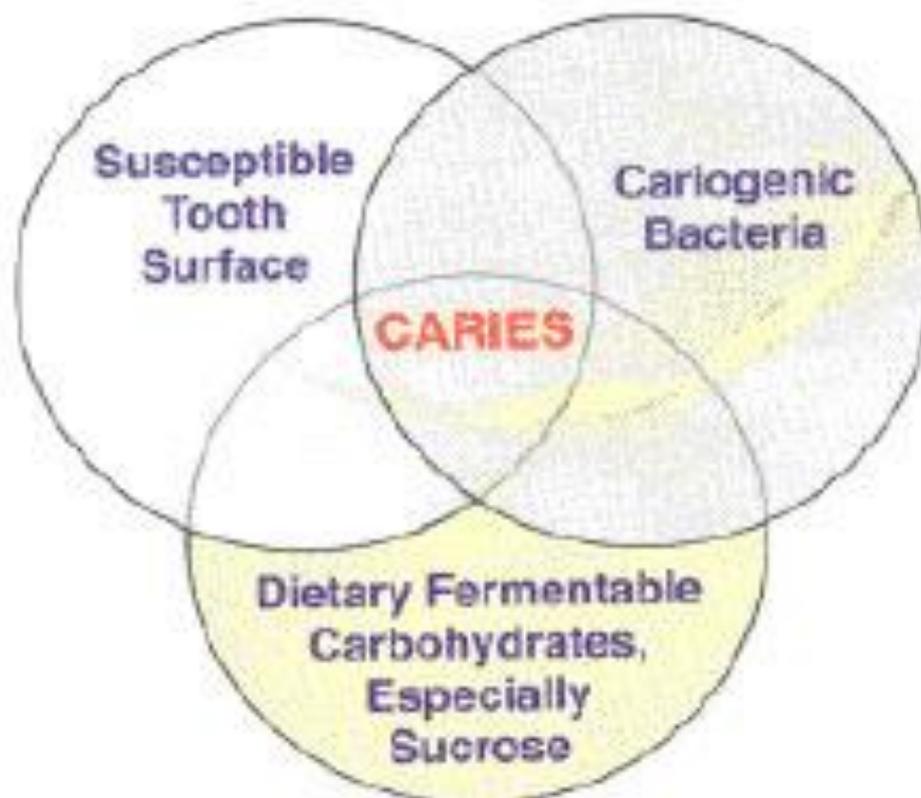
## Etiologic factors in dental caries

Dental caries is a multifactorial disease in which there is an interplay of 3 principle factors

- I. The host (teeth, saliva etc.)
- II. Micro flora
- III. Substrate (diet)

In addition, the fourth factor, time must be considered

## Dental Caries is a Multi-Factorial Infectious Disease



### ✓ Host factor

#### -Tooth

- Composition
- Morphologic characteristics
- Position

#### Composition of tooth

##### **Enamel: -**

- Inorganic: 96%
- Organic + water: 4%

##### **Dentin: -**

- Organic matter +water :35%
- Inorganic :65%

##### **Cementum: -**

- Inorganic: 45-50%
- Organic +water: 50- 55%

#### Morphological characteristics of the tooth

- Feature predisposed to the development of dental caries is presence of deep narrow occlusal fissure/ buccal and lingual pits

#### Tooth position

- Which is misaligned, out of position, rotated or otherwise not normally situated, may be difficult to clean and tend to favor the accumulation of food and debris which subsequently lead to dental caries

#### -Saliva

- Composition
- PH
- Quantity
- Viscosity
- Antibacterial factors

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### Composition of saliva

#### **Inorganic: -**

Positive ions: - Ca, Mg, K,

Negative ions: - CO<sub>2</sub>, Cl, F, PO<sub>4</sub>, thiocyanate

#### **Organic: -**

Carbohydrates: glucose

Lipids: cholesterol, lecithin

Nitrogen: non- protein → ammonia, nitrites & amino acids

protein → globulin, mucin, total protein

Miscellaneous: peroxides

Enzymes: carbohydrases, proteases, oxidases

### PH of saliva

- Determined by bicarbonate concentration
- PH increases with flow rate, normal PH 7.8
- Sialin is an arginine peptide described PH rise factor, present in saliva

### Quantity of saliva

- Normal quantity 700-800 ml per day
- In case of salivary gland aplasia and xerostomia in which salivary flow may entirely lacking, resulting in rampant dental caries

### Viscosity of saliva

Thick, mucinous saliva increases the dental caries

### Antibacterial properties of saliva

#### **Lactoperoxidase**

- They participate in killing of microorganisms by catalyzing the H<sub>2</sub>O<sub>2</sub> mediated oxidation of a variety of substances in the microbes
- Utilizing thiocyanate ions in saliva peroxidation generate highly reactive chemical compound that bond and inactivate general intracellular microbial enzyme system, as well as microbial surface compound.

#### **Lysozyme**

- Small, highly positive enzyme that catalyze the degradation of negatively charged peptidoglycan matrix of microbial cell wall

### Lactoferrin

- Fe binding basic protein found in saliva with mol. wt. near 80,000.
- Tends to bind & link the amount of the free Fe which is essential for microbial growth

### IgA

- Immunoglobulin in saliva
- Inhibit adherence and prevent colonization of microbial on tooth and mucosal surfaces

#### ✓ Bacteria

The most common cariogenic oral flora is two type of bacteria (streptococcus mutants and Lactobacillus) produces an acid that cause the distraction of inorganic components of enamel and dentine

#### ✓ Diet

The cariogenic bacteria produce and secretes the chemical substances (organic acid) from fermentation of carbohydrate which may cause demineralization of tooth

#### ✓ Time

once the diet is rich in suitable carbohydrate the caries can be begin within days of a tooth erupting into the mouth (frequency of exposure to cariogenic environment).

### Factors affecting caries prevalence

**1-Age:** dental caries essentially is a disease of childhood, the mean of DMF increase with age because it is accumulative disease.

**2-Gender:** Its higher in female than male could be explained in children by early eruption of teeth in females.

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**3-Race:** people living in different geographical area having different caries incidence an in Africa and India enjoyed greater freedom caries than Europeans.

**4-Hereditary:(genetic factor)** dental caries run in the family of the parents suffering from caries, although the environment factors have great influence but also the genetic factors contribute to caries occurrence.

**5-Emotional disturbance:** anxiety status influences the incidence of dental caries.

**6-Socioeconomic factors:** prevalence of dental caries in many developing countries are increasing due to the availability of refined sugars, while the caries experience decrease in undeveloped countries.

**7-Nutrition:** malnourished people are attributed higher prevalence of dental caries.

**8-Tobacoo smoking:** it may increase the risk of caries formation.

**9-Oral hygiene habits:** tooth brushing, flossing and uses of fluoride supplement reduce the occurrence of dental caries.

**10-Pregnancy and Lactating:** neglect their oral hygiene.

**11-Use of medications:** drugs promote xerostomia.

**12-Radiation:** increasing caries susceptibility.

## Epidemiology of Oral diseases

### 2- Periodontal Diseases:

**Periodontal disease:** is an infectious disease process that involves inflammation of the structures of the periodontium. it can cause a breakdown of the periodontium resulting in loss of tissue attachment and destruction of the alveolar bone.

### Types of Periodontal Diseases

Gingival diseases and periodontitis are the two basic forms of periodontal disease, and each has a variety of forms.

### Prevalence of Periodontal Disease

Periodontal diseases are the leading cause of tooth loss in adults. Almost 75% of American adults have some form of periodontal disease, and most are unaware of the condition. Almost all adults and many children have calculus on their teeth. Fortunately, with the early detection and treatment of periodontal disease, most people can keep their teeth for life.

### Causes of Periodontal Diseases

Dental plaque is the major factor in causing periodontal disease.  
Dental calculus provides a surface for plaque to attach

- Direct factors: plaque, calculus
- Indirect factors: Food impaction, Tobacco smoking, Faulty restoration, Badly designed partial denture, Lack of lip –seal, Malnutrition and Blood disorder, Malalignment and Improper brushing technique

### Signs and Symptoms of Periodontal Disease

- ✓ Red, swollen, or tender gingiva
- ✓ Bleeding gingiva while brushing or flossing
- ✓ Loose or separating teeth
- ✓ Pain or pressure when chewing
- ✓ Pus around the teeth or gingiva

## Risk Factors for Periodontal Disease

### 1. Sociodemographic factors: include: Age, Gender, Race

**Age:** the prevalence of Periodontal Disease increase with age.

**Gender:** the prevalence of Periodontal Disease was higher in male than female, this may be related to poor oral hygiene usually observed among male.

**Race:** Black people had more sever periodontal disease than white people

### 2. Hereditary or Acquired factor: Obesity, Diabetes

### 3. Behavioral factor: Tobacco, regular dental visits

### 4. Psychological factor: Stress, Bruxism

### 5. Local risk factor: Faulty dental restoration (overhang filling), Crowding

6. **Socioeconomic status:** Lower socio and education individual have higher prevalence and severity of Periodontal Disease than higher income and educate individual.

7. **Hormonal change:** increase in gingivitis is reported in children as they approach puberty and in women during pregnancy, lactation, menopause

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Lec. 5

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### Epidemiology of Oral Cancer

**Cancer is a broad term. It describes the disease that results when cellular changes cause the uncontrolled growth and division of cells.**

☒ **Cancer may be regarded as a group of diseases characterized by:**

- Abnormal growth of cells.
- Ability to invade adjacent tissues and even distant organs.
- The eventual death of the affected patient, if the tumor has progressed beyond the stage when it can be successfully treated.

### Types of cancers

- 1) Carcinoma
- 2) Sarcoma
- 3) Lymphoma
- 4) Leukemia

Oral Cancer is one of the ten most common cancers in the world. Oral cancer term includes cancers of lip, tongue, buccal mucosa, floor of mouth and pharynx Oral cancer is classically described as an indurated, ulcerated lump or sore that may or may not be painful and is often associated with cervical lymph adenopathy. 90 to 95% of all oral cancers are squamous cell carcinomas.

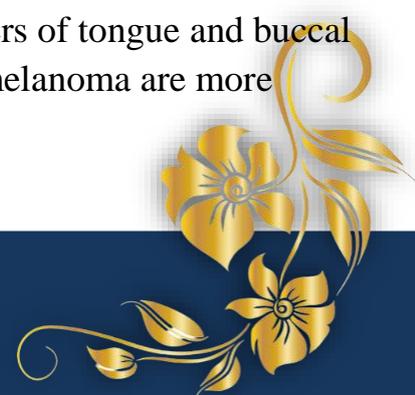
### *Etiology of oral cancer:*

#### ❖ **Host Factors:**

I. **Age:** Incidence increases with age and 85 % of cases are found in those aged 50 and above. Older age shows increase incidence in carcinoma whereas the younger age shows increase in sarcoma.

