Epidemiology of Malocclusion

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DEFINITIONS

- The definition of orthodontics proposed by the American Board of Orthodontics (ABO) and later adopted by the American Association of Orthodontists is:
  "Orthodontics is that specific area of the dental profession that has as its responsibility the study and supervision of the growth and development of the dentition and its related anatomical structures from birth to dental maturity, including all preventive and corrective procedures of dental irregularities requiring the repositioning of teeth by functional and mechanical means to establish normal occlusion and pleasing facial contours."

- Occlusion is defined as a manner in which the upper and lower teeth intercusoate between each other in all mandibular positions and movements. It is a result of neuromuscular control of the components of the mastication systems namely: teeth, periodontal structures, maxilla and mandible, temporomandibular joints and their associated muscles and ligaments (Aash & Raina, 1982).

• Normal occlusion:
  The normal occlusion was when the upper and lower molars were in a relationship whereby the mesiobuccal cusp of the upper molar occluded in the buccal groove of the lower molar and the teeth were arranged in a smoothly curving line of occlusion.
  (Angle, 1899)

• Malocclusion can be defined as:
  a) Improper relation of opposing teeth when the jaws are in contact.
     (Ortho booth Medical Dictionary for Health Consumers, 2007)
  b) Faulty contact between the upper and lower teeth when the jaw is closed.
     (The American Heritage Medical Dictionary, 2007)
  c) A deviation in mandibular and/or intermediacy relations of teeth that present a hazard to the individual's oral health. Often associated with other orofacial deformities.
     (Mosby's Dental Dictionary, 2nd edition, 2007)
  d) The World Health Organization (1987), had included malocclusion under the heading of Handicapping Dental Abnormalities, defined as an anomaly which causes disfigurement or which impairs function, and requiring treatment "if the disfigurement or functional defect was likely to be an obstacle to the patient's physical or emotional well-being."
  e) Malocclusion is an appreciable deviation from the ideal occlusion that may be considered aesthetically unsatisfactory (Johnson, et al., 1983) that impairing a condition of occlusion in the relative sizes and position of teeth, facial bones and soft tissues (lips, cheek, and tongue).

MALOCCLUSION

The advantages of classifying malocclusion is that it helps in,

a) Diagnosis and planning treatment for the patient.
b) Visualizing and understanding the problems associated with that malocclusion.
c) Communicating the problem.
d) Easy comparison of the various malocclusions.

Depending upon which part of the oral and maxillofacial unit is at fault malocclusions can be broadly divided into three types –

a) Individual tooth malpositions.
b) Malocclusion of the dental arches or dentoskeletal segments.
c) Skeletal malrelationships.

These can exist individually in a patient or in combination involving each other.
INDIVIDUAL TOOTH MALPOSITIONS

• These are malpositions of individual teeth in respect to adjacent teeth within the same dental arch. Hence, they are also called intra-arch malocclusions.

• These can be of following types:
  a) Mesial inclination or tipping: The tooth is tilted mesially, i.e. the crown is mesial to the root.
  b) Distal inclination or tipping: The tooth is tilted distally, i.e. the crown is distal to the root.
  c) Lingual inclination or tipping: The tooth is abnormally tilted towards the tongue.
  d) Labial/Buccal Inclination or tipping: The tooth is abnormally inclined towards the lips/cheeks.
  e) Infra-occlusion: The tooth is below the occlusal plane as compared to the other teeth in the arch.
  f) Supra-occlusion: The tooth is above the occlusal plane as compared to the other teeth in the arch.
Rotations: This term refers to tooth movements around the long axis of the tooth. Rotations are of the following two types:

1. Mesiolingual or Distolabial: The mesial aspect of the tooth is inclined lingually or in other words, the distal aspect of the crown is labially placed as compared to its mesial aspect.

2. Distolingual or Mesiolabial: The distal aspect of the tooth is inclined lingually or in other words, the mesial aspect of the crown is labially placed as compared to its distal aspect.

Transposition: This term is used in case where two teeth exchange places, e.g., a canine in place of the first premolar.

Malrelation of Dental Arch:
- An abnormal relationship between teeth or groups of teeth of one dental arch to that of the other arch.

These inter-arch malrelations can occur in all three planes of space, namely:

1. Sagittal plane Malocclusion
2. Vertical plane Malocclusion
3. Transverse plane Malocclusion

Sagittal Plane Malocclusions:
- Pre-normal Occlusion: Where the mandibular dental arch is placed more anteriorly when the teeth meet in centric occlusion.
- Post-normal Occlusion: Where the mandibular dental arch is placed more posteriorly when the teeth meet in centric occlusion.
They can be of two types:

1. **VERTICAL PLANE MALOCCLUSION**
   - Deep bite: Here the vertical overlap of the teeth between the two jaws is in excess of the normal.
   - Open bite: Here there is no overlap or a gap exists between the maxillary and mandibular teeth when the patient bites in centric occlusion. An open bite can exist in the anterior or the posterior region.

2. **TRANSVERSE PLANE MALOCCLUSIONS**
   - These include the malocclusion types where the maxillary teeth are placed labial/buccal to the mandibular teeth. This can happen due to the constriction of the dental arches or some other reason. The most common type is a subdivision, i.e., one or more maxillary teeth are placed mesiolingual to an uninvolved tooth. These differ in intensity, position and/or extent of the teeth that may be involved.

3. **SKELETAL MALOCCLUSIONS**
   - These malocclusions are caused due to a defect that lies in the jaw bones. The defect can be in size, position or relationship between the jaw bones.

**Angle’s Classification of Malocclusion**

Edward Angle was born on June 3, 1855 in Herrick, Bradford County, Pennsylvania. He studied at the Pennsylvania College of Dental Surgery and became a dentist in 1876. The development of Angle’s classification of malocclusion in the 1890s was an important step in the development of orthodontics because it not only subdivided major types of malocclusion but also included the first clear and simple definition of normal occlusion in the natural dentition.

**Class I** - Normal Occlusion

- The maxillary arch is in normal mesiodistal relation to the mandibular arch, with the mesiobuccal cusp of the maxillary first permanent molar occluding in the buccal groove of the mandibular first permanent molar and the mesiolingual cusp of the maxillary first permanent molar occludes with the occlusal fossa of the mandibular first molar when the jaws are at rest and the teeth approximated in centric occlusion.

**Class II** - Malocclusion

- Class II – Division 1: Along with the molar relation as seen in typical of class II malocclusions the maxillary incisor teeth are in labio-version.

- Class II – Division 2: Along with the typical class II molar relationship, the maxillary incisors are near normal anteriorly or slightly lingual to the maxillary lateral incisors are tipped labially and/or mesially.

- Class II – Subdivision: When the class II molar relationship occurs on one side of the dental arch only, the malocclusion is referred to as a subdivision of its division.

**Class III** - Malocclusion

- These are occurring due to an anteroposteriorly displaced maxillary dental arch, i.e., the maxillary arch lies lingual to the mandibular arch.

**Key Points**

- Deep bite
- Open bite
- Malocclusions
- Skeletal malocclusions
- Angle’s classification
- Class I, II, and III malocclusions
- Normal occlusion
- Anteroposterior displacement
- Vertical and transverse malocclusions
- Dental arch relationship
The mandibular dental arch and body is in mesial relationship to the maxillary arch; with the mesiobuccal cusp of the maxillary first molar occlusion in the interdental space between the distal aspect of the distal cusps of the mandibular first molar and the mesial aspect of the mesial cusps of the mandibular second molar.

**Pseudo-class III – Malocclusion:**
This is not a true class III malocclusion but the presentation is similar. It is the mandible shifts anteriorly in the glenoid fossa due to a premature contact of the teeth or some other reason when the jaws are brought together in centric occlusion.

**Class III – Subdivision:**
It is said when the malocclusion exists unilaterally (i.e., Class III molar relation on one side and Class I molar relation on other side).

**Etiology of Malocclusion – Classifications**

- **CLASSICAL FACTORS**
  1. Hereditary
  2. Congenital
  3. Environment
     a. Polycystic lesions, maternal diet
     b. German measles, maternal medication, etc.
  4. Postnatal (both injury, cerebral palsy, mouth breathing, etc.)
  5. Diet (nutritional deficiency)
  6. Genetic errors

- **LOCAL FACTORS**
  1. Anomalies of number:
     a. Supernumerary teeth
     b. Missing teeth (congenital absence or loss due to accidents, caries, etc.)
  2. Anomalies of tooth size
  3. Anomalies of tooth shape
  4. Abnormal labial frenum: mucosal barriers
  5. Premature loss of deciduous teeth
  6. Prolonged retention of deciduous teeth
  7. Delayed eruption of permanent teeth
  8. Abnormal eruptive path
  9. Ankylosis
  10. Dental caries
  11. Improper dental restoration

**The Orthodontic Equation**

Given by: Dr. Dockrell R.

(Classifying etiology of Malocclusion. The Dental practitioner and dental record journal, 1952; 72:25)
Genetic conditions caused by a mutation in a single gene follow predictable patterns of inheritance within families. Single gene inheritance is also referred to as Mendelian inheritance as they follow transmission patterns he observed in his research mice. There are four types of Mendelian inheritance patterns:

- **Autosomal Recessive:**
  - Recessive conditions are clinically manifest only when an individual has two copies of the mutant allele. When just one copy of the mutant allele is present, an individual is a carrier of the mutation, but does not develop the condition. Females and males are affected equally by traits transmitted by autosomal recessive inheritance. When two carriers mate, each child has a 25% chance of being homozygous wild-type (unaffected); a 50% chance of being homozygous mutant (affected); or a 25% chance of being heterozygous (unaffected carrier).
  

- **X-linked Recessive:**
  - X-linked recessive conditions are more common in males, with females acting as carriers. When just one copy of the mutant allele is present, females are carriers of the condition and do not manifest it clinically. Males, however, develop the condition due to the lack of a second, normal allele. Therefore, when females are carriers, they have a 50% chance of passing the recessive allele to each male offspring, all of whom will develop the condition, and a 50% chance of passing the normal allele to each female offspring, who will be carriers. When males are affected, they have a 50% chance of passing the recessive allele to each male offspring, who will also be affected, and a 50% chance of passing the normal allele to each female offspring, who will be carriers. The condition is more prevalent in males because females have two X chromosomes and therefore have a backup copy of the gene.

- **Autosomal Dominant:**
  - Dominant conditions are expressed in individuals who have just one copy of the mutant allele. The phenotype of the condition is observed irrespective of the gender of the individual. The condition is more prevalent in males because females have two X chromosomes and therefore have a backup copy of the gene. However, males have only one X chromosome, so any mutation on the X chromosome will be expressed.

- **X-linked Dominant:**
  - Because the gene is located on the X chromosome, there is no transmission from father to son, but there can be transmission from father to daughter (all daughters of an affected male will be affected since the father has only one X chromosome to transmit). Children of an affected woman have a 50% chance of inheriting the X chromosome with the mutant allele. X-linked dominant disorders are clinically manifest when only one copy of the mutant allele is present.

- **Mendelian Inheritance:**
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Most diseases have multifactorial inheritance patterns. The name implies, multifactorial conditions are not caused by a single gene, but rather are a result of interplay between genetic factors and environmental factors. Diseases with multifactorial inheritance are not genetically determined, but rather a genetic mutation may predispose an individual to a disease.

Other genetic and environmental factors contribute to whether or not the disease develops. Numerous genetic alterations may predispose individuals to the same disease (genetic heterogeneity). For instance coronary heart disease risk factors include high blood pressure, diabetes, and hyperlipidemia. All of those risk factors have their own genetic and environmental components. Thus multifactorial inheritance is far more complex than Mendelian inheritance and is more difficult to trace through pedigrees.

A typical pedigree from a family with a mutation in the BRCA1 gene. Fathers can be carriers and pass the mutation onto offspring. Not all people who inherit the mutation develop the disease, thus patterns of transmission are not always obvious.

BRCA1 and BRCA2 are human genes and its protein product, respectively. The official symbol (BRCA1, italic for the gene, nonitalic for the protein) and the official name (breast cancer 1, early onset) are maintained by the HUGO Gene Nomenclature Committee.

A strong influence of inheritance on facial features such as tilt of nose and shape of the jaws are familial tendencies.

Certain types of malocclusion run in families. The HABSBURG JAW, the prognathic mandible of Habsburg royal family is the best known example.

Hereditary Influence on Facial Type

- Human populations are described as dolichocephalic (long-headed), mesaticephalic (moderate), or brachycephalic (short-headed).
- Technically, the measured factors are defined as the maximum width of the bones that surround the head, above the supramastoid crest (behind the cheekbones), and the maximum length from the most easily noticed part of the glabella to the most easily noticed point on the back part of the head.
Hereditary influence on the growth and developmental pattern

- As with any organ system, a strong hereditary component in the accomplishment of their pattern is also at least partially under the influence of heredity. For example, the development of the root and the eruption of permanent teeth is equally slow.

Heredity and specific dentofacial morphologic characteristics

- Lundstrom concluded that heredity could be considered significant in determining the following characteristics:
  a. Teeth size
  b. Height of the palate
  c. Width and length of the arch
  d. Crowding and spacing of teeth
  e. Degree of sagittal overbite (scoop)

![Image](image1.png)

Example of racial differences in the permanent dentition of Mongoloids

- The most striking feature in the Mongoloid dentition is found on the lingual surface of the incisors. There is the accentuation of the lateral or marginal ridges which are fused with a raised cingulum and creates a deep lingual fossa. The ridge fades towards the incisal edge and this gives the tooth a "shovel" or "scoop" shape. This condition is found in approximately 90% of Mongoloids incisors of Eskimos and American Indians.

![Image](image2.png)

Homogeneous and heterogeneous populations: Effect on Occlusion

- According to Dahlberg the following dento-anthropologic structures are useful for identification purposes and ascertain racial affinities:
  a. Cusp size, number and location
  b. Occlusal groove patterns
  c. Root system
  d. Number and arrangement of teeth
  e. Individual tooth measurement
  f. Dimensional proportions between different teeth (e.g. 1st molar, 2nd premolar)
  g. Occlusal and larynx relationship
  h. Nature of pulp chamber and canals
  i. Microscopic, tooth-surface characteristics

![Image](image3.png)

Dental malocclusion

- Dental malocclusion includes anomalies or deviations from the norm in the relationship of the upper and lower teeth. These are inherited independently. They are classified as either "crowding, spacing, or bite problems". Both are heavily influenced by heredity as a major etiologic factor. In both adults and children, a large number of malocclusion cases are found in the world's population. Malocclusion may arise in the form of congenital or genetic abnormalities, which cannot be changed. If environmental factors are involved at this stage, the individual's jaws and teeth can be expected to change with growth and development.