II. **Race:** Whites develop lip melanoma more frequently than the blacks. Certain odontogenic tumors are more common in black races.

III. **Gender:** commonly Males are more prone than females. Cancers of tongue and buccal mucosa are more common in males. Cancer of lip and Malignant melanoma are more common in women than in men.



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## Lec. 6

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**IV. Genetic factors:** Discovery of oncogenes introduced a time in which it is possible to identify genetic elements involved in the initiation and progression of malignant disease.

**V. Occupation:** Textile workers show an increase in oral cancer. Leather workers show an increase in cancer of buccal mucosa, larynx and pharynx.

**VI. Immunity:** Kaposi sarcoma is more common in AIDS patients.

**VII. Social class:** There is a definite relationship between socioeconomic status and frequency of cancer. Low-income groups show increase in cancer of oral cavity.

**VIII. Customs and habits:** Smoking increases the incidence of cancer. Tobacco chewing, pan chewing, spicy food increases the rate of cancer of floor of mouth and buccal mucosa. Alcohol consumption also increases the chance for cancer.

### *Constituents of tobacco smoke*

Tobacco smoke is a complex mixture of several thousands of chemical compounds:

#### **1-Nicotine:**

Nicotine is among the most toxic of all poisons and acts with great speed (**nitrosamines, which are potent carcinogens component**) . It is the pharmacological agent in the tobacco smoke that causes addiction among smokers. The addictive effect of nicotine is linked to its capacity to trigger the release of dopamine—a chemical in the brain that is associated with the feelings of pleasure.

#### **2-Tar:**

Tar is a sticky brown substance which can stain smokers' fingers and teeth yellow brown. It also stains the lung tissue. Benzopyrene as a carcinogen is a prominent polycyclic aromatic hydrocarbon found in tar.



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### 3-Carbon Monoxide (CO):

Carbon monoxide is a colorless, odorless, poisonous gas. Carbon monoxide interferes with uptake of oxygen in the lungs and with its release from the blood to the tissues that need it.

#### ❖ Agent Factors:

I. **Biological:** (a) Virus (HIV, HSV), (b) Fungus (Candida).

II. **Chemical:** Arsenic, dyes, nickel, aromatic amines, chromium.

III. **Mechanical:** Sharp tooth, any other source of chronic irritation like ill-fitting dentures, chronic sores from jagged teeth, etc.

IV. **Nutritional agents:** Precarcinogens in food (saccharin, aflatoxin), increased consumption of fat, deficiency of folic acid, protein deficiency, increased consumption of red chili powder, decrease in copper, zinc, vegetables, vitamins E and C.

#### ❖ Environmental Factors:

I. **Water contaminants:** It includes some organic pollutants like chloroform.

II. **Air pollution:** Air pollution caused by the release of a number of gases from the automobiles and factories, e.g. carbon dioxide.

III. **Geographic variations:** In Netherlands, buccal mucosa is most commonly affected and is more often seen in males. In Switzerland, lip, tongues are the sites most affected and is often seen in males. In Canadian Eskimos, cancer of salivary gland is more common. In Srikakulam, palatal cancer is most common.

IV. **Solar heat:** Prolonged exposure to sunlight causes melanoma.

V. **Industrialization:** The release of various toxins by the industries contaminates water and air, which may lead to cancer.



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**Potentially malignant lesions** Main potentially malignant lesion is:

- Leukoplakia
- Erythroplakia
- Erosive lichen planus
- Submucosal fibrosis.

Such lesion as leukoplakia and erythroplakia can precede the development of malignancies. However, the rate of malignant transformation is very low 2–6 percent.

***Levels of prevention for oral cancer:***

### **Primary Prevention**

1. Avoid tobacco and alcohol use.
2. Avoid betel nut chewing.
3. Avoid smoking.
4. Avoid exposure to sun.
5. Ensure a healthy diet free from vitamin and nutritional deficiency.

### **Secondary Prevention**

Patients whose cancer is detected at an early stage generally have much longer survival times than those with late-stage disease.

- Screening of high risk groups
- Biopsy: any suspicious oral mucosal lesion including any non-healing ulcer [more than two weeks] must be biopsied. Biopsy should be sufficiently large to include enough suspect and apparently normal tissues for correct diagnosis. An excisional biopsy should be avoided unless the lesion is very small as it will destroy for the surgeon or radiotherapist the clinical evidence of the site and character of lesion.
- In vitro staining: is advised where it is difficult to decide which is more appropriate area of biopsy, especially if there are widespread lesions. Staining with toluidine blue followed by a rinse with 1 percent acetic acid and then saline may stain the most suspicious area and indicate those which need to be biopsied.



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### ☒ Tertiary Prevention

- Surgery, radiotherapy, and chemotherapy.
- In order to stop the recurrence and spread of oral cancers, dentists and other health specialists should work together to provide multi-disciplinary support for

patients.

- Treated patients may still have dental needs which dentists should monitor to maintain life quality.
- Prevention of caries by topical fluoride application, dietary advice.
- Management of a dry mouth, and prosthetic rehabilitation following surgery and radiation therapy.

### Rehabilitation after Oral Cancer

Rehabilitation may vary from person-to-person depending on the type of oral cancer treatment, and the location and extent of the cancer. Rehabilitation may include:

- Dietary counseling: Many patients recovering from oral cancer surgery have difficult eating, so it is often recommended that they eat small meals consisting of soft, moist foods.
- Surgery: Some patients may benefit from reconstructive or plastic surgery to restore the bones or tissues of the mouth, returning a more normal appearance.
- Prosthesis: If reconstructive or plastic surgery is not an option, patients may get benefit from dental or facial-part prosthesis to restore a more normal appearance. Special training may be needed to learn to use a prosthetic device.
- Speech therapy: If a patient experiences difficulty in speaking following oral cancer treatment, speech therapy may help the patient relearn the process.



## Dental Indices

Epidemiological Indices are attempts to quantitate clinical conditions on graduated scale. Quantitative measurement of disease most commonly relies on **index**.

**Index:** A numerical value describing the relative status of a population on a graduated scale with definite upper and lower limits, which is designed to permit and facilitate comparison with other populations classified by the same criteria and methods.

### The purposes of an index:

- To make accurate assessment of the extent and severity of the disease and to compare the disease status among individuals and communities.
- To find out etiological and predisposing factors for the diseases.
- For planning of oral health policy.
- To assess the efficiency of measures undertaken to overcome the disease may be preventive or curative.

### Ideal properties of an index:

Ideally, an index should possess the following properties:

**1- Clarity:** The examiner should be able to carry out the index rules in his mind.

- **Simplicity** The index should be easily to apply, so there is no undue time lost during examination.
- **Objectivity** The index criteria should be clear and unambiguous.

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**2- Validity:** The index should measure what it is intended to measure. So, it should be corresponding with clinical stages of the disease, ex. number of missing teeth in adults is not a valid measure of caries activity.

**3- 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 group condition.

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

### Classification of indices:

#### Which is based upon the:

##### ✓ Direction in which their scores can fluctuate:

**1. Irreversible index:** (DMF) Index that measures conditions will not return to the normal state. Once established cannot decrease in value on subsequent examinations.

**2. Reversible index:** (GI) Index that measures conditions that can be return to the normal state. Reversible index scores can decrease or increase in value on subsequent examinations.

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**3. Composite index:** (PDI) Index that measures conditions that can be return to the normal state and conditions will not return to the normal state.

✓ **The extent to which areas of oral cavity are measured:**

**1. Full mouth index:** This index measures the patient's entire periodontium or dentition e.g. Russell's periodontal index and Dean fluorosis index.

**2. Simplified index:** This index measures only representative samples of dental apparatus e.g. Green and Vermillion's simplified oral hygiene index (OHI-S), calculus surface index CSI

✓ **The entity which they measure:**

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

**2. Treatment index** e.g. measuring gingival or sulcular bleeding ate essentially examples for symptom indices.

**3. Symptom index** e.g. measuring gingival or sulcular bleeding is the best examples for symptom indices and Papilla Bleeding Index (PBI)

✓ **The special categories:**

**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.

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## 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.

## Indices used for dental caries assessment

### Dental Caries:

A progressive irreversible microbial disease affecting the hard parts of the tooth. It is the most prevalent chronic disease affecting the human race. Once it occurs, its manifestations persist throughout life even the lesion is treated. It usually begins soon after the teeth erupted into the oral cavity. So, it is a post eruptive disease. It affects persons both genders, all races, all ages, all socioeconomic groups.

### 1. Indices used for coronal caries

- Permanent teeth index
- Primary teeth index
- Mixed dentition teeth index

### 2- Indices used for root caries

**Permanent teeth index:** Decayed-Missing-Filled Index (DMF) which was introduced by Klein, Palmer and Knutson in 1938 and modified by WHO: DMFT, DMFS

The components are:

### **D component:**

Used to describe (Decayed teeth) which include:

- ✓ Carious tooth
- ✓ Filled tooth with recurrent decay
- ✓ Only the roots are left
- ✓ Defect filling with caries
- ✓ Temporary filling
- ✓ Filled tooth surface with another surface decayed

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### M component:

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

- ✓ Tooth that extracted for reasons other than caries should be excluded, which include: a-Orthodontic treatment, b-Impaction, c-Periodontal disease
- ✓ Unerupted teeth
- ✓ Congenitally missing
- ✓ Avulsion teeth due to trauma or accident

### F component:

Used to describe (Filled teeth due to caries). Teeth were considered filled without decay when one or more permanent restorations were present and there was no secondary (recurrent) caries or other area of the tooth with primary caries. A tooth with a crown placed because of previous decay was recorded in this category. Teeth stored for reason other than dental caries should be excluded, which include:

- ✓ Trauma (fracture)
- ✓ Hypoplasia (cosmetic purposes)
- ✓ Bridge abutment (retention)
- ✓ Seal a root canal due to trauma
- ✓ Fissure sealant.

### Note:

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

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### Principle and rules in recoding:

#### 1-DMFT:

- 1- A tooth may have several restorations but it counted as one tooth, F.
- 2- A tooth may have restoration on one surface and caries on the other, it should be counted as decayed D.
- 3- No tooth must be counted more than once, DM F or sound

#### 2-DMFS:

Each tooth was recorded scored as 4 surfaces for anterior teeth and 5 surfaces for posterior teeth.