![Image](image4.png)
It is logical to assume that heredity plays a part in the following conditions:

1. Congenital deformities
2. Facial asymmetries
3. Macroglossia and microglossa
4. Macroglossia and microglossa
5. Glabella and anadactyly
6. Teeth shape variations (angulated lateral incisors, cuspids, canines, etc.)
7. Cleft palate and nasalia
8. Fossa diastemata
9. Deep overbite
10. Growing and rotation of teeth
11. Mandibular retrusion
12. Mandibular prognathism

**Congenital Defects**

- **Cleft lip & Palate:** defined as a "furrow in the lip and palatal vault" or as a "breach in continuity of lip and palate".

**Etiology:**

- Clefts usually have a strong genetic relationship.
- About 1/3 or 1/2 of all cleft palate children have a familiar history of this deformity.
- According to Bhatia the possible modes of transmission are either by a single mutant gene producing a large effect, or by a number of gene (polygenic inheritance) each producing a small effect together, creating this condition.
- According to Fogo-Andersen slightly less than 40% of the cleft lip cases with or without cleft palate are genetic in origin whereas slightly less than 20% of the isolated cleft palate cases appear to be genetically derived.

**Environment:** Teratogens, radiation & dietary deficiency

A. Teratogens are:
   a) Aspirin - cleft lip and palate
   b) Cigarette smoke (hypoxia) - cleft lip and palate
   c) Dilantin - cleft lip and palate
   d) Valium - cleft lip and palate
   e) Rubella virus

B. Radiations such as X-rays, gamma rays are capable of producing clefs in feta during pregnancy.

C. Dietary deficiency such as folic acid deficiency can produce clefs.

**Multifactorial Etiology:**

- Recent studies have shown that the etiology of cleft lip and palate cannot be attributed solely to either genetic or environmental factors. It seems to involve more than one factor.
- Multi-factorial inheritance theory implies that many contributory risk genes interact with one another and the environment, resulting in a defect in the developing fetus.
- Unless a person is genetically susceptible, the environment factors may not by themselves cause clefs.

**Incidence:**

- Unilateral cleft accounts for nearly 80% of all cleft cases.
- While bilateral clefts account for remaining 20%.
- Among the unilateral clefts, clefs involving the left side are more common.
- Male patients show a higher incidence of cleft lip with and without palate.
- Female patients suffer from isolated cleft palate more.
- Cleft lip & palate are common congenital malformations.
- The reported incidence of clefts in the lip and palate from 1 in 500 to 1 in 2500 live births depending on geographic origin, racial and ethnic backgrounds and socioeconomic status.
- Asian populations have the highest frequencies, often at 1 in 500 or higher, with Caucasian populations intermediate, and African derived populations the least at 1 in 2500.
- In the USA, one child in every 700 live births is afflicted.
Cerebral palsy is a neurological disorder caused by brain damage occurring before or during birth, which can lead to abnormal muscle tone, movement, and posture. It is not contagious nor is it due to infection.

Treatment: Medical therapy, surgery, and physical therapy help improve mobility and control of posture and movements. Some people with cerebral palsy may become independent, while others will require lifelong care.

Torticollis, or wry neck, is characterized by a fixed or abnormal movement of the head and neck in tilt, rotation, and flexion. It is not contagious and is not due to infection.

Treatment: For some children, movement and positioning, including operations to reverse the deformity, may improve movement and appearance.

Epidemiology: The incidence is estimated at 1 in 3,000 births.

Cleidocranial dysplasia is a hereditary disorder characterized by defects in the bones of the skull and collarbone. It is caused by mutations in the genes that code for certain bone-forming proteins.

Epidemiology: The incidence is estimated at 1 in 100,000 births.

Congenital syphilis is caused by the bacterium Treponema pallidum. If left untreated, it can cause severe damage to the brain, bones, and other organs.

Epidemiology: The incidence is estimated at 50 cases per 100,000 live births.
Dental abnormalities associated with Pierre Robin syndrome

- Centrally Notched, Widely Spaced/Pre-Shaped Upper Central Incisors
- Permanent First Molars with Multiple Poorly Developed Cusps

Prenatal

- Maternal nutrition refers to the nutritional needs of women during the antenatal and postnatal period (i.e., when they are pregnant and breastfeeding) and also may refer to the pre-conceptual period (2-4 years before conception).
- Maternal nutritional deficiencies such as folic acid deficiency can result in oral clefts which in turn increases the possibility of malocclusions, an inter-related problem.

Maternal Diet

- Teratogens are substances or environmental agents which cause the development of abnormal cell masses during fetal growth, resulting in physical defects in the fetus. The time of exposure is important for teratogens, as certain stages of embryonic/fetal development are more vulnerable than others. In general, the embryonic stage (first trimester) is more vulnerable than the fetal period (second/third trimester).
- Examples of teratogens include certain chemicals, medications, and infections or other diseases in the mother.
- Thalidomide is one notable classic example. It was marketed as a treatment for morning sickness, which was used in the 1950s to cause total or partial absence of the arms or legs in babies.

MATERIAL DENTAL

- Malocclusion

MALOCCLUSION

- The role of prenatal influences on malocclusion is probably very small.
- Intramural molding pressure against the outer face prenatally can lead to distortion of rapidly growing areas. E.g., On rare occasions an arm is pressed across the face in uterus, resulting in severe maxillary deficiencies at birth.
- Pierre Robin syndrome: a congenital condition of facial abnormalities in humans.
- Current theory is that, at some time during the stage of formation of the bones of the face, the tip of the jaw (mandible) becomes stuck on the point where each of the collar bones (clavicles) meet (the sternum), effectively preventing the jaw bones from growing. It is thought that, at about 12 to 14 weeks gestation, when the fetus begins to move, the movement of the head causes the jaw to "pop-out" of the collar bones. From this time on, the jaw of the fetus grows as it would normally, with the result that, when born, the jaw of the baby is much smaller (micrognathic) than it would have been with normal development, although it does continue to grow at a normal rate until the child reaches maturity.
- Phenytin is an anticonvulsant drug who's exposure to a fetus is believed to cause Fetal hydantoin syndrome, a rare disorder.
- Fetal hydantoin syndrome is a teratogenic likely to occur when a pregnant woman takes phenytin for epileptic seizures.
- The common features of fetal hydantoin syndrome include craniofacial anomalies, mental and physical growth deficiencies, and undivided tails of the fingers and toes, and mental retardation. Less frequently observed anomalies include clubbed fingers, microphthalmia, ocular defects, cardiovascular anomalies, hypoplastic, umbilical and inguinal hernias, and significant developmental delays.
- The risk of oral clefts and cardiac anomalies is 5 times that of other general population in hydantoin exposed infants.

- Alcohol: Fetal alcohol syndrome (FAS) or foetal alcohol syndrome is a pattern of physical and mental defects that can develop in a fetus in association with high levels of alcohol consumption during pregnancy.
- Alcohol crosses the placental barrier and can stunt fetal growth or weight, create distinctive facial stigmata, damage neurons and brain structures, which can result in intellectual disability and other psychological or behavioral problems, and also cause other physical damage.
- The three FAS facial features are:
  - A smooth philtrum - The depth or groove between the nose and lips decreases with increased prenatal alcohol exposure.
  - Thin vermilion - The upper lip thins with increased prenatal alcohol exposure.
  - Small palpebral fissures - Eye width decreases with increased prenatal alcohol exposure.

- Folic acid antagonists, as a group, increase the risk of certain birth defects.
- Multiple studies have evaluated the role of folic acid in the occurrence and recurrence of orofacial clefts.
- Folate antagonists are chemotherapeutic agents used in many neoplastic, autoimmune, and inflammatory disorders. The first suggestions that folic acid antagonists were teratogenic in humans were based on reports of fetal terminations in mothers given aminopterin in the first trimester. Newborns who survived after aminopterin exposure were noted for years to have defects of the nasal tube, skull, or limbs. There is now a well-defined syndrome of congenital anomalies associated with the use of aminopterin. The Folic acid syndrome consists of cranial dysostosis, hypertelorism, anomalies of the external ear, micrognathia, limb anomalies, and cleft palate. The use of aminopterin has now fallen out of favor.*

- Terbuthiamine: Women who use a dihydrofolate reductase inhibitor (3-tert-butyl-3-carboxy-5-aminopterin, orocarboxyteratogenic used mainly in the prevention and treatment of neoplastic and infections) during pregnancy could have an effect on the development of the embryo are at increased risk of having an infant with a cardiovascular defect or an oral cleft.
- Isotretinoin (13-cis-retinoic acid): It is a synthetic Vitamin-A derivative prescribed for severe cystic acne. Rarely, it is also used to prevent certain skin cancers (squamous-cell carcinoma). A pattern of anomalies termed Retinoic acid embryopathy has been associated with isotretinoin exposure in pregnancy. The clinical features include craniofacial anomalies, micrognathia, flat nasal bridge, cleft lip palate.
- Carbamazepine has been assigned to pregnancy category D by the FDA. Carbamazepine can cause fetal harm when administered to a pregnant woman. Epidemiological data suggest that there may be an association between the use of carbamazepine during pregnancy and congenital malformations, including spina bifida.

- An analysis of seven medical research studies involving over 130,000 pregnancies found that consuming 2 to 14 drinks per week did not significantly increase the risk of giving birth to a child with either malformations or fetal alcohol syndrome. Pregnant women who consume approximately 144 grams of pure alcohol per day have a 30-33% chance of having a baby with FAS.*

- * A standard drink is equal to 14.0 grams (0.6 ounces) of pure alcohol.

- Trauma: The effect of trauma on pregnancy depends on the gestational age of the fetus, type and severity of the trauma, and the extent of disruption of normal uterine and fetal physiology.
- The uterine circulation has no autoregulation which implies that uterine blood flow is related directly to maternal systemic blood pressure, at least until the mother approaches hypotensive shock. At that point, peripheral vasorelaxation will further compromise uterine perfusion. Once obvious shock develops in the mother, the chances of saving the fetus are about 20%.
**German measles (Rubella)**
- Maternal infection such as german measles can cause gross congenital deformities including clefts.

**Maternal Infection**
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**Postnatal Influence**
- **Birth Injury**
  - In some difficult births, the use of forceps to the head to assist in delivery might damage either or both the temporomandibular joints.
  - At one time this was a common explanation for mandibular deficiency. But, in light of contemporary understanding, the condylar cartilage is not as easy to blame underdevelopment of the mandible. So, injury to the mandible during a traumatic delivery appears to be rare and unusual cause of facial deformity.

**Forceps or a Vacuum Extractor**
- Another possibility, is the delivery induced deformation of the upper jaw.
- Obstetricians frequently insert the forefinger and middle finger into the baby’s mouth to ease passage through the birth canal.
- Due to the plasticity of the maxillary and promaxillary region, temporary deformation is quite likely and permanent damage may result.

**Accidents**
- The falls and impacts of childhood can fracture jaws just like other parts of the body.
- The condylar neck of the mandible is particularly vulnerable.
- Fortunately, the condylar process tends to regenerate well after early fractures. 75% of children with early fractures of the mandibular condylar process have normal mandibular growth, therefore do not develop malocclusions.
- When a problem does arise following condylar fracture, it usually is asymmetric growth, with the previously injured side lagging behind.

**Endocrine Disturbances**
- A few workers have studied the relation of the pituitary gland to dental development, notably Schour and Van Dyke and Barnes, Becks and associates. Working with rats, they found that after hypophysectomy there was a
  - progressive retardation of eruption of the incisor tooth which eventually ceases to erupt.
  - The tooth attained only about 2/3rd normal size and showed a distortion of form.
  - When an extract of the anterior lobe of the pituitary was injected into the hypophysectomized rats, the eruption rate of the incisor tooth returned to normal.
Baume and his associates injected thyroxin into hypophysectomized animals alone or with purified growth hormones. Their findings led them to the following explanations:

➢ The pituitary gland influences eruption not only with its thyrotropin but also with its growth hormones.
➢ The effect of thyroxin on dental growth and development is different from those of the pituitary growth hormone.
➢ Thyroxin is the factor which stimulates the eruption movements and tooth size but it has little influence on alveolar growth.
➢ Growth hormones on the other hand spur dental as well as alveolar growth.

Hypopituitarism

➢ Two basic manifestations of hypopituitarism—

➢ Dwarfism in Children: Panhypopituitarism, also called hypopituitarism and pituitary dwarfism, is a condition in which the pituitary gland does not produce enough growth hormone. The condition is either congenital or develops over time.
➢ Simmonds’ Disease in Adults: Sheehan syndrome, also known as Simmond syndrome, postpartum hypopituitarism or postpartum pituitary gland necrosis, is hypopituitarism (decreased functioning of the pituitary gland), caused by ischemic necrosis due to blood loss and hypovolemic shock during and after childbirth.

AGALACTIA: the failure of the secretion of milk from any cause other than the normal ending of the lactation period

AMENORRHOEA refers to the absence of menses at the age of 16 and secondary amenorrhea is the cessation of menses for at least 6 months in already cycling women.

THYROID PROBLEMS

➢ HYPOTHYROIDISM: A clinical syndrome in which the deficiency or absence of thyroid hormone slows bodily metabolic processes.
➢ CRETINISM is a condition of severely stunted physical and mental growth due to untreated congenital deficiency of thyroid hormones (congenital hypothyroidism) usually due to maternal hypothyroidism.
➢ The term MYXEDEMA refers to the thickened, nonpitting muco-polysaccharides deposition in the layer of the skin in the soft tissues of patients in a markedly hypothyroid state.