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

### Calculation of DMFT\ DMFS:

1- For individual  $DMF = D + M + F$

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

Maximum score:

1- DMFT = 32

2- DMFS =  $12 * 4 + 20 * 5$   
 $= 48 + 100 = 148$  or 128

Minimum score = Zero

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### 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

### Q- How could you differentiate between tooth missing due to caries and due to exfoliation?

- ✓ By age of the patient if it is near to exfoliation time or not
- ✓ 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
- ✓ Bad oral hygiene mainly associated with carious teeth

### Q- How could you differentiate 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
- ✓ Bilateral and /or opposing missing generally associated with ortho. treatment, while in carious missing teeth it is not necessary

- ✓ 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
- ✓ Crowding or appliance may be seen in ortho. treatment

### 2- Indices used for root caries

Root Caries Index (RCI), which was introduced by Katz in 1979:

RCI is based on the requirement that gingival recession must occur before root surface lesions begin. Therefore, only teeth with gingival recession are examined.

1. All teeth are examined in both the lower and upper arch.
2. To obtain the RCI, each of the four surfaces the mesial, distal, buccal (labial), and lingual, of a root are examined for a single tooth.
3. When multiple types of root surfaces are exposed, the most severely affected root surface be recorded for that tooth

The calculation of RCI:

$$RCI = \frac{R-D + R-F}{R-D + R-F + R-N} * 100$$

(R-D) is no. of root surfaces with decay.

(R-F) is no. of root surfaces which have permanent filling.

(R-N) is the no. of sound root surfaces.

## Indices used for assessment of periodontal disease

There are 4 main areas in periodontal disease for which indices are required:

- a. Plaque or soft deposits on teeth
- b. Calculus
- c. Gingivitis
- d. Periodontal destruction or loss of attachment

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

**Gingival inflammation:** inflammatory process of the gingiva, most form of gingivitis are plaque induced.

**Periodontitis:** is an inflammatory condition of the gingival tissues, characterized by loss of attachment of periodontal ligament and the bone support of tooth.

**Calculus:** 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.

## Periodontal Indices

### 1. Dental Plaque Index (PLI):

#### Described by (Silness and Loe 1964)

- ▶ used for assessment the thickness of plaque at the gingival area of the tooth.
- ▶ 4 gingival areas (facial, lingual, mesial and distal) are examined, or selected surfaces (facial, mesial and lingual).

#### Index teeth

- Only 6 index teeth used for scoring of this index:

For permanent and deciduous teeth

6	2	4	E	B	D
<hr/>			<hr/>		
4	2	6	D	B	E

- No substitution for any missing teeth

#### Scoring criteria:

- 0 No plaque
- 1 A film of plaque adhering to the free gingival margin and adjacent area of the tooth, which cannot be seen with the naked eye. But only by using disclosing solution or by using probe.

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2 Moderate accumulation of deposits within the gingival pocket, on the gingival margin and/ or adjacent tooth surface, which can be seen with the naked eye.

3 Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

### Calculation

$$P1I = \frac{\text{Sum of all individual plaque scores}}{\text{Total no. of surfaces}} \text{ this for individual}$$

### For a group

$$\frac{\text{total scores of individuals in a group}}{\text{Total no. of individual in a group}}$$

Each of the four surfaces of the teeth. (buccal, lingual, mesial and distal) is given a score from 0.3. The scores from the four areas of the tooth are added and divided by four in order to give the plaque index for the tooth.

For example:

	Upper right six	Upper right lateral incisor	Upper left 1st premolar	Lower left six	Lower left lateral incisor	Lower right 1 <sup>st</sup> premolar		
Buccal	1	1	2	1	0	0	24 ÷ 24 = 1	
Mesial	2	1	1	1	0	1		
Lingual	0	1	2	2	1	1		
distal	1	1	1	1	1	1		

### 2. Indices used for measurement of calculus: Calculus Surface Index (CSI)

- ▶ developed by Ennerver et al in 1961.
- ▶ assess the presence or absence of supra gingival or sub gingival calculus on four or six mandibular incisors, by visual or tactile examination.
- ▶ Each incisor is divided into 4 scoring units.

Calculation of index= total no. of surfaces with calculus is considered the CSI score per person.

### 3. Indices used for measurement of gingival inflammation Gingival index (GI)

- **developed** by Loe and Silness in 1963.
- assess the severity of gingivitis and its location in all teeth or selected teeth and in all surfaces or selected surfaces.
- using blunt explorer probe.
- widely used due to its validity, reliability and easy to use.
- the teeth selected as the index teeth the same of plaque index teeth(P1I).

#### Criteria of GI:

- 0 Absent of inflammation/normal gingiva.
- 1 Mild inflammation. Slight change in color, slight edema, no bleeding on probing.

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2 Moderate inflammation, moderate glazing, redness, edema and hypertrophy. Bleeding on probing.

3 Severe inflammation, marked redness and hypertrophy ulceration. Tendency to spontaneous bleeding.

### Index calculation

$$\text{GI for individual} = \frac{\text{Total scores}}{\text{Total no. of examined surfaces}}$$

$$\bullet \text{ group} = \frac{\text{Total scores of all subject}}{\text{Total no. of examined subjects}}$$

- the numerical scores of the gingival index may be associated with varying degree of clinical gingivitis:

## 4. Indices used for measuring periodontal diseases:

### Periodontal Disease Index (PDI)

- Developed by SIGURD P. RAMFJORD in 1959. for epidemiological surveys of periodontal disease.
- **PDI** measure the level of the periodontal attachment related to the Cemento- enamel junction of teeth.

Teeth examined: (**FDI** system tooth numbers are in this index:

1. Maxillary right first molar - (16)
2. Maxillary left central incisor - (21)
3. Maxillary left first bicuspid - (24)
4. Mandibular left first molar - (36)

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5. Mandibular right central incisor - (41)

6. Mandibular right first bicuspid - (44)

upper	16			21	24	
lower		44	41			36

### Component of Periodontal Disease Index:

**1. Plaque component of PDI** --> was developed by Ramfjord in 1959.

Use a numerical scale to assess the extent of plaque covering the surface area of tooth.

The scoring is done on the six Ramfjord (index) teeth.

the surfaces scored are the (Facial, lingual, Mesial and Distal).

Scoring criteria:

- 0 No plaque present
- 1 Plaque present on some but not on all interproximal, buccal and lingual surface of the tooth.
- 2 Plaque presents on some or all interproximal, buccal and lingual surfaces, covering less than one half of these surfaces.
- 3 Plaque extending over all interproximal, buccal and lingual surfaces, covering more than one half of these surfaces.

Note:

\*Only fully erupted teeth should be scored. \*Missing teeth should not be substituted.

Calculation: Plaque Score of an individual = Total scores/ no. of teeth examined

### **2. Calculus component of the Periodontal Disease Index (PDI):**

Also, this index was described by Ramfjord 1959 as one of the components of PDI, to assess the presence and extent of calculus of 6 index teeth. The facial (buccal/labial) and lingual surfaces of the 6 index teeth are examined.

Calculation of the index: total scores/total number of examined teeth

Criteria of scoring:

- |   |   |
|---|---|
| 0 | Absence of calculus.  |
| 1 | Supra gingival. calculus extending only slightly below the free gingival margin (not more than 1 mm). |
| 2 | Moderate amounts of supra gingival and sub gingival calculus or sub gingival calculus alone.          |
| 3 | An abundance of supra gingival and sub gingival calculus.   |

**3. Gingival and Periodontal component of Periodontal Disease Index (PDI).** Periodontal disease index dose so by combining the assessments of gingivitis and gingival depth on 6 index teeth (Ramfjord teeth).

Criteria of Index:

- |   |   |
|---|---|
| 0 | absence of sings of inflammation.   |
| 1 | Mild to moderate inflammatory gingival change, not extending around the tooth.              |
| 2 | Mild to moderate severe gingivitis extending all around the tooth.                          |
| 3 | Severe gingivitis characterized by marked redness, swelling tendency to bleed and ulcerate. |

### Indices used for Treatment Needs Assessment: 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).
- Index teeth: the score is identified by examination of specified index teeth.

6	1	6
6	1	6

#### Criteria of 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 5mm pocket.                             |
| 4 | Presence of 6mm or deeper pocket.                        |

#### Criteria of 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 pocket 4-5mm need scaling and root planning. |
| 3 | Deep pocket 6mm or deeper need deep scaling, root planning and more complex procedure.  |

Advantages of CPITN:

1. Simplicity.
2. Speed.
3. International uniformity.
4. Records the common treatable conditions like periodontal pockets, gingival inflammation and calculus.

### Indices used for dental fluorosis measurement:

Dental fluorosis is hypoplasia or hypo mineralization of tooth enamel or dentine produced by the chronic ingestion of excessive amounts of fluoride during the developing period of teeth. **Dean** in 1931 was discovered that the fluoride in drinking water was the causative agent of dental fluorosis. So that **Dean in 1942** introduced an index for assessment of dental fluorosis known as

*"Dean's Classification of Dental Fluorosis"* or simply as

- *Dean's Fluorosis Index* which recommended in survey of WHO 1997(world health organization).

Criteria of index.

Normal 0            Enamel (translucent, smooth, glossy and creamy white color)

**Questionable (0.5)** Enamel discolored (slight aberration from the translucence of normal enamel, ranging from a few white flecks to occasional white spot.

**Very mild (1)** Small, opaque, paper, white area scattered irregularly over the tooth, but not involving as much as approximately 25% of tooth surface (no more than 1-2 mm of white opacity at the tip of cusps of bicuspid or second molar.

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**Mild (2)** The white opaque areas in the enamel of teeth are more extensive, but not involve as much as 50% of tooth.

**Moderate (3)** All enamel surfaces of teeth are affected and subject to attrition show wear., brown stains is a disfiguring feature.

**Sever (4)** All enamel surfaces of teeth are affected and hypoplasia is so marked that general form of the tooth may be affected, discrete pitting, brown stain wide spread teeth often present a corroded like appearance.

## Fluoride Mechanism and Effects

### What are fluorides?

Fluoride ion comes from the element fluorine. It is negatively charged and will not remain as a free element. Fluoride has a high affinity for calcium. It is, therefore, very compatible with teeth and bone. Fluorine is 17th most abundant element in the earth crust. Never encountered in its free state in nature. Exists only in combination with other elements as a fluoride compound.

### Source of Fluoride

1-Ground water: Rain water, sea water and river water

2-Atmosphere: fluoride containing soils and gas

3- Food: certain foods contain more F than others e.g. tea and sea foods.

4-Drugs and fluoride containing dental products. Dentifrices, Fluoride mouth rinse, Professional applied fluorides and Dietary fluoride supplements.

5-Pollution: in vicinity of industries involved in production of aluminum from cryolite and phosphate fertilizers.