➢ Hypothyroidism:

➢ If hypothyroidism occurs in infancy and childhood, Cretinism results.
➢ If it occurs in the Adult, Myxedema results.
➢ The cretinism leads to mental defects, retarded somatic growth, generalized edema.
➢ Skeletal growth in the cretin is characteristically more inhibited than the soft tissue growth.
➢ As a result of this disproportionate rate of growth, the soft tissues are likely to enlarge excessively giving the appearance of an obese and short child.
Large tongue in cretinism, may contribute to the development of mandibular prognathism by causing the mandible to be positioned forward at all times.

SECONDARY HYPERPARATHYROIDISM

- Hyperparathyroidism can also occur secondary to other disorder, the most common being end stage renal disease.
- Roentgenographic evidence of bone disease involving the jaws shows Brown tumor and loss of lamina dura.

PRIMARY HYPERPARATHYROIDISM

- Increased activity is usually due to an adenoma of one or more of the four parathyroid glands.
- Almost all patients with hyperparathyroidism have skeletal lesions, some of which may occur in the skull or jaws.
- The skeletal disturbances in hyperparathyroidism vary from vague to roentgenographically characteristic lesions and even gross clinical evidence of bone lesions.
- Occasionally the first sign of the disease may be a giant cell tumor or a cyst of the jaw.
- Loss of phosphorus and calcium in this disturbance results in a generalized osteoporosis.
- Malocclusion caused by sudden drifting with definite spacing of teeth.

HYPERFUNCTION: Osteoblastic (cretin's disease): A malfunction in the body's immune system releases abnormal antibodies that make TSH deprived by these false signals to produce, the thyroid's hormone factories work overtime and exceed their normal quota.

- Toxic adenoma: A thyroid adenoma may be clinically silent ("cold" or "warm" adenoma), or it may be a functional tumor, producing excessive thyroid hormone ("hot" adenoma). In this case, it may result in symptomatic hyperthyroidism, and may be referred to as a toxic thyroid adenoma.

The oral manifestations of thyrotoxicosis, includes increased susceptibility to caries, periodontal disease, enlargement of extraglandular thyroid tissue (mainly in the lateral posterior tongue), maxillary or mandibular osteoporosis, accelerated dental eruption and burning mouth syndrome.

- In hyperthyroidism shedding of deciduous teeth occurs earlier than normal.
- Eruption of the permanent teeth is greatly accelerated.
- Alveolar atrophy occurs in advanced cases.
**SEX HORMONES**

- The two major female sex hormones: estrogen and progesterone influence the growth of oral epithelium.
- They also dilate the blood vessels in the underlying tissue and increase their permeability.
- Endogenous sex steroid hormones can influence the periodontium at different life stages such as puberty, menstruation, pregnancy, menopause and postmenopause.
- Clinical changes in the periodontal tissues during menstruation:
  - Bleeding and swollen gums: Progesterone - increased permeability of the microvasculature - increases fetal metabolism - stimulates the production of prostaglandins - enhances the chemotaxis of polymorphonuclear leukocytes (PMNL).
  - An increase in gingival exudate: A peak of exudate is detected just before ovulation, coinciding with the highest levels of these hormones.
  - A minor increase in tooth mobility: During the initial phase of the cycle, when progesterone reaches its highest concentration, intracellular apoptosis occurs, hyperkeratinized lesions and candida infections may also occur in women.

**ACUTE FEBRILE ILLNESS**

- Acute febrile illness is capable of producing general disturbances in the general health of the child but might also affect the dentition and surrounding bone and soft tissues.
- Temporarily they are capable of producing exfoliation and may cause delayed tooth eruption.
- Usually if the severity and duration of the illness exceeds the child’s ability to recover lost time and catch-up growth/compensatory growth is possible.
- Acute febrile disease during development years may cause disturbances in tooth eruption and shedding pattern and thus may predispose to malocclusion.

**INFECTIOUS DISEASES**

- Diseases with paralytic effect, such as poliomyelitis are capable of producing malocclusions.

**OSTEOMYELITIS**

- Osteomyelitis of the mandibular condyle – necrosis/complete destruction of the mandibular condyle – Malocclusion.
- Teeth in the affected region may demonstrate increased mobility even leading to malocclusion and show decreased or loss of sensitivity.

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**VITAMIN A DEFICIENCY**

- In the developing tooth that is deficient in Vitamin A, the odontogenic epithelium fails to undergo normal baso-differentiation and morphodifferentiation, resulting in the distortion of the shape of the teeth.
- Since the enamel forming cells are disturbed, enamel matrix is arrested &/or poorly defined or that calcification is disturbed and unformed hypocalcified results.
- Eruption rate is retarded and in prolonged distempers eruption ceases.
- The alveolar bone is retained in its role of formation.
- The gingival epithelium becomes hypertrophic & in prolonged deficiencies shows keratinization. This tissue is easily invaded by bacteria that may cause periodontal disease.

**VITAMIN D DEFICIENCY**

- It is required for normal development of bones and teeth.
- Necessary for the absorption of calcium and phosphorus from food in the small intestine.
- Deficiency leads to rickets.
  - Effects on teeth:
    - Delayed eruption
    - Misalignment of teeth
    - Disturbed calcification of teeth
    - Higher caries index
    - Increased risk of jaw fracture (brittle bones)

**DIETARY PROBLEMS**

- A cross-sectional study with probabilistic sampling design was used: 2,660 students aged 12 to 15 years enrolled in schools in the northeast of Brazil were evaluated. Crowding was defined according to World Health Organization (WHO) as malnutrition due to lack of space for them to erupt in the correct position. Nutritional status was evaluated by means of body mass index and height-for-age, using the WHO’s reference curves.
- It was found that malnutrition is related to crowding in permanent dentition among mouth-breathing adolescents.
- However, further studies are needed to increase the consistency of these findings and improve understanding of the subject.
**Vitamin C Deficiency**

- Vitamin C is important for normal development of intercellular ground substances in bone, dentition, and other connective tissues as deficiencies of ascorbic acid are associated with disturbances in these tissues.
- The characteristic change in the teeth is atrophy and disorganization of the odontoblasts resulting in the production of irregularly laid down dentine with few, irregularly arranged tubules.
- Interdental and marginal gingiva is bright red with a swollen, smooth, shiny surface. In fully developed scurvy, the gingiva becomes boggy, ulcerates and bleeds.
- In severe, chronic cases of scurvy, hemorrhage & swelling of periodontal membranes occur, followed by loss of bone & loosening of teeth, which eventually exfoliate.

**DEFINITIONS**

- Johnson (1938): A habit is an inclination or aptitude for some action acquired by frequent repetition and showing itself in increased facility to performance and reduced power of resistance.
- Mashow (1949): A habit is a formed reaction that is resistant to change, whether useful or harmful, depending upon the degree to which it interferes with the child’s physical, emotional and social functions.
- Dorland (1957): Habit can be defined as a fixed or constant practice established by frequent repetition.
- Butterworth (1961): A frequent or constant practice or acquired tendency, which has been fixed by frequent repetition.
- Fun (1972): A habit is an act, which is socially unacceptable.

**CLASSIFICATION OF HABITS**

<table>
<thead>
<tr>
<th>WILLIAM LAMBERT</th>
<th>KINGSLEY (1956)</th>
<th>EARLIEST KALINOFF</th>
<th>FINANDRY (1898)</th>
<th>GRABER (1976)</th>
</tr>
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<tbody>
<tr>
<td>Useful Habits: habits of normal function e.g. correct tongue position, finger &amp; thumbing</td>
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<tr>
<td>Harmful Habits: habits which cause pressure interference e.g. against teeth and dental arches and also result in systemic &amp; lingual abnormalities</td>
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<tr>
<td>Functional oral habit</td>
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<td>Muscle habits complexly formed, electrically driven</td>
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<tr>
<td>Combined muscle habits associated with sucking</td>
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<tr>
<td>Postural habits due to posture, head position, facial balance, and chewing</td>
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<tr>
<td>Muscular habits caused by a definite neurological or psychological disturbance</td>
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<td>Empty habits due to the need for sensory, tactile, or motor stimulation</td>
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<tr>
<td>Compulsive habits due to the need for sensory, tactile, or motor stimulation</td>
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<tr>
<td>Non-competitive habits due to the need for sensory, tactile, or motor stimulation</td>
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</table>

**THUMB AND FINGER SUCKING**

- Definition:
  - Gellen (1978): Digital sucking is the habitual sucking of thumb or one or more fingers in varying depths into the mouth.
  - There are 2 forms of sucking:
    - Nutritive form
    - Non-nutritive form
  - The nutritive form:
    - Breast & bottle feeding which provides essential nutrients

**BREAST FEEDING**

- Sucking by the baby stimulates the hypothalamus, which signals to the posterior pituitary gland to produce oxytocin. Oxytocin stimulates contraction of the myoepithelial cells surrounding the alveoli, which already hold milk. The increased pressure causes milk to flow through the duct system and be released through the nipple.
The practice of feeding an infant a substitute for breast milk.

Breastfeeding experts have ignored the basic physiology of sucking. The non-nutritive nipple contacts only the mucous membrane of the lips. The warmth of association centered by the breast & the mother’s body is largely lacking & the physiology of sucking is not duplicated.

Because of poor design, the mouth is held open more widely & greater demand is made on the buccinator mechanism.

The pumping action of the tongue, the raising & lowering & the rhythmic backward & forward movement of the mandible are reduced.

Sucking becomes sucking:

<table>
<thead>
<tr>
<th>Nipple</th>
<th>Stick</th>
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<tbody>
<tr>
<td>Nonnutritive</td>
<td>Nutritive</td>
</tr>
<tr>
<td>Nonfunctional</td>
<td>Functional</td>
</tr>
<tr>
<td>Nonanatomic</td>
<td>Anatomic</td>
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<tr>
<td>Nonfeeding</td>
<td>Feeding</td>
</tr>
</tbody>
</table>

To provide as close a duplicate of the human breast as possible, a nipple was designed which imitated the same functional activity as breast feeding.

The functionally designed latex nipple largely eliminate the objectionable features of previous non-physiologic counterparts.

The non-nutritive forms:

Children who neither receive unrestricted breast feeding nor have access to a pacifier may satisfy their need with habits like thumb sucking which ensures a feeling of warmth & some sense of security but may be detrimental to their dentofacial development.

Nearly all infants engage in some sort of habitual non-nutritive sucking: sucking of the thumb, tongue or similarly shaped objects.

The majority of infants do so during from 6 months to 2 years or later.

After the eruption of the primary molars during the second year, drinking from a cup replaces drinking from a bottle or continued nursing from the mother’s breast. The number of children who engage in non-nutritive sucking then diminishes.

Some fetuses have been reported to suck their thumbs in utero.12

The association between breastfeeding, malocclusion and parafunctional habits:

The dental records of a sample of 540 Puerto Rican children aged 6 to 72 months screened for oral conditions and behavioral risk factors were evaluated for variables such as history of breastfeeding, malocclusion and parasymptomatic habits.13

It was then concluded that breast-feeding practices and time period are behavioral factors that contribute to the prevention of malocclusion in addition to decreasing the practice of parafunctional habits in preschool children.

Data on 3,998 children aged between 3 and 17 years were analyzed retrospectively to assess the association between breastfeeding and dental malocclusion. After controlling for confounding factors, increased duration of breastfeeding was associated with a decline in the prevalence of malocclusion. (http://www.unicef.org.uk)14

Warren JJ et al. (ADA, 2004) concluded that continuous nonnutritive sucking habits of 48 months or longer produced the greatest changes in dental arch and occlusal characteristics, children with shorter sucking durations also had detectable differences from those with minimal habit durations.15

Monica VH et al. (Oral Ortho, 2006) conducted a longitudinal study to assess the relationship between non-nutritive sucking habits and the presence of anterior open bite (AOBs) and posterior crossbites and their association with facial morphology. They concluded that the Nonnutritive sucking habits are risk factors for the occurrence of an AOB and a posterior crossbite. AOBs were associated with the presence of continuing sucking habits, whereas the same was not true for posterior crossbites. Also it was found that Self-correction of an AOB was associated with the cessation of sucking habits.16

Common in infants 23% to 46% of children aged 1 to 4 years (Infante,1976; Larson & al.,1983)

Most of the children discontinue the habit by 3-4 years of age. (Firmans & Schmitt,1989; Tausman & Tausman,1988)

Continues after 4 y: - greater risk for dental malocclusion (Firmans & Schmitt,1987)

digital deformities (Reid & Price,1984) speech difficulties (Lake & Reward,1983)

Severity depending on frequency, duration, Intensity
1. Flared and spaced maxillary incisors (proclined) and lingually positioned lower/mandibular incisors (retroclined).
• The labially positioned upper permanent incisors are particularly vulnerable to accidental fractures.

• Alfonso-Am A et al. (Dent Press J. 2004-26) however concluded that the majority of children with prolonged thumb-sucking have proclined lower incisors rather than retroclined lower incisors (contrary to popular belief). 17
• In the group with retroclined lower incisors (proclined) the angle between the thumb and the lower incisors was significantly smaller and the thickness of the lower lip significantly thinner than in the group with proclined incisors. A higher frequency of early loss of deciduous incisors was also observed in the group with retroclined incisors.

2. Anterior open bite can be defined as a malocclusion without contact in the anterior region of the dental arch, leaving the posterior teeth in occlusion. When it extends to the posterior segment, it is called combined open bite.

• AOB is associated by a combination of interference with normal eruption of incisors and excessive eruption of posterior teeth.
• When a thumb or finger is placed between the anterior teeth, the mandible must be positioned downward to accommodate it.
• The interposed thumb directly impedes incisor eruption.
• At the same time, the separation of jaws alters the vertical equilibrium on the posterior teeth and as a result, there is more eruption of posterior teeth than might otherwise have occurred. 18

MECHANISM

• It is associated by a combination of interference with normal eruption of incisors and excessive eruption of posterior teeth.
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3. Negative pressure is created within the mouth during sucking, but this is not responsible for the construction of the maxillary arch.
• When the thumb is placed between the teeth the tongue must be lowered, which decreases pressure by the tongue against the lingual of upper posterior teeth.
• At the same time cheek pressure against these teeth is increased as the buccinator muscle contracts during sucking.
• Cheek pressure are greatest at the corners of the mouth, and this probably explains why the maxillary arch tends to become V-shaped, with more constriction across the canines than the molars.

Exempl gratia: 1mm of elongation posteriorly causes 2mm of bite opening

• Anamnestic and pretreatment cephalometric records of 1710 mixed-dentition subjects were assessed for sucking habits, dental open bite, and facial hypodivergence.

Results:
• The rate of anterior open bite was 17.7%.
• Both prolonged sucking habits and hypodivergent vertical relationships significantly increased the probability of an anterior dentomaxillary open bite, with a prevalence rate of 36.3%. This was 4 times the prevalence of sucking habits and facial hypodivergence in subjects without anterior open bite (0.1%).

4. Unilateral anterior open bite may be preventable by modifying nonnutritive sucking behaviours.

5. A functional manual bite is a safe way to suck.
The hypertensive mentalis muscle pulls the lower lip upward and forward and presses it against the lingual surfaces of the upper incisors. This keeps lip tonus relatively motionless. The normal lips and the tongue displaced downwards.

This type of inflexile mouthparts aggravates the intraoral incoordination.

TONGUE THRUSTING HABIT

- Schneider, 1982 - Tongue thrust is a forward placement of the tongue between the anterior teeth and against the lower lip during swallowing.
- Norton and Gellin defined tongue thrust as a condition in which the tongue protrudes between the anterior or posterior teeth during swallowing with or without affecting tooth positions.
- The term tongue thrust is something of a misnomer:
  - Since it implies that the tongue is forcefully thrust forward.
  - But individuals who place the tongue tip forward when they swallow usually do not have more tongue force against the teeth than those who keep the tongue tip back.

Individuals with an anterior open bite place the tongue between the anterior teeth when they swallow, while those who have a normal incisor relationship usually do not and is to tongue retraction the open bite for this pattern of tongue activity.

Humans show 2 types of swallow pattern:

- Infantile and neonates swallow:
  - Jaws apart, tongue between gums and palate
  - Mandible stabilized by contraction of facial muscles and upper tongue
  - Swallow is guided and controlled by sensory interchange between lip and tongue
  - Active contractions of the musculature of the lips
  - Tongue tip brought forward into contact with the lower lip
  - Lip activity of the posterior tongue or pharyngeal musculature
  - Forward position of mandible and tongue
  - Tongue groove (depolarized central position) to store the liquid into pharynx and oesophagus

- Mature/Adult swallow:
  - Teeth - together (immovably)
  - Mandible stabilized by contraction of mandibular elevator muscles
  - Tongue tip - against palate, above and behind the incisors
  - Minimum contraction of lips
  - Appears between 2-5 years in normal pattern

Pre-disposing factors (A predisposing factor is something that is likely to lead to a certain result):

- Associated with history of finger sucking
- Associated with chronic naso-respiratory distress
- Mouth breathing
- Tonsillitis or pharyngitis
- Improper bottle feeding
- Macroglossia
- Constricted dental arches
1. **Simple Tongue-Thrust**
   (Teeth-together swallow)
   - Teeth are in occlusion as tongue swells into-open bite
   - Tongue-thrust is present to seal open bite
   - Well circumnashed open bite
   - Secure intercuspation
   - History of digit sucking
   - Displays contractions of lips, mentalis and mandibular elevators

2. **Complex tongue-thrust**
   (Teeth apart swallow)
   - Teeth apart during tongue-thrust
   - More diffuse open bite
   - Poor occlusal fit
   - History of breathing or chronic nasorespiratory diseases
   - Combined contractions of lip, facial and mentalis muscles
   - Lack of contraction of mandibular elevators

---

1. **Anomalies of tooth number**
2. **Anomalies of tooth size**
3. **Anomalies of tooth shape**
4. **Abnormal labial frenum**
5. **Premature loss of deciduous teeth**
6. **Prolonged retention of deciduous teeth**
7. **Delayed eruption of permanent teeth**
8. **Abnormal eruption path**
9. **Ankylosis**
10. **Dental caries**
11. **Improper dental restoration**

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**LOCAL FACTORS**

**SUPERNUMERARY TEETH**

Supernumerary teeth are defined as those in addition to the normal series of deciduous or permanent dentition. These are more common in maxilla than in the mandible.

Supernumerary teeth can present in any region of the oral cavity. They may erupt or remain impacted and may lead to various complications.

(Alsheh Pariola et al. J. Conserv Dent. 2011)

- As such, supernumerary teeth do not cause any complication. However, they may lead to delay or failure of eruption of permanent teeth, displacement, crowding, root resorption, obliteration, loss of vitality of adjacent teeth, subacute parapharyngeal inflammation, periodontal abscesses, dental caries due to plaque retention in inaccessible areas, incomplete space closure during orthodontic treatment, and pathological problems such as dentigerous cyst formation, ameloblastomas, odontomas and furcations. They may also interfere in alveolar bone growth and implant placement.

(Alsheh Pariola et al. J. Conserv Dent. 2011)

Mesiodens usually results in oral problems such as malocclusion, food impaction & poor aesthetics. (G. Meighan et al. J Dent Hygiene 2009)

- Supernumerary teeth can cause:
  a) Non-eruption of the adjacent teeth
  b) Delayed eruption of adjacent teeth
  c) Deflect the erupting teeth into abnormal position
  d) Crowding in the dental arch

---

- If the postural position is normal, the tongue thrust swallow has no clinical significance because tongue thrust swallowing simply has too short a duration to have an impact on tooth position.
- Pressure by the tongue against the teeth during a typical swallow lasts for approximately 1 second.
- A typical individual swallows about 800 times/day while asleep but has only a few swallows/hour while awake. The total/day therefore is usually under 1000.
- One thousand seconds of pressure, of course, totals only a few minutes, not nearly enough to effect the equilibrium.
- On the other hand, if a patient has a altered resting posture of the tongue, the duration of this pressure, even if very light, could effect tooth position, vertically or horizontally.
MISSING TEETH: True anodontia or congenital absence of teeth may be of 2 types.

1. Total anodontia: All the teeth are missing, may involve both the deciduous and the permanent dentition.
   This is a rare condition, eg: hereditary ectodermal dysplasia

2. Partial anodontia: Hypodontia/elgodontia involves one or more teeth and is a rather common condition.
   Instead of false anodontia occurs as a result of extraction of all teeth.
   The term 'Pseudomodonitisa' is sometimes applied to multiple unerupted teeth.

MACRODONTIA: It refers to teeth that are larger than normal

- True generalized macrodontia: The condition in which all teeth are larger than normal.
- Relative generalized macrodontia: presence of normal or slightly larger than normal teeth in small jaw gives the illusion of macrodontia
- Macroodontia of a single tooth,
- The size of teeth is largely determined by heredity
- It might be assumed that there is a greater tendency towards crowding with large teeth than with the smaller teeth. From various research studies, this does not seem to follow.

Although any tooth may be congenitally missing, there is a tendency for certain teeth to be missing more frequently than others.

- The order of frequency of absence is
  1. Maxillary & Mandibular 3rd molar
  2. Mandibular lateral incisors
  3. Mandibular 2nd Premolar
  4. Mandibular incisors
  5. Maxillary. 2nd Premolar

- Congenital absence problems are more likely to be bilateral than are supernumerary teeth.

MACRODONTIA: Teeth which are smaller than normal

- True generalized microdontia: All the teeth are smaller than normal.
- Relative generalized microdontia: Normal or slightly smaller than normal teeth in a jaws that are somewhat large than normal and there is no chance of true microodontia
- Microdontia involving only a single tooth is a rather common condition.
- It affects most often the maxillary lateral incisor (peg lateral) and the 3rd molar.

FUSION: Fixed teeth arise through union of two normally separated teeth germs.

- It has been thought that some physical force or pressure produces contact of the developing teeth and their subsequent fusion.
- In some cases the condition has been reported to show a hereditary tendency
- If this contact occurs early, at least before calcification begins, the two teeth may be completely united to form a single large tooth.
- If the contact of teeth occurs later, when a portion of the teeth crown has completed its formation, there may be union of roots only.
- The possible clinical problems related to appearance, spacing and periodontal conditions brought about by fused teeth.

Anomalies of tooth shape

CONGENITAL ANOMALIES OF MAXILLARY CANINES INCOMPLETE EMBRYONAL FUSION W/INCISORS"
Dilaceration: Dilaceration is a developmental disturbance in shape of teeth. It refers to an angulation, or a sharp bend or curve, in the root or crown of a normal tooth.

- This condition is thought to be due to trauma or possibly a delay in tooth eruption relative to bone remodeling gradients during the period in which teeth are forming.
- If distortion of root position is severe enough, it is almost impossible for the crown to assume its proper position for this reason, it may be necessary to extract a severely dilacerated tooth.

Dens Evaginatus: a developmental malformation characterized by the presence of an extra cusp that takes the form of a tubercle arising from the occlusal or the lingual surface of the tooth. It is also referred to as talon cusp in the anterior teeth and heavy premolar in the premolars.

- Though many case reports of dens evaginatus and dens invaginatus have been found in the literature, an association of both is a rare anomaly. Only two cases of concomitance of dens invaginatus and dens evaginatus have been reported.

Premature Loss of Deciduous Teats:

- Deciduous teeth serve not only as organs of mastication, but as “space savers” for the permanent teeth.
- They also assist in maintaining and maintaining the proper occlusal level.
- When a unit within the dental arch is lost, the arch tends to contract and the space closes.
- Premature extraction of a deciduous second molar will very likely lead to mesial drift of the first permanent molar and blocking of the erupting second premolars.
- Even when the premolar erupts, it is deflected buccally or lingually into a position of malocclusion.

Abnormal Labial Frenum:

- At birth the frenum is attached to the alveolar ridge, with fibres actually running into the lingual interdental papilla.
- As the teeth erupt and a alveolar bone is deposited, the frenum attachment migrates superiorly with respect to the alveolar ridge.
- Fibers may persist between the maxillary central incisor and in the V-shaped intermaxillary suture.
- This attachment may well interfere with the normal developmental closure of the spacing in ‘ugly duckling’ stage.
- But existence of a heavy fibrous frenum does not always mean that spacing is present...
Prolonged Retention and Abnormal Eruption of Deciduous Teeth

- Over-retained deciduous teeth cause buccal/labial or palatal/lingual deflection in the path of eruption of permanent successors.
- A palatally deflected permanent tooth might lead to a crossbite.
- The method of control in removal of the deciduous tooth according to the timetable established by the same tooth in the remaining quadrants of the mouth and creating a tract for the permanent tooth to erupt toward its normal position in the mouth.
- Prolonged retention of deciduous teeth is one of the characteristic signs in a history of hypothyroidism.
- Another possible factor in prolonged retention of deciduous teeth is ankylosis.
- Even when the deciduous teeth appear to be lost on time, the patient should be observed until the permanent teeth erupt.

Delayed Eruption of Permanent Teeth

Possibility of delayed eruption of permanent tooth may be seen because of:

- Endocrine disorders (such as hypothyroidism).
- Presence of a supernumerary tooth or deciduous root (Road block).
- Ankylosed deciduous teeth
- Presence of cysts and odontomas
- There is the relative chance of a "twin oral barrier". The heavy mucosa usually deteriorates before the advancing tooth.
- Since root formation and eruption go hand-in-hand, the delay in root formation further reduces the eruptive force.

Abnormal Eruptive Path

In the case of inadequate space to accommodate all the teeth, deflection of the erupting tooth may occur because of the presence of:

- A supernumerary teeth.
- Retained deciduous teeth or root fragment.
- Possible bone barrier.
- Ankylosed teeth.
- A blow to the tooth: Because of blow to the tooth, deciduous incisor may be driven into the alveolar process, it may turn the developing successor in an abnormal direction.
- Cervical cysts can also cause abnormal eruptive path.
- Some abnormal eruptive paths are of idiopathic (unknown) origin. A canine or premolar will erupt buccally, lingually, or transposed, with no apparent cause.

- Frequently early loss of the deciduous teeth means early eruption of the permanent tooth.
- But occasionally a bony crypt forms in the line of eruption of the permanent tooth, like the mucosal barriers, it effectively bars the eruption of the tooth.

The bony compartment surrounding the developing tooth.

Abnormal Eruption of Primary Canines

- Another form of abnormal eruption is referred to as ectopic eruption.
- In it a permanent tooth erupting through the alveolar process causes resorption in a contiguous deciduous tooth or permanent tooth, rather than its predecessor.
- Frequently the maxillary 1st permanent molar is the offending tooth, causing abnormal resorption of the maxillary second deciduous molar as it erupts beneath the distal convexity of this tooth.
- Ectopic eruption may generally be considered a manifestation of arch length deficiency.

Retained primary canines (arrows) & permanent canines (---arrows)
Ankylosis:
- Tooth ankylosis, the fusion of bone and cementum, is a progressive anomaly of tooth eruption which usually has a prolonged effect on the occlusion.
- Deciduous teeth become ankylosed far more frequently than do permanent teeth, the ratio being better than 10 to 1, and lower teeth are ankylosed more than twice as often as upper teeth.
- Tooth ankylosis is not likely to be of random or accidental origin, nor is excessive or traumatic pressure a probable cause, although the latter enjoys wide acceptance as a possible explanation. Tooth ankylosis may be due to a disturbed metabolism.

(William Biederman. Am Jue Orthodontics-Dentofacial Orthops. 1962)'

Dental Ankylosis is an abnormal dental condition characterized by a solid fixation of the alveolar socket and cementum of the root. When this occurs, the root may erupt and drift around the ankylosed tooth, whereby the ankylosed tooth may displace the permanent tooth that is trying to erupt. Occasionally, this may cause retention of the space needed for the permanent tooth to erupt, or create functional malocclusion.

2 ways to determine if a tooth is ankylosed:
1. Visual examination: The ankylosed tooth will appear like it’s not erupting or is sinking back into the gum tissue. In some cases, the ankylosed tooth will completely disappear and be covered up with gum tissue.

2. Tapping: Since the tooth is connected to the bone, it will create a lower frequency sound when tapped by the end of a metal mouth mirror.