### Types of Fluoride Used in Dentistry

A- Water fluoridation (Systemic fluoride)

B- School Water fluoridation (Systemic fluoride)

C- Self- applied fluorides (Topical fluoride)

D- Professionally applied fluoride (Topical fluoride)

### A- Water Fluoridation

Fluoridation is the adjustment of the fluoride in drinking water to the optimal level for reducing tooth decay

“Fluoridation is the single most effective public health measure to prevent tooth decay and improve oral health over a lifetime, for both children and adults.”

For colder climates where the mean annual maximum air temperature is lower than 10-degree Celsius fluoride concentration in water as high 1.3 ppm must be considered safe and beneficial

### Optimal fluoride concentration & climatic conditions.

- In temperate regions – 1 ppm.

Temp in degree Celsius	Recommended ppm
$\leq 18.3$	1.1 – 1.3
18.9 – 26.6	0.8 – 1.0
$\geq 26.7$	0.5 – 0.7



Advantage of water Fluoridation

- 1-Safe
- 2-Socially acceptable
- 3-Feasible
- 4-cost effective

### B-School Water fluoridation

It is recommended only if the students are coming from the area which have low or no fluoride content. The recommended concentration for school water fluoridation is 4.5 ppm. Studies have shown approximately 40% reduction in dental caries due to school water fluoridation.

Why concentration of fluoride in school water 4.5 times than community?

- 1-children spend only a part of their total waking hours in schools.
- 2-They enter the school at 6 years of age. Thus, the incisors are no longer at risk of dental fluorosis.
- 3-Only part of daily water intake is consumed.

### C- Self-applied fluorides: (Topical fluoride)

It is benefit in post eruptive phase

- Dentifrices
- Fluoridated mouth rinse
- Fluoridated gel.

### D- Professionally applied fluoride (Topical fluoride)

In the form of solution, gel foam, varnishes, prophylactic paste or pumice. Many types of fluoridated agent used, mainly:

- Sodium fluoride (NaF)
- Stannous fluoride (SnF<sub>2</sub>)
- Acidulated phosphate fluoride
- Zirconium fluoride
- Titanium fluoride
- Amine fluoride

Choice depend on:

- Current levels of fluoride intake
- Caries status
- Age of subject in the area

### **Mechanism of action**

Three principal mechanisms by which fluoride is considered:

- 1- To inhibit dental caries have been identified.
- 2-It reduces the enamel solubility in acid by pre eruptive incorporation into the hydroxyapatite crystal.
- 3-It promotes remineralization and inhibits demineralization of early carious lesions. It inhibits glycolysis, the process by which cariogenic bacteria metabolizes fermentable carbohydrates.

**In general, fluoride has many effects in relation to caries reduction (anti-caries effect) these include:**

- 1- Decrease solubility of enamel in acid by converting hydroxyapatite into less soluble fluorapatite.
- 2- Enhance remineralization of enamel in areas that have been demineralized by acid.
- 3- Antibacterial action: Bactericidal in high concentration and bacteriostatic in low concentration. Fluoride affect oral bacteria and dental ecology. It inhibits bacterial adsorption and decrease acid production of plaque bacteria.
- 4- Improve tooth morphology making them more self-cleansing.

### **Metabolism of fluoride**

When fluoride is ingested, the absorption occurs mainly in the stomach. Fluoride concentration in the blood reach a peak after about 30 minutes, and returns to the usual level after 11-15 hours. About 99% is associated with calcified tissue (bone and teeth). Fluoride also can be absorbed following inhalation and through the skin. The main route of F excretion is via the kidney.

### **Dental Fluorosis**

Hypo-mineralization of enamel results from excessive fluoride ingestion during tooth development.

### **Side effect of fluoride**

- 1- Dental fluorosis
- 2- Reversible gastric disturbance
- 3- Skeletal fluorosis
- 4- Death

## Infection control

### Concepts of disease transmission

- 1-Infection: is the multiplication of infections agent (micro-organism) within the host
- 2-Invasion: is the process in which micro-organism enter the host cell.
- 3-Virulence: is the ability of agent (m.o) to cause disease.

### The acquisition means of pathogens

- 1-Direct contact: skin to skin or skin to mucous membranes
- 2-Indirect contact: droplet or body secretion
- 3-Air born mechanisms: Inhalation of pathogens
- 4-Vehicle borne mechanisms: contaminated food, water
- 5-Vectors: animals or insects

### Transmission of infectious diseases

- 1- Transmission of infection from infected patients to dental health care workers.
- 2- Transmission of infection from infected workers to the general public.
- 3- Transmission of infection from infected patients to another.

### The common infections condition

- 1-Viral hepatitis: hepatitis B and C
- 2-Herpes virus infection: herpes simplex virus.
- 3-Syphilis

4-Acquired Immune Deficiency Syndrome (AIDS): cause by human immunodeficiency virus (HIV)

5-Tuberculosis: caused by mycobacterium tuberculosis

### Control of infectious disease

#### 1-Personal barrier techniques:

##### a-Hand washing

There is no acceptable way to sterilize human hands. For this reason, all health care providers who come in direct contact with patient must wear disposable gloves when performing intraoral procedures.

The recommended hand washing procedure include

-Scrubbing of all surfaces of the nails, fingers, hand and lower arms with soft sterile brush or disposable sponge and antimicrobial preparation.

-All jewelry must be removed. Care should be taken to avoid the over use of stiff bristle brush, which will cause abrasion and laceration to skin a nail area.

-Hand must be washed between the patient before gloving to reduce the skin microbial flora and prevent skin irritation by the waste products of bacterial growth under the gloves.

##### b-Gloves:

##### Gloves used for

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

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

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### **Gloves should be:**

- Change between patients and are not to be washed with detergent at any time.
- Punctured gloves should be removed as soon as possible

### **c-Masks:**

- 1- Prevent spatter from patient mouth
- 2- Reduction in the inhalation of air born particles
- 3- Mask should be changed per hour or between each patient.
- 4- Mask should be properly disposed of after each use and not left hanging around the neck.

### **d-Eye wear:**

- The eyes due to limited vascularity and lower immune abilities are susceptible to macroscopic and microscopic injury.
- Protective eye wear should be worn by all dental personnel involved in treatment in form of glasses to prevent trauma to the eye tissue from flying droplets.
- Dental personnel at risk from the herpes simplex virus and hepatitis B may develop after the initial contamination.
- Protective eye wear should be available to patients as well as the dental personnel. The supine position renders the patient susceptible to falling object in the head and neck area.
- All Protective eye wear should be cleansed after every appointment. Eye wear should be washed with soap first, then rinsed with water and surface disinfectant can be used later.

### **e-Protective clothing:**

- Protective clothing is the outer layer or covering of garments that would first be contacted by the contaminating droplets, generating sprays and splatter.

-The garment should be worn only in the dental environment and should be changed at the end of the treatment, also should be changed immediately if soaked or spattered with blood or other contaminants.

### **2- Immunization:**

All dental health care workers should be Immunized by taken 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-Radiographic asepsis:**

-For operator: A convenient way to prevent spread of contamination on film packs to use plastic disposable covers on packs before they are placed into patient mouth.

-For patient: using plastic barrier material on the portions of cone and tube head and on the exposure, switch will reduce the cross contamination between patients.

### **5-Use of disposable instrument for patient:**

Use of disposable items to prevent patient to patient contamination.

Numerous disposable items are available in dentistry which include: gloves, masks, gowns, surface covers, saliva ejector tip, air syringe tip, impression tray, fluoride gel tray and high-speed handpieces.

### **Sterilization of instruments**

#### **Instrument processing involves:**

##### 1-Cleaning:

Presoaking of contaminated instrument keeps them wet until thorough cleaning can occur. This procedure prevents blood and saliva from drying on the instrument and facilitate cleaning of instrument which is achieved by:

- Hand scrubbing of contaminated instruments.
- Ultrasonic cleaning. (2-20mint) is needed to clean instrument ultrasonically.

##### 2-Packing:

After cleaning instruments have been rinsed and dried, they are to be packaged in functional sets before sterilization (caution must be exercised to ensure that the items are dry before sterilization to prevent corrosion). This packaging protects the instrument from becoming contaminated after sterilization.

##### 3-Sterilization:

**Sterilization:** It is process of killing all microorganism using physical and chemical procedure.

**Disinfection:** It is process of killing most, but not all microorganism using physical and chemical procedure.

##### 4-Drying, cooling, storage and distribution of instrument.

## School Dental Health Program

The maximum time consuming and the most important task in the field of community dentistry is school dental health program. Because of very high prevalence of dental caries in this age group.

### Objectives of school health program:

- 1-To evaluate the health status of pupils
- 2-To educate and motivate the children for correction defect like cleft lip and palate
- 3-To Identify, educate and motivate the handicapped children
- 4-To prevent and control diseases
- 5-To provide emergency services

### Phases in School Oral health program:

#### A-Dental Health Instruction:

Dental Health counseling consist of the procedures for helping children and parents understand the nature and significant of conditions revealed by dental inspections and to solve dental health problems.

There are various methods of teaching dental health in school

These are the following:

- 1-Lecture methods
- 2- Lecture demonstration methods
- 3-Discussion methods
- 4-Questioning methods

5-Directed study and practice method

6-Team teaching method

## **B- Dental Health Service Program**

It is determining the dental health status of each child in relation to his or her school groups, his or her family and his or her community and providing the dental health services.

These are following:

1-Periodic dental check- up

2-Reports to parents

3-Periodic follow up of program and home care check- up

4-Emergency care

5-Oral prophylaxis

6-Periodical evaluation

## **C- Dental Health Treatment including preventive procedure**

It includes all those treatment and preventive procedures which are to be carried out after the examination of teeth and formulation of diagnosis

### **\*School based preventive programs include**

#### **A- Self applied fluorides:**

a-school fluoride mouth rinsing program

b- school fluoride tablet program

c-tooth brushing with fluoridated dentifrices

## **B- School based Sealant program**

The placement procedure for the sealant is rapid and painless. They are highly effective in protecting the occlusal pit and fissure.

## **C-School water fluoridation**

It is recommended only if the students are coming from the area which have low or no fluoride content. The recommended concentration for school water fluoridation is 4.5 ppm. Studies have shown approximately 40% reduction in dental caries due to school water fluoridation.

Why concentration of fluoride in school water 4.5 times than community?

1-children spend only a part of their total waking hours in schools.

2-They enter the school at 6 years of age; Thus, the incisors are no longer at risk of dental fluorosis.