Dental Caries:
- Dental caries may be considered the local causes of malocclusion.
- Caries leads to premature loss of a deciduous or permanent tooth so that subsequent drifting of continuous teeth, abnormal axial inclination, overeruption, and bone loss occurs.
- Because of proximal carious lesions that are unrepaird, there is actual loss of arch length.
- So it is basic that current lesions should be repaired not only to prevent infection and loss of teeth but to maintain the integrity of the dental arches.

Improper Dental restoration:
- An increase in arch length through improper restoration of one or more cuspid proximal surfaces may result in the creation of broken contacts and/or rotations.
- Poor contacts encourage food packing.
- Lack of anatomic detail in restoration of cusped area of a tooth can permit elongation of opposing teeth (supra-eruption) or create functional prematurities.
- Overhanging or poor proximal contacts may predispose to periodontal breakdown around these teeth.
- Uncontrolled proximal restorations result in loss of arch length due to drifting of adjacent teeth to occupy the space.
- Uncontrolled proximal restorations might bridge into the space to be occupied by a succedaneous tooth and result in a reduction in this space.

Epidemiology and Public Health Aspects of Malocclusion:
- At an early point it was realized that, due to the complexity of malocclusion, epidemiologic studies had to be based on some kind of classification. Angle’s classification is the only one among several typologic classifications which has gained wide ground in the epidemiology of malocclusion.
- Angle’s classification has been praised in epidemiologic studies all over the world.
- Occasionally, it has been emphasized that Angle’s classification is not sufficiently differentiated for epidemiologic purposes, and it has also been pointed out that the individual morphologic traits of Angle’s classes are not all adequately defined. As might be expected, therefore, poor intra and interexaminer reliability of recording Angle’s classes has been demonstrated.
• The current major public health problem in this field is to bridge the gap between recognition of the occurrence of the defined single traits or combinations of traits, and determination of the need for treatment of these conditions.

• The main purpose of the indices is to interpret malocclusion severity objectively in terms of treatment priority. Fundamentally, the index scores are based on clinical estimations of the severity of the various traits. In other words, the scores are assigned according to clinical concepts of the adverse effects of the traits on facial appearance, function, and oral health. Thus, the objectivity involved in such interpretations would seem to be questionable.

• Once the basic needs for care control in a child population have been met, the problems of organizing orthodontic care come into focus. Traditionally, the responsibility for initiating orthodontic measures and the economic burden of the treatment have rested mainly with the parents, or rather with their parents. Thus, the provision of orthodontic treatment has often been determined by the Hereditary educational and socio-economic level of the family, instead of the severity of the patient's malocclusion.


2.人生的意義與社會期望：一個心理學家的洞察。台北：心理出版社；1969.


Index of Orthodontic Treatment Needs (IOTN)

Index of orthodontic treatment needs attempts to rank malocclusion based on the level of treatment needed on treatment priority. The index intends to identify people who would most likely benefit from orthodontic treatment. It is a dental and an aesthetic component wherein the significance is given to reclining teeth affecting individual dental health and perceived dental aesthetic impairment.

The 2 Components:

1. Dental Health Component (DHC) Based on the Swedish Medical Health Board index.

2. Aesthetic Component (AC) Using a series of 10-color photos the degree of dental attractiveness is assessed.

Grade 1:

• No treatment need (e.g., contact point displacements of less than 1 mm)

• Grade 1: treatment need (e.g., slight hypolocclusion or reverse sagittal overjets greater than 9 mm)

Aesthetic Component (AC) Using a series of 10-color photos the degree of dental attractiveness is assessed.

Grade 1:

• Aesthetically optimal dentition

Grade 10:

• Aesthetically worst imaginable dentition

Factors affecting Receipt of Orthodontic Treatment

• Improvements in personal appearance: Strongest motivational factor.

• Self-perceptions and self-esteem: People with low self-esteem greatly underrate their dental appearance.

• Gender and age: More girls in their teens receive orthodontic treatment, reflecting a greater societal emphasis of high physical attractiveness on the females.

• Peer groups: Pressure varies according to the culture and societal norms.

• Social class: Uptake of services is more in higher social class.

• General oral health: Attitudes, beliefs & awareness of the general dentists influence orthodontic service utilizations.

• Availability of resources: Availability of trained manpower (dentists, specialist orthodontists & dental assistants) and orthodontic laboratories influence uptake of orthodontic services in any area.
What is dentistry all about? Not just teeth, but all the oral and maxillofacial tissues—and it is increasingly being recognised that good oral health is important for good general health.

a challenging profession combines a high degree of manual dexterity and precision with a thorough understanding of craniofacial biology and pathology, and excellent communication skills. The dentist diagnoses and carries out treatment planned to each patient's oral needs.

Painful removal of gangrenous part (decayed tooth) - extraction

Restorative procedures, occlusal corrections, community programs, maxillofacial surgeries, high-tech implants

History Of Dentistry

DR HUMANSHU KUMAWAT
Dept of Public Health Dentistry

Mesopotamia
- 3000 BC - Gold toothpicks used in Mesopotamia

Early Egyptians
- 2600 BC - Hesy-Re, an ancient Egyptian, was considered the first dental surgeon

Chinese civilization
- 2500 BC - Hwang-Ti, founder of Ancient China, wrote a book devoted to dental hygiene

Egypt
- 1500 BC - Ebers papyrus - described oral diseases, offered a number of prescriptions to strengthen teeth
- 480 BC - Hippocrates discussed functions of teeth and etiology of periodontal diseases

7th century AD - A medical text in China mentioned the use of "silver paste," a type of amalgam

9th century AD - Evidence of Arabs using small wooden sticks with chewed ends (named SIWAK), used as brushes

Late 10th century AD - First recognition for removal of calcareous deposits for control of periodontal diseases mentioned by Abulcasis
A Guild of Barbers was established in France. Barbers eventually evolved into two groups: surgeons who were educated and trained to perform complex surgical operations; and lay barbers, or barber-surgeons, who performed more routine hygienic services including shaving, bleeding, and tooth extraction.

1400 - A series of royal decrees in France prohibited lay barbers from practicing all surgical procedures except bleeding, cupping, leeching, and extracting teeth.

1530 - The Little Medicinal Book for All Kinds of Diseases and Infirmities of the Teeth, the first book devoted entirely to dentistry, was published in Germany for barbers and surgeons who treated the mouth.

1575 - In France, Ambrose Pare, known as the Father of Surgery, published his Complete Works. This included information on tooth extraction, treatment of tooth decay, and jaw fractures.

1723 - Pierre Fauchard, a French surgeon, published 'The Surgeon Dentist, A Treatise on Teeth'. Fauchard is credited as being the Father of Modern Dentistry because his book was the first to describe a comprehensive system for the practice of dentistry including basic oral anatomy and function, operative and restorative techniques, and denture construction.

1760 - John Baker, the earliest medically trained dentist to practice in America, immigrated from England and set up practice.

1776 - In the first known case of post-mortem dental forensics, Revere verified the death of his friend, Dr. Joseph Warren in the Battle of Breed's Hill, when he identified the bridge that he had constructed for Warren.

1789 - Frenchman Nicolas Chemant received the first patent for porcelain teeth.

1790 - John Greenwood, one of George Washington's dentists, constructed the first known dental foot engine.

Josiah Flagg, a prominent American dentist, constructed the first chair made specifically for dental patients. To a wooden Windsor chair, Flagg attached an adjustable headrest, plus an arm extension to hold instruments.

1825 - Samuel Stockton began the commercial manufacture of porcelain teeth. His S.S. White Dental Manufacturing Company was established and dominated the dental supply market throughout the 19th century.

1832 - James Snell invented the first reclining dental chair.

1833 - The Crawcour brothers introduced amalgam filling material in the United States under the name Royal Mineral Succedaneum. The brothers were charlatans whose unscrupulous methods sparked the "amalgam wars," a bitter controversy within the dental profession over the use of amalgam fillings.

1839 - The American Journal of Dental Science, the world's first dental journal, began publication.

1840 - Horace Hayden and Chapin Harris founded the world's first dental school, the Baltimore College of Dental Surgery, and established the Doctor of Dental Surgery (DDS) degree. (The school merged with the University of Maryland in 1923).

The American Society of Dental Surgeons, the world's first national dental organization, was founded. (The organization dissolved in 1856.)

1846 - Dentist William Morton conducted the first successful public demonstration of the use of ether for surgery.

1855 - Robert Arthur originated the cohesive gold foil method, allowing dentists to insert gold into a cavity with minimal pressure.

1859 - Twenty-six dentists met in Niagara Falls, New York, and formed the American Dental Association.

Sanford C. Barnum developed the rubber dam, a simple device that isolates the tooth from the oral cavity, a troublesome problem for dentists.

1866 - Lucy Beaman Hobbs graduated from the Ohio College of Dental Surgery, becoming the first woman to earn a dental degree.
1871 - James B. Morrison patented the first commercially manufactured foot-treadle dental engine. The American George F. Green received a patent for the first electric dental engine, a self-contained motor and handpiece in 1880.

1880s - The collapsible metal tube revolutionized toothpaste manufacturing.

1895 - Wilhelm Roentgen, a German physicist, discovered the x-ray. In 1896 C. Edmond Kells took the first dental x-ray of a living person in the U.S.

1899 - Edward Hartley Angle classified the various forms of malocclusion. He is credited with making orthodontics into a dental specialty.

1903 - Charles Land devised the porcelain jacket crown.

1905 - Alfred Einhorn formulated the local anesthetic procain, later marketed under the trade name Novocain.

1907 - William Taggart invented the “lost wax” casting machine.

1908 - Greene Vardiman Black, published his monumental two-volume treatise Operative Dentistry, developed techniques for filling teeth, standardized operative procedures and instrumentation, developed an improved amalgam.

1937 - Alvin Strock inserted the first Vitallium dental screw implant.

1938 - The nylon toothbrush was introduced.

1945 - When Michel published...

1950 - Mark...

1957 - John Borden introduced a high-speed air-driven contra-angle handpiece.

1958 - A fully reclining dental chair was introduced.

1960 - Lasers for soft tissue work, first electric toothbrush developed.

1962 - Rafael Bowen developed Bis-GMA, the thermoset resin complex used in most modern composite resin restorative materials.

1980 - Branemark described techniques for the osseointegration of dental implants.

1990 - New tooth-colored restorative materials plus increased usage of bleaching, veneers, and implants inaugurated the era of esthetic dentistry.

1997 - FDA approved the erbium YAG laser, the first for use on dentin, to treat tooth decay.

Born on December 24, 1890
- Founded the first dental college of India in Calcutta (presently Dr. R. Ahmed Dental College, Kolkata).
- It was financed by starting the New York Soda Fountain in Calcutta. It is affiliated with the University of Calcutta since 1949.
- He served as the Principal of the college from 1920 to 1950.
- Dr. R. Ahmed established the Bengal Dental Association and established the Indian Dental Journal in 1925.
- He helped to form the Bengal Dentists Act, the first dental government regulation in India.
History of Dentistry
The Indian Chapter

1948 - Dentists' act was passed by the Indian Parliament in association with All India (Now Indian) Dental association on 29 March 1948.

1949 - The Dental faculty of King George Medical College, Lucknow was born as a separate section of Dept of Surgery.

1950 - It was established as a full fledged department with a separate building in 1950.

1952 - Government Dental college, Amritsar was Established.

1971 - Mr Orango started the Department of Public Health Dentistry at Government Dental College, Bangalore under Dr. Mohandas Bhatt.

1988 - National Oral Health Care Program, a project of Ministry of Health and Family Welfare was initiated to address the issue of prevailing oral diseases in the country.

1995 - Redrafted oral health policy was accepted in principle as part of national health policy in 14th conference of CCHFW.

2002-03 - National oral health survey was carried out.

In the British ruled India, a dental branch of the IMS (Indian Medical Services) was established and designated it as IMS (D). The first batch of 7 officers were granted Emergency King's commission and were ordered to join various establishments on 1st Feb 1941.

In 1943 the Indian Medical Service Dental (IMS (D)) became the Indian Army Dental Corps (IADC).

In 1946, King George VI granted the 'Royal' prefix to the Army Dental Corps (British) for the exceptional performance in World War II and the Corps had a new badge.

In 1947, as a result of partition, the Indian personnel of all Army Dental Centres, whether for British or Indian troops, were united to form Military Dental Centres.

In 1953, by the order of the President of India a new name - A D Corps was sanctioned to be effective from 26 Jan 1950.

Today, the AD Corps is one of the largest Military dental establishments in the world with a strength of more than 670 officers providing quality oral healthcare facilities to armed forces personnel and their families. It also plays a pivotal role in providing oral healthcare facilities to civilians through regular camps in sensitive remote areas of the country (J&K, Ladakh, North East) as well as abroad (United Nations peacekeeping missions in various countries).

Health is a state of complete physical, mental and social well being and not merely the absence of disease or infirmity. (WHO)

Public health – the art and science of preventing disease, prolonging life and promoting physical and mental efficiency through organized community efforts (Winslow).

Dental public health is defined as “the science and the art of preventing and controlling disease and promoting dental health through organized community efforts”. (ADA)

To prevent and promote dental health

- Knowledge of the basis of public health, preventive dentistry, public health problems in India, nutrition, environment and their role in health, basics of dental statistics, epidemiological methods, national oral health policy with emphasis on oral health policy.
- Identify health problems affecting the society, conducting health surveys & health education classes, deciding health strategies and taking responsibilities in providing health.
- Communicate the needs of the community efficiently and inform the society of recent methodologies in preventing oral diseases.
THANK YOU
**CONTENTS**
- About IDA
- Significance of the Emblem
- Objectives of IDA
- Functions of IDA
- Structure of the association
- Membership of IDA
- Privileges of IDA
- Office bearers of IDA
- Management of the association
- Responsibility of IDA

**ABOUT IDA**
- 1948 – Dentist Act was passed by Indian parliament.
- 1949 – IDA was formed
- Before 1949, IDA was known as All India Dental Association.
- Nomenclature of IDA – started in 1946
  - I - integrity
  - D - dedication
  - A - action

**IDA EMBLEM**

**SIGNIFICANCE OF EMBLEM**
- **Head of the Elephant**: Adopted only in India, by the Indian Dental Association. It represents the sagaciousness or thoughtfulness.
- **Tusks of the Elephant**: They denote the dental profession and were used as far back as the Egyptian culture dates, to replace human teeth in the mouth with ivory. The tusks are the most expensive and beautiful “Teeth” known to mankind and thus stand for dentistry.
- **The Staff of Aesculpius**: Stands for the Captor of authority and represents the professional authority of the Association.
Serpents entwined around the Staff: In 300 B.C., the God of Medicine and Healing of the Romans was Aesculpius who used serpents and a rod for healing. The Greek philosopher, Hippocrates, adopted this as a symbol of healing. It has since been associated with the medical science. Our emblem has two serpents entwined around the staff in opposite directions.

Wings on the Staff: Represent the spread of Knowledge. According to the Greek mythology, God Hermes had wings on his legs. The emblem has 6 small and 3 large divisions on the wings on either side of the staff.

OBJECTIVES OF IDA

- Promotion and advancement of dental sciences.
- Encourage members to take measures for improving public health and education in India.
- Maintains honour and dignity of dental profession.
- Maintains co-operation between the members of the association.

FUNCTIONS OF IDA

- Holds periodical meetings and conferences of the members of the association and of dental profession.
- Publish and circulate journal of the association bringing the work of the association into limelight.
- Encourage opening of libraries in the state branches.
- Encourage research by providing scholarships.
- Conduct educational campaign among people.
- Protects public from unethical treatment by unqualified practitioners.
- Imports essential dental materials and instruments.
- Publish papers related to dental researches.

STRUCTURE OF THE ASSOCIATION

Registered office in India

Local branch

State branch
**MEMBERS OF IDA**

- Dental practitioners registered under Dentists Act 1948 are eligible to become members.
- Areas where no registration takes place, dentists eligible to be members under part A are also considered.
- Part A - those who have qualification
- Part B - those who practice dentistry but have no qualifications.

**PRIVILEGES OF IDA**

- All members shall be supplied with a copy of the journal free of cost.
- Members are eligible to use library affiliated with the association.
- Members can attend all general meetings, lectures, demonstrations and conferences organized by the association.

**MANAGEMENT OF THE ASSOCIATION**
**FUNCTIONS OF CENTRAL COUNCIL OF IDA**
- Regulates the general affairs of the association.
- Appointment of the committees and sub committees if necessary.
- Consideration regarding memberships, resignation of members and has the power to raise question against any member or branch.
- Frame or alter rules and laws of the association.
- Gives information about outstanding dues towards members or any branches.

- Represents the association in front of the government or any public bodies.
- All transactions pertaining to the association are under the control of central council.
- Fund-raising investments by the association are controlled by central council.
- In case of dispute between members or any two branches, central council appoints a tribunal which consist of 3 members & third member either accepted by both the parties or appointed by the council. The decision of the council shall be final.

**SOURCES OF INCOME OF ASSOCIATION**
- Subscription of the members
- Funds contributed by the branches
- Donations through the branches
- Income derived from journals and other publications
- By organizing Indian Dental Conferences

**USE OF FUNDS BY IDA**
- Utilized for works organized by the association like camps, educational programs.
- For issuing the association journals authorized by it.
- For organizing conferences, scientific investigations, prizes & scholarships.

**ANNUAL GENERAL MEETINGS OF THE ASSOCIATION**
- Once a year in the month of December.
  - Agenda followed in the meetings:
    - election of chairman (if necessary)
    - adoption of annual report for previous year
    - a look on previous years accounts
    - election of an auditor
    - election of the office bearers

**RESPONSIBILITY OF IDA**
- Protect people from unethical treatment by unqualified professionals.
- Safeguard and regularize the practice of dentistry.
- Upliftment of peoples dental health by organizing dental health camps, educational campaigns.
CONCLUSION

★ IDA is the heart of dental profession in India.
★ It is also affiliated to Federation Dentaire Internationale (F.D.I).
★ IDA helps in promoting awareness about dental problems among people.
★ IDA is the backbone in various researches and inventions made in the field of dentistry.
Introduction

Objectives of Infection Control

- Reduce
- Protect
- Implement
- Simplify

Definition

- **Infection control**: The purpose of infection control in dental practice is to prevent the transmission of disease-producing agents such as bacteria, virus and fungi from one patient to other, from dental practitioner and dental staff to patients, and from patients to dental practitioners.

- **Cross contamination**: The spread of microorganisms from one source to another.

- **Sterilization**: It is a process by which an article, surface or medium is made free of all microorganisms either in vegetative or in spore form.

- **Disinfection**: It means destruction of all pathogens or organisms capable of producing infection but not necessarily spores. All microorganisms may not be killed but their no is reduced to a level that is no longer harmful to health.

Universal precautions

- All blood specimens or body fluids should be placed in a leak-proof impervious bags for transportation to the laboratory.
- Use gloves while handling blood and body fluid specimens and other objects exposed to them. Use face masks and glasses.
- Wear laboratory coats or gowns while working in lab.
- Never pipette by mouth. Mechanical pipetting devices should be used.
- Decontaminate the laboratory work surfaces with an appropriate disinfectant after the spillage of blood or other body fluids and when the procedure is completed.
- Limit use of needles and syringes.
- Always wash hands after completing work.
- Remove all protective clothing before leaving the lab.
- Do not eat anything in the lab.
- Do not wear open style heel sandals.
- Cover all the wounds before entering in lab.
Infectious agent - any potential pathogen.
Reservoir - where the pathogen lives
Portal of exit - how the infectious agent leaves its reservoir and reach a new host
Transmission - direct, indirect, airborne, droplet
Portal of entry - how the infectious agent gets into the new host
Susceptible host - someone who is not immune

Categories of Task in Relation to Risk

- **CATEGORY I**
  - Task that involve exposure to blood, body fluid or tissues. Dentist, dental hygienist, dental assistant and laboratory technician fall in this category.

- **CATEGORY II**
  - Task that do not involve routine exposure to blood, body fluids or tissues. It includes non professional workers who handle instruments or impression materials.

- **CATEGORY III**
  - Task that involve no exposure to blood, body fluids or tissues. It includes receptionist.

The American Dental Association (ADA) and Occupational Safety And Health Act (OSHA) guidelines advised that all dental office staff in category I and II and dentist be trained in infection control to protect themselves and their patients.

Personal Barrier Techniques

1) **Washing and Care of Hands**
   - Dental health care workers should wash their hands before and after treating each patient and after bare handed touching of inanimate objects likely to be contaminated by blood, saliva or it.
   - Hands should be lathered for at least 15 sec, rubbing all surfaces and rinsed.
   - Hands cleansers with 4% chlorhexidine may have broader activities for special cleansing.

2) **Gloves**
   - Medical gloves (latex or vinyl) always must be worn by dentist when there is potential for contacting blood, blood contaminated saliva or mucous membranes.
   - Same Gloves must not be used for more than one patient.
   - Inexpensive, disposable, well fitting treatment gloves are available for chair side use.

Hand Wash Technique

Donning Technique
3) GOWNS
- Protective clothing such as reusable or disposable gowns, laboratory coats or uniforms should be worn when clothing is likely to be soiled with blood or other body fluids.
- It should be changed at least daily or as soon as it becomes visibly soiled.

4) MASKS
- A mask should be worn to protect against aerosols.
- Chin length plastic face shield or surgical masks should be worn when splashing or spattering of blood or other body fluids is common.
- When a mask is used, it should be changed between patients or during patient treatment if it becomes wet or moist.

5) PROTECTIVE EYE WEAR
- They may consist of goggles or glasses with solid side shield. When eye wear are removed they should be cleaned and disinfected.

6) FOOTWEAR
- Footwear with open heels and / or holes across the top can increase the risk of harm to the person wearing them due to more direct exposure to blood/ body fluids or of sharps being dropped for examples.

7) RUBBER DAM
- Appropriate use of rubber dams, high velocity air evacuation, and proper patient positioning should minimize the formation of droplets, spatter and aerosols during patient treatment.

Cleaning the environment
- Floors, walls and curtains pose minimal risk in a dental practice, nevertheless, these surfaces must be kept clean.
- Inanimate objects such as toys act as fomites and can spread infections through indirect contact. For this reason, it is prudent to wipe down the hard surfaces of toys in reception and waiting areas on a periodic basis using detergent impregnated wipes designed for use on clinical hard surfaces, to reduce the levels of transient microorganisms.
- Environmental surfaces such as bench tops outside the contaminated zone must be cleaned weekly using detergent and water, including floors, window sills, door handles, and telephone handsets are cleaned weekly.
- A schedule should also be developed for cleaning solid surfaces in the waiting room.
- Walls, blinds and window curtains in patient care areas must be cleaned when they are visibly dusty or soiled.
- Damp dusting, dust retaining mops and vacuum cleaners with air filtration of the exhaust are recommended. Brooms must not be used in clinical areas as these disperse dust and bacteria into the air. Mops and cloths must be cleaned after use and allowed to dry before reuse. Alternatively single use disposable mop heads or cloths may be used.
Sharp items (e.g. needles, scalpel blades, wires) contaminated with patient blood and saliva should be considered as potentially infective and handled with care to prevent injuries.

- All sharp instruments should be disposed off in designated puncture resistant containers.
- Orthodontics wire and bands also considered sharp and are disposed off accordingly.
- Unsheathed needles should not remain on the instrument tray or in operating.

**STERILIZATION**
- It is a process that destroys or eliminates all forms of microbial life and is carried out in health care facilities by physical or chemical methods.

**THREE MOST COMMONLY USED METHODS IN DENTISTRY ARE**
- The steam autoclave
- The unsaturated chemical vapor sterilizer (chemiclave)
- Dry heat ovens

**OTHER METHODS ARE**
- Exposure to ethylene oxide gas
- Boiling water
- Ionizing radiations
It is an efficient, reliable and rapid method of sterilization except for oils, greases and powders. All living organisms are rapidly destroyed at 121°C temperature and 15 lbs pressure for 15 minutes. Material to be sterilized should be wrapped in paper, muslin or steam permeable.

**PRINCIPLE:**
- Steam above 100°C or moist or saturated steam has better killing power than dry heat. Saturated steam penetrates porous materials easily. When steam comes in contact with cooler surface it condenses to water and liberate its latent heat to that surface.
- Large reduction in volume sucks in more steam to the same site. The process continues till temperature of article is raised to that of steam.
- The condensed water produces moist conditions for killing the microbes.

**TEST FOR EFFICACY**
- To prove sterilization, spore strips containing known number of Bacillus stearothermophilus should be placed in deepest layer of the sterilizer load. After sterilization the strips are incubated. Absence of growth proves sterilization.

**ADVANTAGES**
- Most rapid and effective method for sterilizing cloth surgical packs and towel packs.

**DISADVANTAGES**
- Items sensitive to elevated temperature cannot be autoclaved.
- Autoclaving tends to rust carbon steel instruments and burs.

This sterilizer uses a special chemical solution containing formaldehyde.

**ADVANTAGES**
- Carbon steel and other corrosion sensitive instruments are said to be sterilized without rust.

**DISADVANTAGES**
- Heavy cloth wrappings of surgical instruments may not be penetrated to provide sterilization.

These sterilizers use hot air to kill microorganisms and do not cause corrosion.

**ADVANTAGES**
- Conventional Dry Heat Oven
  - These operates at an air temperature of about 320°F for exposure times of 60 to 120 min. Closed container can be used.
  - Short Cycle, High Temperature Dry Heat Oven
    - It utilizes a controlled internal airflow system. The instrument warm faster as 375°F
    - Sterilization time is 6 min for unwrapped instruments and 12 min for wrapped instruments.

**CONCLUSION**
- The aim of infection control is to control iatrogenic, nosocomial infections among patients and potential occupational exposure of care providers to disease causing microbes during provision of care.
- Therefore dental health care provider must follow high standards of infection control for safety of patients and dental health care workers.
REFERENCES

- Soben Peter, 5th edition.
- Sturdevants book of operative dentistry.
- Infection control in dentistry by ADA.
- Textbook of oral and maxillofacial surgery (Neelima Anil Malik)
Topic: Introduction to Community Dentistry

Aims of Community Dentistry:
• To prevent & control oral diseases & promote oral health through organized community efforts.

Objectives of Community Dentistry:
• To get knowledge about public health, dental public health & preventive dentistry.
• Conducting oral health survey, oral health education.
• To instill positive attitude towards dental health in society.

Scope of Community Dentistry
• Application of preventive dentistry procedures
• For planning & evaluation of preventive and oral health programs
• Helping government in planning and execution of preventive dentistry programs.
• Organizing outreach programs for the community.
• Epidemiological studies and research
• Be an academician
• In army, navy and airforce
• In all health sector (Administrative job)
• Health services
Preventive Dentistry

It is that specialized branch of dentistry which deals with prevention and interception of the progress of all dental & oral diseases, prevention & limitation of disabilities & provides rehabilitation.

Community Dentistry

It is that specialized branch of dentistry which deals with delivery of comprehensive dental & oral health care to the masses so as to improve the total dental & oral health of the community as a whole.

PROCEDURAL STEPS IN DENTAL PUBLIC HEALTH

1. SURVEY.
2. ANALYSIS.
3. PROGRAMME PLANNING.
4. PROGRAMME OPERATION.
5. FINANCING.
6. PROGRAMME APPRAISAL.

-SURVEY-

The survey constitutes the first step in the present day dental public health procedure.

•The focus of attention in a survey is the population rather than an individual.

•A survey of a dental disease in a community is initiated based on the chief compliant 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 and also to identify cases that have not been identified.

•There are various parameters to be included in a survey like the assessment of the socio-economic status of the community, the nature of distribution of the community, resources available for elimination of the problem and attitudes of the community towards the health providers.
- **ANALYSIS** -

- Information collected through a survey is subjected to an analysis in order to define the characteristic of specific health problems in the community.

- Since in dental public health, the health care provider is interacting with groups of people it is necessary to arrange or organize the data in such a way that meaningful figures are obtained.

- In the present modern world electronic data processing medias such as computers are resorted to for analyzing data.

---

**PROGRAMME PLANNING**

- After the problem and its characteristics are analyzed, the next step is programme planning.

- The main objective of any public health professionals is to have the designed programme accepted by the community and that people show an interest in it.