3-Only part of daily water intake is consumed

## **D- Topical fluoride application program**

Acidulated phosphate fluoride (APF) topical procedure should be applied to children with new smooth surface caries, history of high caries or handicapped conditions

## **E- Oral health education**

The school can promote good health and prevent oral problems by educating students and parents, it should focus on:

- 1- Prevention of caries through proper oral hygiene
- 2- Use of fluoride or fluoridate water.
- 3- Good nutrition including restricting cariogenic diet
- 4- The use of mouth guard in high body contact sports

## Primary Health Care

Primary health care is an essential health care that is a socially appropriate, universally accessible, scientifically sound first level care provided by a suitably trained workforce supported by integrated referral systems and in a way that gives priority to those most in need, maximizes community and individual self-reliance and participation and involves collaboration with other sectors.

The concept of Primary health care involves a concentrated effort to provide the rural population of developing countries with at least the bar minimum of health services.

### Element of Primary health care

- 1-Education concerning prevailing health problems and the methods of preventing and controlling them
- 2-Promotion of food supply and proper nutrition
- 3-Monitoring an adequate supply of safe water and basic sanitation
- 4-Maternal and child health care, including family planning
- 5-Immunization against the major infectious diseases
- 6-Prevention and control of locally endemic diseases
- 7-Appropriate treatment of common diseases and injuries
- 8-Basic laboratory services and provision of essential drugs.
- 9-Training of health guides, health workers and health assistants .

### Principles of Primary health care

#### 1-Equitable Distribution.

The first key Principle in Primary health care strategy is equitable distribution of health services. Health services must be shared equally by all people irrespective of their ability to pay all (rich, poor, urban or rural) must be have access to health services.

#### 2- Community participation.

Overall responsibility is of the state. The involvement of individuals, families and community in promotion of their own health and welfare is an essential ingredient of Primary health care.

PHC coverage cannot be achieved without the involvement of community in planning, implantation and maintenance of health services.

#### 3- Intersectoral Coordination

PHC involves in addition to health sector, all related sectors in particular agriculture (e.g. food security). food industry, education, housing, public works and communication. To achieve cooperation, planning at country level is required to involve all sectors.

### Primary dental health care

dental health may be defined as a state of complete normality and functional efficiency of the teeth and support structures and also of the surround parts of the oral cavity.

The general goals of dental care are:

- 1- Dental health promotion
- 2- Prevention and treatment of dental diseases.

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**P.D.H.C can be considered under four heading or steps these are:**

**A-Socially:**

The community itself must take the principle role in dental health care activities. It is the responsibility of dental profession to each the people that they should not regard dentistry as simply the provision of services to relieve pain and restore function and appearance, but they must be motivated to use preventive measures themselves from birth to old age to keep their teeth in a healthy mouth.

Each community must primarily be educated about:

- 1-The benefit of fluoride in reducing dental caries.
- 2-Various oral hygiene measures of removal dental plaque.
- 3-Correct food habits for children (restriction of eating sweet not more than 3 times a day and not between snacks).
- 4-Harmful effects of habits such as smoking.
- 5-Early recognition of precancerous and cancerous lesion (e.g. ulcer in the mouth not healing for 2-3 weeks, should consult dentist).
- 6-The importance for regular visits to the dentist for routine examination.

**B- Technically:**

Oral health teams must be developed which enable both dentist and auxiliaries to guide their community population toward desired level of oral and general health through the development of an appropriate primary dental health system.

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Dental school in some countries produce dentists who are also able to render primary oral health care. Dentist or medical doctor with appropriate oral health information should act as leaders of the whole health team.

C- Economically:

Those responsible for dental health care services must develop systems which utilize the resources available to provide level of D.H.C for everyone.

D- Politically:

Primary dental health care cannot develop without the full support of national resources.

**Basic dental services are given below these services:**

1-Emergency dental care (relief pain).

2-Primary care includes (oral hygiene instruction, use caries preventive as fluoride and fissure sealant).

3-Secondary care (simple restoration, pulp therapy in primary teeth, anterior teeth endodontic).

4-Limited rehabilitation (complex restoration builds up, surgical extraction).

5- Rehabilitation (Fixed bridge, molar endodontic).

6-Complex rehabilitation (placing implant, elective oral surgery 3<sup>rd</sup> molar).

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## Environment

can be defined as the sum total of all conditions and influences that effect the development and life of an organism.

It comprises of:

- 1-Physical environment: it is applied to non-living things and physical factors (e.g. air, water, soil, climate.....etc)
- 2- Biological environment: it is the universe of living things which surrounds man including man himself.
- 3- psychological environment: it is including a complex psychological factor which are defined as those factors affecting personal health, health care and community well-being that stem from psychosocial make up of individual and the function of social groups (e.g. culture, habit, religion, occupation and income)

### **Pollution:**

It is distinct from contamination and implies the presence of offensive but not necessarily infectious in the environment.

**The activities under environment health include:**

- 1- Control of air pollution, radiation and noise.
- 2- Accident prevention.
- 3- Public recreation.
- 4- Solid waste management.
- 5- Food hygiene and sanitation measures at times of epidemics, disasters, emergencies and migration.

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## Environment indicators:

### A- Air pollution:

It is important physical factors causes mechanical and irritation of the respiratory passage and lungs. Pure air is never found the foreign substance are always present in air at all times and at all place.

Toxic and irritant gases and fumes:

- 1-carbon monoxide and carbon dioxide
- 2-Nitrogen dioxide
- 3-Sulfur dioxide
- 4-Hydrogen sulfide
- 5-Amonia
- 6-Ozone

Sources of air pollution;

- 1-Industrial
- 2-Combustion of coal and oil
- 3-Motor vehicles (more in urban area)

Effect of air pollution:

- 1-The immediate effect: allergy, acute bronchitis.
- 2- The delayed effect: chronic bronchitis, lung cancer
- 3- It does not affect the oro-dental disease, but indirectly it effects the development of joints and nasopharyngeal complex, thereby affecting the oro-dental structure.

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Prevention and control of air pollution

- 1- Dilution and ventilation: (green belts around industrial zones) reduce air pollution
- 2- Prevention of escape substances.
- 3- Converting coal based industrial to electricity based.
- 4- Legislation smoke nuisance act (to improve quality of air and to prevent and control air pollution).
- 5- International action: WHO has established in international network of many centers and laboratories in various part of the world for monitoring and study of air pollution.

### B- Radiation:

- Radiation is part of man environment. It is transmission of energy through space.
- Ionizing radiation is applied to radiation which has the ability to penetrate tissues and deposit its energy within them.

Effect of radiation on oral tissues:

- 1-Mucositis: secondary infection by candida albican.
- 2-Taste bud: taste acuity decreases during course of radiation.
- 3- Salivary glands: reduced salivary flow lead to dry mouth which cause difficulty in swallowing
- 4-Teeth: tooth bud may be destroyed and lead to severely retarded development of teeth.
- 5-Bone: bone infection and necrosis may occur following irradiation (osteoradionecrosis).

Protection from radiation:

- 1-Un necessary x-ray exposure should be avoided especially in children and pregnant women.
- 2-Lead aprons and thyroid collars will reduce the intensity of scattered x-ray.
- 3-Film badge should be used by all workers.
- 4-Safe distance from x-ray machine.

### C- Water Pollution:

The main cause of problems health in the underdeveloped or developing countries is lack of safe drinking water. If water contains infective and parasitic agent, poisonous chemical substances it is called polluted or contaminated water.

Hazard of water pollution may be classified in two groups:

- 1-Biological hazards: characterize by the presence of infective agent like viral, bacteria
- 2-Chemical hazards: characterize by the presence of chemical substance like cyanides, heavy metal, mineral, organic acid nitrogenous, sulphide and ammonia.

Purification of water:

- 1- Storage: water should not be stored for more than 14 days.
- 2- Filtration: about 99% of Bacteria, ova and cyst are removed by this process
- 3- Chlorination: it is done along with filtration; chlorine kills pathogen bacteria but it has no effect on viruses.

### D- Noise Pollution:

Noise is defined as un wanted sound in the wrong place at the wrong time.

Effect of noise:

- 1- Auditory effect: fatigue and deafness (Temporary or Permanent)
- 2- Non auditory effect:
  - Interference with speech
  - Noise can greatly affect efficiency
  - Annoyance (psychological response)

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Physical change:

- 1-increase blood pressure
- 2-increase intracranial pressure
- 3-increase heart rate and breathing
- 4-increase tension
- 5-interfer with sleep

Noise control:

- 1- Control of noise at source: by application of noise reducers to machines
- 2- Control of transmission: by covering the room walls with sound absorbing materials.
- 3- Protection of exposed persons: hearing protection is recommended for all workers exposed to noise like use ear plugs or ear muffs
- 4- Legislation and education.

## Dental Need and Demand

**Need for care** is defined as the quantity of dental treatment which should be available over a time period for people to be certified dentally healthy

**Demand:** is the expression by a patient or the public of desire to receive health care related to the perceived needs

**There are four categories of need:**

- Normative need (defined by the professional) is that which the professional defines as need in any given situation
- Felt need (Perceived need) this reflects the individual own assessment of his or her requirement for health care. It is equated with want.
- Expressed need (demand) this is felt need is converted in to action by seeking care
- Comparative need, which is assessed by comparing care received by different people with similar characteristics.

**The methods of assessment of treatment need has been through:**

- 1-Clinical examination
- 2-Measuring patient demand for treatment.
- 3-Survey system to determine oral health status of the population

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**Utilization** can be defined as the actual attendance by members of the public at dental treatment facilities to receive dental care

## Factors affecting dental demands:

- Age: Utilization are lowest in children < 5 years and in person >65 years.
- Gender: female more than male but in some age and education, male= female
- Education: Utilization increased with increasing the level of education.
- Socioeconomic status: higher social class more than low social class. This is because higher social class often related to high income and good educational level.
- Occupation: Persons in professional occupation visit their dentist more than non-skilled manual worker.
- Residence: Urban area more than rural area

**Manpower:** defined as individual with a kind of knowledge, skill and attitude need to achieve predetermined health target and ultimately health status objective.

**Dental health manpower planning:** has been defined as the process of estimating the number of persons and the kind of knowledge and skills the need to achieve predetermined dental health targets and optimal improvements in dental health of the population

## Dental health manpower planning involves:

- 1-Analysis and projections of dental health needs and demands for population which obtained from epidemiological surveys and treatment records.
- 2-Assessment of present dental health manpower availability and its pattern of utilization.
- 3-Formulation of policy.
- 4-Estimation of future manpower requirements.

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## Biostatistics

**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 & 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.
- For comparison & researches.

**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.

There are two general types of data:

### **-Quantitative data**

Quantitative or numerical data is information about quantities; that is, information which can be measured and written down with numbers. Some examples of quantitative data are height, number of people in a household, number of cigarettes smoked per day.



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## **-Qualitative data:**

Is information about qualities; information that can't actually be measured. Qualitative data is a categorical measurement expressed not in terms of numbers, but rather by means of categories.