- The usual reactions from the part of the people may be to reject it or to partly accept it, or to find an alternative method which is comprehensive and cheaper.

- The decision made by the community usually reflects the relative values they placed on solving the particular problem in comparison to other problem in the community, which are in need of attention.

- Hence it has to be ensured that the community is well informed about the programme and that they participate in all the steps involved.

---

**PROGRAMME OPERATION**

- When a specific public health programme has to be adopted for a community, a public health team which constitutes of professionals in various disciplines has to be employed for executing the programme.
• This can be best illustrated with the example of water fluoridation in a community with higher prevalence of dental caries and a low level of fluoride content in their water supply.

• To fluoridate the water, several disciplines have to work together as a team.

• The dentist will have the responsibility of preparing the baseline data with regard to the prevalence of dental caries.

• The engineers will designed the equipment needed for fluoridating the water supply, whereas the chemist will analyzed the water samples for its fluoride content.

- Financing -

• Financing in public health programmes are usually through the funds provided by the governments or by the local or state authorities.

- Programme Appraisal -

• This is the final step in any public health programme where the effectiveness of the programme is assessed.

• The base line data collected prior to the introduction of the public health programme serves as an indicator against which the effectiveness of the programme can be assessed.

• The public health authorities and the water works department will have the responsibility of addition of fluoride into the water supply and periodical maintenance of the same.

• The public health personnel has to identify the source for securing the funds and also should plan for the management of the same.

• Many public dental health programmes have been conducted successfully through the financial aid provided by local foundations and local service clubs.

• Before the starting of a public health programme, the public health personnel has to identify the source for securing the funds and also should plan for the management of the same.
• THE DIMENSIONS USED FOR PROGRAMME APPRAISAL ARE EFFICIENCY, APPROPRIATENESS, ADEQUACY, POSSIBLE SIDE EFFECT ETC.

• ULTIMATELY, IT IS THE VALUE ASSIGNED BY THE COMMUNITY WHICH WILL DETERMINE THE CONFIDENCE THEY HAVE PLACED IN THE PUBLIC HEALTH WORKER.

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<th>DENTAL PUBLIC HEALTH</th>
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<td>Program planning</td>
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<td>evaluation</td>
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DIFFERENCES

<table>
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<th>PRIVATE DENTAL PRACTICE</th>
<th>PUBLIC HEALTH DENTISTRY</th>
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<tbody>
<tr>
<td>target</td>
<td>Individual patient</td>
<td>community</td>
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<tr>
<td>Movement</td>
<td>Patient comes to clinic</td>
<td>Practitioner goes to community</td>
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<tr>
<td>emphasis</td>
<td>Curative and restorative care</td>
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CHARACTERISTIC

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>PRIVATE DENTAL PRACTICE</th>
<th>PUBLIC HEALTH DENTISTRY</th>
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</thead>
<tbody>
<tr>
<td>area</td>
<td>Confined to clinic</td>
<td>Several career options</td>
</tr>
<tr>
<td>Results</td>
<td>Immediate</td>
<td>Long term</td>
</tr>
<tr>
<td>Payment</td>
<td>Higher pay</td>
<td>Less, but gets fringe benefits like vacation</td>
</tr>
</tbody>
</table>

TOOLS OF DENTAL PUBLIC HEALTH

1. EPIDEMIOLOGY.
2. BIOSTATISTICS.
3. SOCIAL SCIENCES.
4. PRINCIPLES OF ADMINISTRATIONS.
5. PREVENTIVE DENTISTRY.

THANK YOU
MESSAGES IN HEALTH EDUCATION PROGRAMS

PRESENTED BY—
DR. HIMANSHU KUMAWAT
Dept. of Public Health Dentistry

1a. Eat foods that have vitamins and minerals.

1b. Avoid eating sweets or sticky foods between meals.

2. Brush after every meal to remove plaque.

3a. Use trusted dental aids like toothpaste and mouthwash.

3b. Avoid other tooth abrasive like red tooth powder, red brick powder, black tooth powder and ash powder.
4. Visit your dentist every six months/one year.

Old tooth brush can cause harm to your teeth and gums. Dentists recommend changing your tooth brush every three months.

**NEW TOOTH BRUSHING TECHNIQUE**

GUIDED BY:
Dr. PRANATI ESWAR
MDS, READER
DEPT. OF PREVENTIVE AND COMMUNITY DENTISTRY

PRESENTED BY:
- TANU AGARWAL
- VAIBHAV KULDEEP
- VAISHALI JAMDADE
- VISHAKHA CHOUDHARY
- SHANKAR KUMAWAT

Place bristles along the gumline at a 45-degree angle. Bristles should contact both the tooth surface and the gumline.

Gently brush the outside, inside of each tooth.

Brush the chewing surface of each tooth, by placing the bristle of brush at right angle to the chewing surface and move the brush back and forth.

Brush the chewing surface of each tooth, by placing the bristle of brush at right angle to the chewing surface and move the brush back and forth.
Use tip of the brush to brush behind each front tooth both top and bottom.

Gently brush your tongue to remove bacteria and freshen breath.

After performing above given action, rinse the mouth with water.

THANK YOU
Oral Health Care Delivery System

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Definition:
Structure of system is related to the manner in which patients and providers (Dentist or dental auxiliaries) get together for the provision of oral health care.

The principle components are:
1. Structure of the system that is the organizational arrangements by which patients meet up with providers (dentist).
2. The means by which the dental care is paid for.
3. The supply of various types of oral health care personnel.

Modes of providing oral health care
1. Solo practice
2. Group practice
3. Services provided by government institutions
4. Services provided by community health centers
5. Services provided by dentists employed by the government in the defense, railways, navy and other central government body.
6. Services provided by private institutions
7. Dental department at private hospitals
8. Retail dental clinics
9. Corporate dentistry
10. Services provided by local programs
   • a) Mobile units
   • b) Dental camps

DENTIST
- A dentist is a person who is permitted to practice dentistry under the laws of the relevant state province, territory or nation. These laws are intended to ensure that a prospective dentist has satisfied certain requirements such as:
  • 1) Completion of a specified period of professional education in an approved institution
  • 2) Demonstration of competence
  • 3) Evidence of satisfied personal qualities

Solo practice
- It is dental practice in which there is a Single ownership, by a dentist, who may appoint a dental hygienist or assistant or other appropriate staff.

- It is the most common form of practice in which dentist does his or her own work. He is the boss of the clinic and sets his own clinical policy, timing, fees structure and vacation.
Advantages:-
- Provider and patient flexibility in terms of availability of services
- Provider determines policy and staffing
- Provider can except or refuse patients within acceptable legal parameters

Disadvantages:-
- Total responsibility of providing care to the patient lies in one dentist; he may at times be absent from the clinic.
- Limited care is available to the patient
- Lack of facilitates may be there due to lack of funds.
- Quality assurance is difficult to monitor.

Group practice
- It is a type of practice in which two or more dentist get together under a formal agreement to render dental care by equally sharing same clinic space, patients facility, losses, benefits, responsibilities of patient care and its management.

Advantages to the dentist
- A dentist in a group practice enjoys a higher level of income
- Reduces the cost of running and managing the practice
- Leave and vacations can be planned & substituted.
- Practitioner sustains less stress
- Quality may improve due to peer review.
- Practice grows more quickly takes advantage of newer technology and marketing strategies
- Sharing & reduction of management responsibility
- Emergencies can be handled properly

Advantages to the patient:
- A good dental care to the patient
- Continuity of care since treatment is done in one roof.
- Cost of treatment is less
- Security is more to the patient

Disadvantages
- Personal conflicts may arise affecting the practice philosophy
- There may be loss of individuality
- Management is complex and necessary
- Location and business procedures may not please all the members
- Patient may fear of getting shifted from one operator to another

Dental Department At Private Hospitals
- Dental care is provided at private hospitals.

Corporate dentistry
- It is a company owed and operated dental care facility, designed to meet oral health needs of its employees.
- Provides dental benefits to employees and or the retires and dependence.
- Oral health providers are full time salaried persons

Advantage: - reduces employees absenteeism
Retailed Dentistry

- Dental care facility is provided at retail establishments such as a departmental store

- The departmental store views the dental clinic as an additional service to the customers similar to pharmacies or the optical department.

Mobile dental clinic
- It serves the purpose of providing comprehensive dental care.
- Mainly used in rural areas where facility for basic dental care is lacking
- Use to provide dental services to institutionalized and homebound patients.
- Most mobile units have a dental chair fully operated dental attachments, instruments, materials and a power generating unit & a water tank.
- They do services like extraction, scaling, filling and other urgent needs are met.

Dental camps:-
- It is a program to offer preventive education & comprehensive dental care to a group pf people living in a particular area or locality.

Features:-
- More personal are required
- Camp kit with emergency drugs
- Camp van
- Planning
- Publicity: - date, time, place
- Education and treatment

Open camp: - it is one, which is open to all any individual can utilize the facilities offered in the camp.

Closed camp: - a camp that is organized only for a specific pre-selected group like a school, industrial workers, home bound people ect.

Advantages: -
- Helps the doctor to build good public relation
- Provides an opportunity for oral health education to a group
PLANNING AND EVALUATION

DR HIMANSHU KUMAWAT
Dept of Public Health Dentistry

CONTENTS
- Definition of planning
- Elements of planning
- Elements of plan
- Stages of planning
- Planning cycle
- Evaluation

DEFINITION

- National development planning is defined as ‘continuous, systematic, co-ordinated planning for the investment of the resources of a country (men, money, material) in programmes aimed at achieving the most rapid economic and social development possible’

- National health planning has been defined as 'the orderly process of defining community health problems, identifying unmet needs and surveying the resources to meet them, establishing priority goals that are realistic and feasible and projecting administrative action to accomplish the purpose of the proposed programme’

ELEMENTS OF PLANNING

- Objective – planned end point of all activities, is precise.
- Target – discrete activity, permits the concept of degree of achievement.
- Goal – ultimate desired state towards which objectives and resources are directed. What, extent, population & geographic area involved, time.
- Target concerned with the factors involved in a problem; objectives are concerned directly with the problem itself; while goals are not constrained by time or resources, nor necessarily attainable.

A “plan” is a blue print for action. It consists of 5 major elements:
- Objectives
- Policies – guiding principles stated as an expectation, not as commandment
- Programme – sequence of activities designed to implement policies and accomplish objectives, step-by-step approach
- Schedule – time sequence for the work to be done
- Procedures – set of rules for carrying out work which, when observed by all, help to ensure the maximum use of the resources and efforts
STAGES OF PLANNING

1. Analysis of health situation
2. Establishment of objectives and goals
3. Assessment of resources
4. Fixing priorities
5. Write-up formulated plan
6. Programming and implementation
7. Monitoring
8. Evaluation

- Analysis of health situation – collection, assessment & interpretation of information
- Establishment of objectives and goals - needed to guide efforts
  - otherwise haphazard activity, uneconomical use of funds and poor performance
  - Short term – upto 2 yrs
  - Long term - > 2 yrs

- Assessment of resources – manpower, material, money, skills, knowledge, technology what is required and what is available
- Fixing priorities – establishment of priorities in order of importance or magnitude
- Write up formulated plan – preparation of detailed plan – each stage, time, cost

- Programming and implementation – plan execution
- Monitoring – day to day follow up of activities
- Evaluation – final outcome, assess the achievement of stated objectives, its adequacy, efficiency, acceptance

PLANNING CYCLE

EVALUATION

- Evaluation is defined as the collection and analysis of information to determine programme performance
- On-going process aimed mainly at rendering health activities more relevant, efficient & effective.
Process and outcome evaluation

- **Process** – to determine the degree to which a programme is being carried out in such a way as to reach a desired goal.
- **Outcome** – the extent to which goals & objectives of a programme are reached.

Evaluation should therefore include 3 levels - the content, the process, the outcome.

Evaluation criteria (WHO 1972)

- The standards by which programme achievements can be assessed.
- 4 main criteria:
  - Effectiveness
  - Efficiency
  - Appropriateness
  - Adequacy

Evaluation schedule

- Periodic evaluation is most important
- Short term evaluation – upto 2 yrs
  - Long term evaluation - >2 yrs
- Preliminary evaluation (initial)
  - Medium-term evaluation
  - Final evaluation (after 5-10yrs or more)

Types of evaluation

- Relevance evaluation
- Progress/ formative/ process evaluation
- Effectiveness evaluation
- Impact evaluation
- Efficiency evaluation
Prevention of dental caries

By: Dr. HIMANSHU NKUMAWAT
Dept. of Community Dentistry

Prevention of dental caries

- Fluorides
- Oral hygiene measures
- Dietary measures
- Sugar Discipline
- Pit and fissure sealants
- Salivary stimulations
- Periodic visits to a dentist

FLUORIDES IN FOOD

- Fish contains good amount of fluoride (6-27ppm)
- Seafood, fish bone contain high quantities of fluoride.
- Tea leaves contain about 97ppm of fluoride. 0.82mg/cup of tea
- Whole potatoes contain 6.5ppm of fluorine.
- Vegetables, cereals & fruits contain 0.2-0.3ppm.
- Average daily intake by adults is 2.2-3.2ppm & infants it is 1-1.2ppm.

FLUORIDES IN CARIES PREVENTION

1) Systemic Fluoride
2) Topical Fluoride

SYSTEMIC FLUORIDE

1) Community water fluoridation
2) School water fluoridation
3) Salt fluoridation
4) Milk fluoridation
5) Fluoride supplements

TOPOCAL FLUORIDE

PROFESSIONALLY APPLIED PASTES AND GELS
1. Sodium fluoride
2. Stannous fluoride
3. Acidulated phosphate fluoride
4. Fluoride varnishes
5. Restorative materials containing fluoride
6. Oral prophylaxis pastes containing fluoride

SELF APPLIED
1. Fluoride mouthwash
2. Fluoride gels
3. Fluoride dentifrices

Oral hygiene measures

A clean tooth never decays

- Tooth-brushing is the most widely used mechanical plaque control aid.
- It has very little effect on the proximal surfaces- hence use of inter-dental aids is recommended
The various aids used for mechanical plaque control can be listed as follows:

- **Toothbrushes**
  - a) Manual toothbrush
  - b) Electric toothbrush

- **Interdental aids**
  - a) Dental Floss
  - b) Triangular toothpicks
  - c) Interdental brushes
  - d) Yarn
  - e) Super floss
  - f) Perio-aid

- **Aids for gingival stimulation**
  - a) Rubber tip stimulator
  - b) Balsa wood edge

- **Others**
  - a) Gauze strips
  - b) Water irrigation devices
  - c) Pipe cleaners

**Aids for edentulous or partially edentulous patients**

- a) Denture and partial clasp brushes
- b) Cleansing solutions

---

"No specific toothbrush can be singled out as clearly superior for the routine removal of microbial deposits from the teeth."