Some examples of qualitative data are the gender, race, religion, color of eyes or sport.

## **Qualitative data are classified as:**

**a- Nominal** if there is no natural order between the categories (e.g. eye color: blue, green, brown etc..).

**b-Ordinal** if an ordering exists (eg. exam results: pass or fail, socioeconomic status: low, middle or high.).

**Methods of Data Collection:** There are different methods of data collection:

**Census.** A census is a study that obtains data from every member of a population. In most studies, a census is not practical, because of the cost and time required.

**Sample survey.** A sample survey is a study that obtains data from a subset of a population, in order to estimate population attributes.

**Experimental study.** An experiment is a controlled study in which the researcher attempts to understand cause-and-effect relationships. The study is "controlled" in the sense that the researcher controls (1) how subjects are assigned to groups and (2) which treatments each group receives.

**Observational study.** Like experiments, observational studies attempt to understand cause-and-effect relationships. However, unlike experiments, the researcher is not able to control (1) how subjects are assigned to groups and/or (2) which treatments each group receives.



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## Sampling Technique

It is difficult to study all members of a population due to constraints of time and money. Often the measurements made may be better and several types of biases can be avoided. However, the sample that has been drawn needs to be representative of the population from which it is drawn.

Sampling: is the process of selecting a part of population with appropriate characteristics and adequate size. Sample: is a part of a parent population that satisfies a set of well-defined selection criteria. Sample selected in two basic ways:

### 1) PURPOSIVE SELECTION

When a researcher chooses specific people within the population to use for a particular study or research project. The idea behind purposive sampling is to concentrate on people with particular characteristics who will better be able to assist with the relevant research. It does not need the preparation of sampling frame.

### 2) RANDOM SELECTION

It is useful in investigations on community health. Here a sample of units is selected in such a way that all the characteristic of the population is reflected in the sample and selecting the units of sample randomly that each unit in the population has an equal chance of being in the sample.

## Random Sampling designs:

Different sampling designs are available depending on the type and nature of the population and the objectives of the investigation. Some designs commonly used are:

- a) Simple random sampling
- b) Systematic random sampling
- c) Stratified random sampling
- d) Cluster sampling
- e) Multiphase sampling

### a) Simple random sampling:

Each element in the population has an equal chance of being included in the sample. There are many ways to obtain a simple random sample. One way would be the lottery method. Each of the N population members is assigned a unique number. The numbers are placed in a bowl and



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thoroughly mixed. Then, a blind-folded researcher selects  $n$  numbers. Population members having the selected numbers are included in the sample.

It requires that a complete list of every element in the population be obtained. Random number tables could be used for this technique. In this method, the selection of the unit is determined by chance only.

## **b) Systematic random sampling:**

it is formed by selecting one unit at random and then selecting additional units at evenly spaced interval till the sample size has been formed. For example: 300 patients in a clinic and it is decided to select a sample of size 30. From the numbers 1 to 10, suppose the number 3 is selected at random. The next unit will be, for example, 7 which is the interval, so the serial numbers of the sample units will be 3, 10, 17, 24, and 31, and so on till 30 numbers.

## **c) Stratified random sampling:**

- The population to be sampled is subdivided into groups known as strata in which the individuals share the same characteristic. For instance, the population might be separated into males and females.

- A simple random sample is then chosen from each stratum. This type of sampling is used when the population is heterogeneous with regard to the characteristic under study. For example, study prevalence of dental caries in different age groups, then the age groups form the strata and a random sample is to be chosen from each stratum

## **d) Cluster sampling:**

This method is used when the population forms natural groups or clusters, such as children of school etc. Here, first a sample of the clusters is selected and then all the units in each of the selected clusters are surveyed. For example, in a dental survey in schools each section in a class could be used as a cluster.



## e) Multiphase sampling:

In this method, a part of the information is collected from the whole sample and a part from the sub-sample. For example, in a school health survey, all the children in the school may be examined. From these, only the ones with tooth fracture may be selected in the second phase. A section needing treatment may be selected in the third phase.

### Sample size

The sample size is the number of participants in a sample.

- A larger sample can yield more accurate results.
- The sample size should be defined before starting a clinical study so as to avoid bias in interpreting results.
- If we include very few subjects in a study, the results cannot be generalized to the population as this sample will not represent the size of the target population. Further, the study then may not be able to detect the difference between test groups, making the study unethical. On the other hand, if the study included **more subjects than required**, more individuals will be exposed to the risk of the intervention, also making the study unethical, and waste precious resources, including the researchers' time

**Sampling errors:** there are two types of errors that arise in sampling investigation:

A- Sampling errors which occur due to sampling process and could arise because of:

- faulty sampling design
- small size of the sample

B –non-sampling errors arise due to:

- coverage error due to non-response or non-cooperation of the informant.
- observational error due to interviewer's bias or imperfect experimental technique or interaction of both.
- processing error due to error in statistical analysis.



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## 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 summarized and analyzed 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.

#### Frequency Distribution Tables

Is a table which shows the data arranged into different classes (or categories) and the number of cases (or frequencies) which fall into each class.

#### Gender distribution of survey population

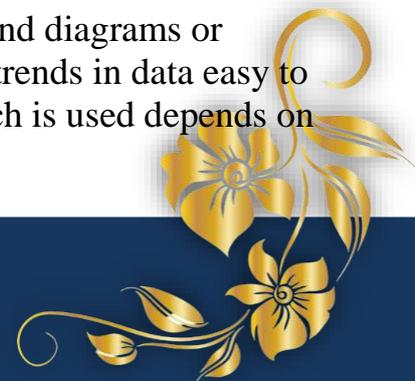
<i>Gender</i>	<i>Number</i>	<i>%</i>
Females	44	58.6
Males	31	41.4
Total	75	100

#### Prevalence of caries among males and females

Gender	Caries	%	No Caries	%	Total
Female	30	68.2	14	31.8	44
Male	16	51.6	15	48.4	31
Total	46	61.3	29	38.7	75

### 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.



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

**3-Sub-divided bar graph (component bar):** When there are many categories and they have further subcategories, then to accommodate the categories, the bars may be divided into parts, each part representing a certain item and proportional to the magnitude of that particular item, various components in each bar should be kept in the same order. The components are shown with different colors.

## c-The Frequency Polygon

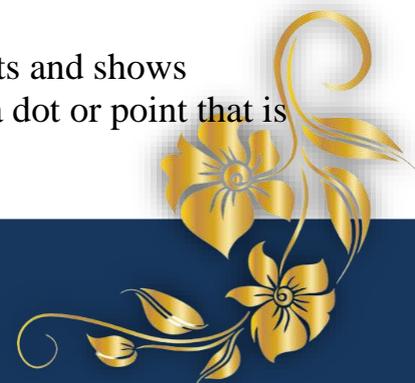
Using the fact that each class interval may be represented by its class mid-point, we may plot the class mid-points against the class frequencies to obtain a display of single points so it is an area diagram of frequency distribution over a histogram, obtained by joining the mid points of the histogram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



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## **f-Scatter-plots diagram**

The scatter-plots visualize a relation (correlation) between two variables X and Y (both of them quantitative). If the dots cluster round a straight line, it shows evidence of a relationship of a linear nature. If there is no such cluster, it is probable that there is no relationship between the variables.

## **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.

## **h-Pictogram**

Popular method of presenting data to those who cannot understand conventional charts. Small pictures or symbols are used to present the data, e.g a picture of a doctor to represent the population physician. Fraction of the picture can be used to represent numbers smaller than the value of whole symbol



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## Measures of Central Tendency and Dispersion

Two kinds of statistics are frequently used to describe data, they are:

- Measures of central tendency.
- Measures of dispersion.

These are often called **descriptive statistics** because they can help in describing the data.

### Measures of central tendency:

A score that indicates where the center of the distribution tends to be located.

A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position of a distribution within that set of data (where the center

of the data set is). They help summarize a lot of scores with a single number. So, they give

idea about the shape and nature of the distribution.

The **mean, median and mode** are all valid measures of central tendency, but under different conditions, some measures of central tendency become more appropriate to use than others.

### **1-Mean (arithmetic)**

The mean (or average) is the most popular and well-known measure of central tendency.

The mean is equal to the sum of all the values in the data set divided by the number of values in the data set. It is affected by extreme values. Example: if we have  $n$  values in a data set and they have values  $x_1, x_2, \dots, x_n$ , the sample mean, usually denoted by

(pronounced  $\bar{x}$ ), is:

$$\text{Mean} = \frac{\sum x_i}{n}$$



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## 2-Median

The median is the middle value for a set of data that has been arranged in order of magnitude. Half the values are above the median and half are below the median. It is not affected by the extreme values.

In order to calculate the median, suppose we have the data below:

6	5	8	2	3	4	5	9	7	14	12
---	---	---	---	---	---	---	---	---	----	----

We first need to rearrange that data into order of magnitude (smallest first or the reverse.):

2	3	4	5	5	6	7	8	9	12	14
---	---	---	---	---	---	---	---	---	----	----

The median mark is the middle mark - in this case, **6**. It is the middle mark because there are 5 scores before it and 5 scores after it. This when number of scores is an odd, but when an even number of scores (e.g. Only 10 scores) the middle two scores are taken and average

the result. So, if we look at the example below: We again rearrange that data into order of magnitude:

The 5th and 6th score in the data set should be taken then average them to get a median of  $5 + 6 / 2 = 5.5$

2	3	4	5	5	6	8	9	12	14
---	---	---	---	---	---	---	---	----	----

## 3- Mode

The mode is the most frequent score in data set.

2	3	4	5	5	6	8	9
---	---	---	---	---	---	---	---

Mode= 5

## Measures of Dispersion:

A measure of dispersion is a numerical value describing the amount of variability present in a data set. It helps in describing the spread of scores within a group of scores (if the scores close together or are they far apart).

**-Standard deviation (SD)**

**-Variance**

**-Range**



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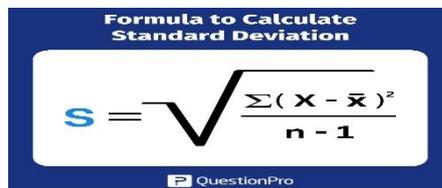
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## 1-Standard deviation (SD)

is the most commonly used measure of dispersion. It is used to quantify the amount of variation or dispersion of a set of data values. A low standard deviation indicates that the data points tend to be close to the mean (also called the expected value) of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values. With the SD we can measure the variability between data values from the mean (the scatter of the values about their mean).

The Standard Deviation is a measure of how numbers are spread out. SD is the square root of the variance.



Formula to Calculate Standard Deviation

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

QuestionPro

**2- Variance** measures the degree of spread (dispersion) in a variable's values.

Theoretically, a population variance is the average of squared difference of values from the mean, in other word it is the square of standard deviation. If the data tend to be far away from the mean, the variance will be large. Conversely, if the data tend to be close to the mean, the variance will be small.

$$s^2 = \frac{\sum (X - \bar{X})^2}{N - 1}$$

### To Find Variance and Standard Deviation:

1. Calculate the mean,  $\bar{x}$ .
2. Write a table that subtracts the mean from each observed value.
3. Square each of the differences.
4. Summation of the  $(X - \bar{x})^2$
5. Divide by  $n - 1$  where  $n$  is the number of items in the sample, this is the *variance*.
6. To get the *standard deviation* we take the square root of the variance.



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## 3-Range

can also be used to describe the variability in a set of data and is defined as the difference between the largest and the smallest values in a data set. The range value of a data set is greatly influenced by the presence of just one unusually large or small value. it only measures the spread between highest and lowest values.

Example: In {4, 6, 9, 3, 7} the lowest value is 3, and the highest is 9. So, the range is  $9 - 3 = 6$



## Occupation Hazards in Dentistry

Dentists are exposed to a number of occupational hazards. They result in diseases and complexes in many cases. Close contact with the patients, their saliva and blood, exposes the dentist to occupational biohazards, many of them are contagious. Dental professionals are at risk for exposure to numerous biological, chemical, environmental, physical, and psychological workplace hazards.

We can define "Occupational hazard" as a risk to a person usually arising out of employment.

Many occupational health problems still persist in modern dentistry despite numerous technical advances in recent years. These include percutaneous exposure incidents; exposure to infectious diseases, radiation, dental materials, and noise, musculoskeletal disorders, dermatitis and respiratory disorders, eye injuries, and psychological problems.

### ***Major occupational hazards are:***

1. Biological health hazards
2. Physical hazards
3. Chemical hazards
4. Musculoskeletal disorders and diseases of the peripheral nervous system
5. Hearing loss
6. Radiation exposure
7. Stress
8. Legal hazards
9. Other risks



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## **Biological Health Hazards**

Dentists constitute a group of professionals who are likely to become exposed to biological health hazards.

These hazards are constituted by infectious agents of human origin which include prions, viruses, bacteria and fungi. All of the dental team are at risk of exposure to hepatitis B virus (HBV), HIV infection, and other types of communicable infections. Several of the common viral agents that can cause hepatitis have been detected in body fluids like saliva and blood. A dentist can become infected either directly or indirectly.

**Direct infection** microorganisms can pass into organism, through a cut on the skin of his/her hand while performing a medical examination, as a result of an accidental bite by the patient during a dental procedure, or through a needle wound during an anesthetic procedure.

**Indirect infection** include: Aerosols of saliva, gingival fluid, natural organic dust particles (dental caries tissue) mixed with air and water, and breaking free from dental instruments and devices.

The main entry points of infection for a dentist are: epidermis of hands, oral epithelium, nasal epithelium, epithelium of upper airways, epithelium of bronchial tubes, epithelium of alveoli, and conjunctival epithelium.

## **Physical Hazards**

The dentist and the clinical staff are at risk of physical injuries during many dental procedures. Sources of physical injury can include debris from the oral cavity striking the eyes, cuts from sharp instruments, or puncture wounds from



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needles or other sharp instruments. Those injuries can result in the transmission of serious infectious disease to the dental worker.

Percutaneous exposure incident (PEI) is a broad descriptive term that includes needle stick and sharp injuries, as well as cutaneous and mucous exposures to blood and serum. The most common of them is from needles and drilling instruments such as burs.

## ***Eye injuries may occur from***

**Projectiles** such as bits of calculus during scaling procedures

**Splatters** from body fluids (bacterial and viral aerosols) while using high-speed hand pieces.

Another potential source of eye injury is the **intense dental curing light**. Users of dental curing lights should be advised to employ protective eyewear during use. The use of protective eyewear is an important means of preventing occupational injury related to the use of dental curing lights and high-speed rotary instruments. Injury from splatters and projectiles including calculus and flying debris during cavity preparation is a common cause of damage to the eyes, and the use of protective eyewear should be emphasized.

## ***Chemical Hazards***

Many of these chemicals are among those whose health effects may not be known and may pose health problems taking years to manifest. Hazardous chemical agents used in clinical dentistry include mercury, powdered natural rubber latex (NRL), disinfectants, and nitrous oxide (N<sub>2</sub>O).



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## ***Mercury***

has the potential for continuous occupational exposure of a dental practitioner to mercurial vapor which can be absorbed via the skin and the lungs. It is advisable to conduct regular mercury vapor level assessments in clinical settings; receive episodic individual amalgam blood level tests; and use goggles, water spray, and suction during the removal of old amalgam restorations.

## ***Latex Hypersensitivity***

Gloves and mask form an integral part of dentist's protective equipment. The gloves and the mask form an efficient barrier against most pathogens; they also constitute a very good barrier against viruses, provided they are intact. However, they may also be a source of allergies, primarily in those persons who use rubber products on a regular basis. The continued use of powdered natural rubber latex (NRL) gloves and disinfectants has predisposed clinical dental workers to hand dermatitis, contact dermatitis, contact urticaria, and allergic dermatitis.

## ***Cyanoacrylate (CA) Toxicity***

Cyanoacrylate (CA) and its homologues have a variety of dental applications as adhesives. The increasing use of CA in dentistry, particularly as adhesive and sealing glue, has raised concerns regarding its potential toxicity in humans. Reported toxicity of CA is uncommon in the dental workplace, but may manifest as conditions such as urticaria, contact dermatitis and other dermatoses.

Dental staff using CA adhesives should avoid direct contact with CA and use appropriate personal protective measures. Maintaining higher levels of humidity, optimizing room ventilation and using special air conditioning filters in the



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working environment may be useful in minimizing the toxicity of volatile CA adhesives.

## ***Musculoskeletal Disorders and Diseases of the Peripheral Nervous System***

At work, the dentist assumes a strained posture (both while standing and sitting close to a patient who remains in a sitting or lying position), which causes an overstress of the spine and limbs. The overstress negatively affects the musculoskeletal system and the peripheral nervous system; above all, it affects the peripheral nerves of the upper limbs and neck nerve roots.

The most common injuries reportedly experienced by the dental hygienist are musculoskeletal in nature.

## ***Hearing Loss***

The noise of suction, saliva ejectors, turbines, engines, amalgamators, compressors, etc. may cause impaired hearing. Still some dentist may be at risk especially where faulty or older equipment is used.

## ***Radiation Exposure***

The radiation dose received by an individual is generally low and relatively few cells are damaged during an average radiological examination. Thus, the effect of even low levels of exposure to ionizing radiation over periods of time may accumulate and could represent a potential hazard to health. Dental staff should take steps to protect themselves during exposure by standing behind protective barrier, use of radiation monitoring badges and regular equipment checks and maintenance. Use of safety shields and glasses are recommended as they are protective.



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## *Legal Hazards*

There are relevant statutes and regulations which apply to the practice of dentistry in every country. The contravention of any of these may warrant that legal actions be brought against a dental practitioner particularly in developed countries where the citizens appear more aware of their rights. To help assure a safe work environment in dental treatment, the hazard awareness and prevention of legal risks should be made known to all clinical workers of the dental hospital/clinic.

## *Prevention of Occupation Hazards*

Health risks in dentistry may arise as new technologies and materials are developed. However, once identified and recognized as risk, new guidelines, precautions, and protocols are often rapidly instituted to greatly reduce or even eliminate the occupational hazard.

**Education.** The role of one's occupation as an important factor in maintaining personal health needs to be constantly emphasized so workers understand any possible negative health implications of their jobs and how to minimize them.

**Infection control** and proper handling of potentially infected materials. Barrier techniques include gloves, masks, protective eye wear, high power suction and good ventilation to reduce aerosols and vapor dangers.

**Hypoallergenic nonlatex gloves** are proposed can decline latex allergy

**prevent radiation hazard** Lead aprons, periodic maintenance of the X ray machine and radiation level sensors



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## **Prevent musculoskeletal disorders**

Identify symptoms as soon as they become apparent

Consider ergonomic features for dental equipment

Modify working conditions to achieve optimal body posture

Achieve optimum access, visibility, comfort, and control at all times



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## Forensic Dentistry

**Forensic dentistry** or **Forensic Odontology** is the proper handling, examination and evaluation of dental evidence, which will be then presented in the interest of justice.. It comes into use when identification by the use of skin (ex. fingerprints) is not possible. The teeth and dental restorations are the strongest elements in the human body and survive the destructive influences of fire and exposure to the elements. Forensic identification plays a major role in man-made or natural disaster. Dental identification of humans occurs in a number of different cases:

1. The bodies of victims of violent crimes, fires, and motor vehicle accidents
2. Persons who have been deceased for some time prior to discovery,
3. Those found in water, can be disfigured to such an extent that identification through conventional methods are difficult.

In the case of forensic dentistry, experts (forensic dentists) can use dental records for:  
**I. Identification of found human remains:** It was done by using dental records.  
The principle of dental identification is that:

- ❖ postmortem dental remains can be compared with antemortem dental records, including
  - written notes,
  - study casts,
  - radiographs,
  - photographs etc, to confirm identity.



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❖ If there is no antemortem dental records, a postmortem dental profile will typically provide information on the victim's:

## 1-Age:

- In children: The patterns of tooth eruption, the root length, tooth wear were assessed.
- In young adults: The third molar development.
- In middle-aged and older adults: Periodontal disease progression, excessive wear, multiple restorations, extractions were assessed.

2-**Race** can be assessed from skull shape and form. Additional characteristics, such as cusps of Carabelli, shovel-shaped incisors and multi-cusped premolars.

3-**Gender** can be assessed from

- Skull shape and form, (no gender differences regarding teeth morphology).
- Presence or absence of Y-chromatin in teeth.
- DNA analysis.
- Mandibular canine size

4- **Socio-economic status** can be assessed through the quality, quantity and presence or absence of dental treatment.

5-**Occupation, dietary habits and dental or systemic diseases.** The presence of erosion can suggest alcohol or an eating disorder while stains can indicate smoking, tetracycline. Unusual wear patterns may result from pipe stems, cigarette holders.

II. **Identification the suspect** through the assessment of bite mark injuries in cases of abuse in (child, spousal, elder) and in women during sexual attacks. Bite marks can be found on:

- the victim (by the attacker),
- the attacker (suspect) when a victim attempts to defend himself,
- an object found at the crime scene.



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## **Evidence collection from the bite victim**

Dentists should be familiar with the general principles of evidence collection. These are:

### *1. Documentation*

Make a descriptive record of the injury, including the physical appearance, colour, size and orientation of the injury, location on the body, relative contour and elasticity of the site, and types of injuries.

### *2. Photographs*

Take photographs, both color and black-and-white films.

### *3. Saliva swab*

a. Saliva will have been deposited on the skin during biting and this should be collected and analyzed.

b. A buccal swab or a sample of whole blood must be collected from the victim at this time to assess the victim's DNA. This will enable analysis of any mixtures that are found in the sample from the bite.

### *4. Impression*

Fabricate an impression of the bitten surface to record any irregularities produced by the teeth.

## **Evidence collection from the bite suspect**

The following evidence are recovered during examination of the bitemark suspect:

### *1. Clinical examination*

The extra and intra-oral structures are examined and are noted on a dental chart. Special attention is focused on the status of the dental health, occlusion and mandibular articulation, tooth mobility, periodontal pocketing, dental restorations, diastemata, fractures, caries, etc., and the function of masticatory muscles.

### *2. Photographs*

Full facial and profile photographs are produced in addition to frontal and lateral views of the teeth in occlusion.



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## 3. Impressions

It is necessary to produce extremely accurate study casts of the teeth that record all characteristics of the dentition.

## 4. Bite sample

A sample of the suspect's bite is recorded in centric occlusion using a wax.

## 5. Salivary sample

Saliva is also taken for DNA testing.

## **\*\*Forensic physical and biological techniques for comparison**

The most common methods to determine if the suspect's teeth caused the bitemark include techniques to compare:

- the suspect's **study casts** with the actual or photographs of the bitemark,
- the suspect's **teeth pattern of dental cast** with photographs of the bitemark,
- the suspect's **test bites** with the actual bitemark.

The conclusions are often based on the expert's level of personal experience.

## **Factors that may affect the accuracy of bite mark identification include:**

1. Time-dependent changes of the bite mark on living bodies,
2. Effects of where the bite mark was found,
3. Damage on soft tissue,
4. Similarities in dentition among individuals,
5. Poor in techniques, exa. photography, impressions.

Also, dental profiles of the suspect are subject to change by time, for example

1. Loss of teeth.
2. Teeth attack by dental caries.

So, the suspect's DNA profile obtained from saliva or blood with salivary DNA surrounding the bitemark area proves to be a more reliable form of identification.



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## **DNA Analysis:**

Because of the resistant nature of dental tissues to environmental assaults, such as incineration, immersion, trauma, mutilation and decomposition, teeth represent an excellent source of DNA material. DNA analysis, also known as DNA fingerprinting, is a fairly new technology that may replace dental identification and fingerprint identification as the most definitive means of identifying unknown remains. Dental DNA analysis (the coronal pulp chamber and radicular canal are obvious target for DNA sampling).

## **Genomic and Mitochondrial DNA in Forensic Dentistry:**

The genomic DNA is found in the nucleus of each cell in the human body and represents a DNA source for most forensic applications. The teeth are an excellent source of genomic DNA because PCR analysis allows comparing the collected postmortem samples to known antemortem samples or parental DNA. Mitochondrial DNA is another type of material that can be used for body identification. Its main advantage is the high number of copies per cell (from hundreds to thousands of organelles). Second advantage is that mtDNA is inherited from mother only, not from father. Thus, an identical mtDNA can be obtained from siblings, their mother and maternal relatives. When the extracted DNA samples are too small or degraded, such as those obtained from skeletonized tissues, the likelihood of obtaining a DNA profile from mitochondrial DNA is higher than that with any marker found in genomic DNA.



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## Oral health care for Special populations

There are special populations in the community, including children, pregnant women, individuals with mental, physical or developmental disabilities, and those with other diseases as HIV, AIDS, heart disease, cancer, or diabetes. They have unique needs with respect to oral health and therefore may require care and oral health care that is integrated with medical care.

### Children:

The single most common chronic childhood disease is dental disease. Sometimes people wonder whether there is a need to look after a child's first teeth since they fall out anyway. However, all want healthy looking teeth as adults and that starts with having healthy teeth as children.

In order to help children protecting their teeth and gums and greatly reducing their risk of getting cavities, simple steps should be followed:

- Breastfeeding is the best form of nutrition for infants and it is associated with a lower risk of developing dental decay when compared with bottle feeding.
- Advice to brush child teeth twice a day with accepted fluoride toothpaste to remove plaque-the sticky film on teeth that's the main cause of tooth decay.



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- Advice to eat a well-balanced diet that limits starchy or sugary foods, which produce plaque acids that cause tooth decay. When child eat these foods, eat them with meal instead of as a snack-the extra saliva produced during a meal helps rinse food from the mouth.
- A balanced diet is necessary for the child to develop strong, decay-resistant teeth. As well as a full range of vitamins and minerals, a child's diet should involve plenty of calcium, phosphorous, and proper levels of fluoride.
- Frequent snacking may be the biggest enemy. The sugars and starches found in many foods and snacks like cookies, candies, dried fruit, soft drinks, pretzels and potato chips combine with plaque on teeth to create acids. These acids attack the tooth enamel and may lead to cavities.
- If the child is in pain from a broken, cracked or chipped tooth, should visit the dentist immediately. If possible, keep any part of the tooth that has broken off and take this with you to the dentist.
- If a tooth is completely knocked out of the mouth by an injury, take the tooth to the dentist as soon as possible. Handle the tooth as little as possible do not wipe or otherwise clean the tooth. Store the tooth in water or milk until you get to a dentist. It may be possible for the tooth to be placed back into the child's mouth, a procedure called reimplantation.
- Advice to take the child to the dentist for regular checkups, if there is no complain.



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## Pregnant women

Pregnancy is a unique period during a woman's life and is characterized by complex physiological changes, which may adversely affect oral health. Preventive, diagnostic, and restorative dental treatment is safe throughout pregnancy and is effective in improving and maintaining oral health. In addition to providing pregnant women with oral health care, educating them about preventing and treating dental caries is critical, both for women's own oral health and for the future oral health of their children. Evidence suggests that most infants and young children acquire caries-causing bacteria from their mothers. Providing pregnant women with counseling to promote healthy oral health behaviors may reduce the transmission of such bacteria from mothers to infants and young children, so that delaying or preventing the onset of caries. For these reasons, it is essential for health professionals to provide pregnant women with appropriate and timely oral health care, which includes oral health education.

## Elderly people

As the ageing population is increasingly retaining their natural teeth, their need for optimal oral health care also increases.

Older peoples' mouths are prone to oral disease and those with natural teeth are more likely to have advanced gum disease (gingivitis or periodontitis). Oral health care for older people is often further complicated by a past dental history including crown and bridge work, partial dentures and implants.



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Oral health is linked to general health, and oral conditions including teeth, gums and dentures can significantly affect overall well-being and the ability to age positively.

- + Chronic oral infection can complicate the medical management of general illnesses such as diabetes, chronic heart failure and respiratory diseases.
- + Poor oral health results in bad breath and affects people's ability to speak, socialize and feel happy with their appearance.
- + Medications taken by older people often cause dry mouth (xerostomia) which affects speaking, eating and also increases the levels of oral bacteria and infection.
- + Older people may have a range of health problems or disabilities that affect on their ability to care for their own oral health and may need assistance during their hospital stay as well as follow up care on discharge. This may be related to issues associated with cognitive impairment or functional limitations such as hand and upper limb function due to poor dexterity, pain and strength. It may also involve functional problems with mouth and tongue movements and swallowing.

The following is a standard protective oral hygiene regimen for older people based the best ways to maintain a healthy mouth.

Additional oral care management may be identified and prescribed by the doctor or dentist. For example: antifungal, antibiotic and pain medication.

The best ways to maintain a healthy mouth for older people:

1. Brush morning and night.
2. Use fluoride toothpaste on teeth.



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3. Use a soft tooth brush on gums, tongue and teeth.
4. Use antibacterial product after lunch (Chlorhexidine product).
5. Keep the mouth moist.
6. Cut down on sugar.

## Special Care Dentistry (SCD):

The definition of Special Care Dentistry (SCD) could be as a branch of dentistry that provides oral care services for people with special health care needs (SHCN). It is used in reference to care for individuals with disabilities or those with systemic diseases.

## Special Health Care Needs (SHCN)

Special Health Care Needs (SHCN) is defined as any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and / or use of specialized services or programs.

Health care for individuals with special needs required specialized knowledge acquired by additional training, as well as increased awareness and attention, adaptation, and accommodative measures beyond what are considered routine.

Individuals with SHCN may be at an increased risk for oral diseases throughout their lifetime. Oral diseases can have a direct and disturbing impact on the health and quality of life of those with certain systemic health problems or conditions.



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## Patients with special health care needs including those with:

- Compromised immunity (Leukemia or other malignancies, human immunodeficiency virus)
- Medically compromised patients
- Cardiac conditions associated with endocarditis
- Mental disability
- Developmental disability
- Physical disability
- Amelogenesis imperfecta
- Odontogenesis imperfect
- Cleft lip / palate
- Oral cancer
- Ectodermal dysplasia
- Epidermolysis bullosa

## Interventions and Practices Considered:

**1. Scheduling:** The parents / patients initial contact with the dental practice allows a both patients an opportunity to address the patients primary oral health needs and to confirm the appropriateness of scheduling an appointment with that practitioner.

### **2. Patient assessment:**

- Obtaining medical history
- Performing comprehensive head, neck and oral examination



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- ✦ Caries risk assessment
- ✦ Recommending an individualized preventive program
  - Providing a summary of oral findings and specific treatment recommendations

**3. Consulting with physician,** nurses and social workers when necessary. The dentist should coordinate care via consultation with the patient's physician regarding medications, sedation, general anesthesia, and special restrictions or preparations that may be required to ensure the safe delivery of oral health care.

**4. Establishing good communications:** An attempt should be made to communicate directly with the patient during the provision of dental care. A patient who does not communicate verbally may communicate in a variety of nontraditional ways. At times, a parent, family member, or caretaker may need to be present to facilitate communication and or provide information that the patient cannot.

**5. Obtaining informed consent**

**6. Behavior guidance**

- Protective stabilization
- Sedation or general anesthesia
- Provision of care in a hospital or outpatient surgical care facility



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## 7. Preventive strategies

- Education of parents to ensure appropriate and regular supervision of daily oral hygiene
- Demonstrating oral hygiene techniques
- Stressing the need to use a fluoridated dentifrice twice daily and to brush and floss daily.
- Use electric or modified tooth brush
- Dietary counseling
- Sealant application
- Use of topical fluoride
- Interim therapeutic restoration (ITR).
- Use of chlorhexidine mouth rinse

8. **Encouraging** assistance from community – based resources

9. **Special considerations** for patients with developmental or acquired orofacial conditions

10. **Making appropriate referrals**