---

**Objectives of tooth brushing**

- 1. To clean teeth and interdental spaces
- 2. To prevent plaque formation
- 3. To disturb and to remove plaque
- 4. To stimulate & massage gingival tissues
- 5. To clean the tongue

- Soft to medium tooth brush is recommended

- Choice of the toothbrush is left to the patient as long as he or she is able to brush properly his or her teeth without injuring the hard or soft tissue.

- Toothpaste delivers the abrasives and antimicrobials which prevent accumulations of surface stains

---

**Classification of Antiplaque Agents**

<table>
<thead>
<tr>
<th>First Generation</th>
<th>Second Generation</th>
<th>Third Generation</th>
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</thead>
<tbody>
<tr>
<td>Reduces Plaque Scores by 20-30%</td>
<td>Reduces Plaque Scores by 70-90%</td>
<td>Under Trial</td>
</tr>
<tr>
<td>Poor Retention</td>
<td>Better Retention</td>
<td>Block binding of microorganisms to tooth surface and each other</td>
</tr>
<tr>
<td>E.g. Antibiotics, Phenols</td>
<td>E.g. Chlorhexidine</td>
<td>E.g. Delmapinol</td>
</tr>
</tbody>
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**Dietary measures**

- Diet-nutrition
- Local effect of diet: arch criminal of dental caries.
- Hard, sticky, sugary foodstuffs are more prone for caries.
- Objective is to reduce total sugar clearance time per day
DIET MEASURES FOR PREVENTION

<table>
<thead>
<tr>
<th>Points considered at the consultation</th>
<th>Measures to reduce carry risk not able to stop ongoing carry activity</th>
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<tbody>
<tr>
<td>Frequency of meals</td>
<td>Number of meals should be kept near low level. Further info</td>
</tr>
<tr>
<td>Avoidance of certain items</td>
<td>A low sugar intake is preferable from a nutritional point of view. Further info</td>
</tr>
<tr>
<td>Control of sugar and absence of flour</td>
<td>Sugar should be consumed at low or positive from the oral cavity. Foods needing active chewing tend to remain subsistence, which is unsatisfactory. Further info</td>
</tr>
<tr>
<td>Control of sugar and absence of flour</td>
<td>Polyflourides, fructose and sucrose-sugar can contribute to the oral cavity, that is why different between different products. Further info</td>
</tr>
<tr>
<td>Trade education</td>
<td>Use of sugar substitutes results in a lower discontinuation. Further info</td>
</tr>
<tr>
<td>Preventive and successful control in sit</td>
<td>Example 1: Fluoride treatment or caries-inhibiting effect. Further info</td>
</tr>
<tr>
<td>Preventive and successful control in sit</td>
<td>Example 2: Fluoride, silver, silver, silver, etc. have low use and found to have no caries at medium level</td>
</tr>
</tbody>
</table>

Diet should contain –

- fibre rich products are recommended (raw veg, fruits and nuts)
- no snacks between meals
- brush immediately after eating sticky foods

SUGAR DISCIPLINE

- “Sugar clock” for visualizing patients acid attack followed for 5-6 days
- Main meal should be improved
- Goal is not to exclude sugar from diet but to take it in a “sensible way” which means reasonable amount and mainly at meal times- “sugar discipline” (WHO Technical report series, 797)

Pit and fissure sealants

- Morphology – Susceptibility
- Indications
  - presence of deep occlusal pit and fissures on newly erupted teeth
  - presence of incipient lesions
  - children at high risk
- Contraindications: -
  - open lesion / proximal caries / restorations
  - shallow pits and fissures

PROCEDURE

- Polish The Tooth Surface
- Isolate And Dry The Tooth Surface
- ETCH WITH 30-50% PHOSPHORIC ACID FOR 15-20 sec
- Wash The Surface With Water and dry
- Isolate The Tooth Surface And Look For Frosty White Appearance
- Apply Intermediate Bonding Agent And Cure It.
- Place The Sealant
- Check sealant quality For Occlusal High Points

Salivary stimulations

- Rapid flow of highly buffered saliva is less carious because of rapid clearance of sugar from the oral cavity
- Many materials are available to stimulate salivary flow -
  - physiologically - food
  - sugarless chewing gum
  - chewing gum containing fluoride, chlorhexidine are more caries protective
  - artificial saliva
Topic:-
Salt And Milk Fluoridation
SCHOOL WATER FLUORIDATION

PRESENTED BY
DR HIMANSHU KUMAWAT
DEPT OF COMMUNITY DENTISTRY
Salt fluoridation is the *controlled addition* of fluoride usually *sodium* or *potassium fluoride*, during the manufacture of salt meant for human consumption.
Fluoridated salt as a means of preventing caries was first suggested by WESPI.

He was an expert in iodized salt and had a strong commitment to public health. He suggested the health director in Switzerland, that fluoride should join iodine as a salt additive.

The canton of ZURRICH was the first to act on this suggestion and authorized sale of domestic salt in 1955 at 90mg F/kg
1967- More than 3-quarters of domestic salt sold in **SWITZERLAND** is fluoridated at 90mg \(\text{kg}\) of fluoride.

**MARTHALER et.al** proved that the addition of 250 mg of fluoride per kg salt, reduced dental caries more effectively than at 90mg of fluoride\(\text{kg}\).
LOGISTICS, IMPLEMENTATION AND TECHNICAL ASPECTS.
• DECENTRALIZED OR INTERMINGELED WATER SUPPLIES WHICH FORMS AN ECONOMIC OBSTACLE TO WATER FLUORIDATION.

• Fluoridated salt has the ability to reach a wide population irrespective of geographic location and economy.

• The process does not require experienced and trained operators at community level or at salt factory.

• The cost of implementation is absorbed through the normal salt marketing process, and the cost of fluoride compound is substantially less than cost of water fluoridation.
ECONOMIC ASPECTS AND SAFETY
PRODUCTION OF SALT WITH FLUORIDE CONTENT OF 90-250mg /Kg IS SIMPLE AND CHEAP.

FLUORIDE INGESTION IS STUDIED BY MONITORING URINARY OUTPUTS.

THERE IS NO PROBLEM OF ACUTE TOXICITY WITH FLUORIDATED SALT BECAUSE RENAL CLEARANCE OF FLUORIDE IS MORE RAPID THAN IT IS FOR EITHER SODIUM OR Chlorine.
REQUIREMENTS.

1) MULTIPLE SOURCES OF WATER POSE A SERIOUS ECONOMIC OBSTACLE TO WATER FLUORIDATION.

2) CENTRALIZED SALT PRODUCTION UNIT

3) POLITICAL WILL AND RESOURCES TO IMPLEMENT.
ADVANTAGES

- Quite economical
- Practical/feasible

Caries reduction is 40-50%

INDIVIDUAL MAY ACCEPT OR REJECT IT.

NON-FLUORIDATED SALT, LIKE NON-IODISED SALT MAY BE MADE AVAILABLE TO THE POPULATION.
DISADVANTAGES

• FLUORIDATED SALT CONSUMPTION IS LOWEST WHEN THE NEED IS GREATEST – IN EARLY YEARS OF LIFE.

• Not useful in case of medically compromised patients (hypertension/renal failure).
Success of salt fluoridation has been reported in *Columbia, Costa Rica, Jamaica, Switzerland, France and Germany*

*Jamaica* is the only country where virtually all salt destined for human consumption has been fluoridated since 1987.
MILK FLUORIDATION
Milk fluoridation is the addition of a measured quantity of fluoride to bottled or packaged milk to be drunk by children.

It was promoted by ZIEGLER, an influential pediatrician who started to fluoridate milk in The SWISS city Winterthur in 1955.

Because milk is recommended as a good food for infants and children, it was considered to be a suitable vehicle for supplementing children fluoride intake especially in areas with fluoride deficient water supplies.
ERICCSON 1958 showed that fluoride was absorbed in the gut as readily from milk as from water, relating the suggestion that - the high calcium content of milk would render the fluoride unavailable.

He showed that fluoride ion absorption from mono-fluoro phosphate (MFP) in milk is as high as that from sodium fluoride in water.
Concentration:-

- 2.2mg of sodium fluoride (1mg of F) was added to 1/4th liter of milk.

- Later, 0.625mg of F was added to 250 ml of milk.
The rational for adding fluoride to milk is that the procedure targets directly children and thus would be less expensive than fluoridating the drinking water.

Having both fluoridated and non-fluoridated milk can maintain consumer choice.

It is shown that, fluoride is absorbed as completely from milk as it is from water.
Limitations

- Children from the lower socio-economic groups tend to drink the lowest amount of fresh milk, they would benefit least.

- Any benefit ceases as an individual matures and drinks less milk.

- Costly

- Parent co-operation is required.
Caries reduction is 60%
Thank you
SCHOOL WATER FLUORIDATION
One method of supplying fluoride to children is by fluoridating ‘THE SCHOOL WATER SUPPLY’.
A pilot school water fluoridation study was initiated in *VIRGIN* islands (1954).

The fluoride content of water at two sources on *island of st. Thomas* was adjusted to 2.3 ppm or three times more than the optimum recommended level of community water supplies.
In 1962, 8 years after fluoridating the school water supplies - The test school had **22% LOWER CARIES LEVEL** than their counterparts.
ADVANTAGES

1) NO EFFORT IS REQUIRED BY THE RECIPIENT.

2) IT IS EFFECTIVE AND ECONOMICAL.

3) IT IS TECHNICALLY FEASIBLE.

4) CHILDREN WHO LIVED IN HOMES WHICH RECEIVED WATER WITH NEGLIGIBLE FLOURIDE LEVELS, BUT ATTEND SCHOOL RECEIVED CONSIDERABLE BENEFITS.

5) Caries experience is high during the developmental period.
Disadvantages

- There is a need for co-operation from school authorities
- All children may not attend the school on all days
STUDIES-(SWF)

The study began in 1957, were ELK LAKE, PENNSYLYANIA, the school water supplies was fluoridated at 5ppm(approx). i.e. 4 1/2 times the recommended community water fluoride level

PIKE COUNTY, KENTUCKY at 3ppm (approx) 3.3 times the recommended level.
These levels were chosen because –

♥ children consume part of their daily water intake at school, i.e. they spend 5-6 hrs a day.

♥ children do not enter school before 6 yrs- an age when incisor teeth can no longer be considered at risk of developing fluorosis.

♥ Students may not attend the school throughout the year

so it is fluoridated at a higher level.
<table>
<thead>
<tr>
<th>Years of fluoridation</th>
<th>Place</th>
<th>Caries reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 4 yrs</td>
<td>PIKE COUNTY</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>ELK LAKE</td>
<td>30%</td>
</tr>
<tr>
<td>After 8 yrs</td>
<td>PIKE COUNTY</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td>ELK LAKE</td>
<td>35%</td>
</tr>
<tr>
<td>After 12 yrs</td>
<td>ELK LAKE</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td>SEAGROOVE-</td>
<td>40%</td>
</tr>
</tbody>
</table>
RESULTS ALSO SHOWED THAT—

a) APPROXIMAL SURFACES BENEFITED MORE.

b) GREATER PREVENTIVE EFFECTS WERE OBSERVED IN LATE ERUPTING TEETH (CANINES, PREMOLARS & SECOND MOLARS).

c) NO FLUOROSIS WAS SEEN.
Conclusion

Fluoridate your water with confidence. Use high purity ALCOA SODIUM FLUORIDE.
Dental Health Programs are of 2 Types

- 1) Public health program
- 2) School health programs

School health program has been a high priority for dental profession because of high prevalence of dental caries in this age group.

- The school has emerged as the most logical and practical setting to implement large scale dental health program
- The program should not be an extra burden to the teachers and it should be cost effective in terms of manpower, money and materials and should produce good results.

School Health Services

- To appraise the health status of pupils & school personal.
- To counsel pupils, parents and others concerning findings.
- To encourage the correction of remediable defects.

Advantages

- To assist in identification and education of handicap children.
- To help prevent and control disease.
- To provide emergency services for injury or sudden sickness.

- Children are available at place for preventive and treatment procedures.
- School clinics are less life threatening than private offices.
- They inculcate healthy habits.
- They facilitate central education on dental subjects.
Guidelines For Ideal School Dental Program

A comprehensive school program should be administratively sound. Should be available to all children. Should provide facts about Dentistry and dental care, especially about self care procedures.

- Aid in the development of favorable attitudes towards dental health.
- Provide the environment for development of psychomotor skills necessary for tooth brushing and flossing.
- Include primary preventive dentistry programs.
- Ensure all pathology is expeditiously treated.

Objectives

- 1) To help every school child to appreciate the importance of a healthy mouth.
- 2) Appreciate relationship of dental health to general health.
- 3) To encourage the observance of dental health practices, personal care, professional care, proper diet & oral habits.
- 4) To correlate dental health activities with total school health program.
- 5) To stimulate the development of resources to make dental care available to all children and youth.

Important Elements Of School Dental Program

- Improving school community relations.
- Conducting dental inspection.
- Conducting health education.
- Performing specific programs.
- Referral for dental care.
- Follow up of dental inspections.

Improving school community relations

This can be done by first forming an advisory committee to organize school dental program. Committee should be representatives from parents, teachers, doctors, community leaders and administrators of school and the dental profession.

- The committee should work to appraise and publicize the dental needs of school children, which is an important element of health.
Conducting Dental Inspection

- Doing a dental inspection is a matter of debate.
- Some are in opinion that it is mere waste of resources (manpower, money, material and time) To examine a disease which is almost present universally and which requires treatment which is costly

Others are in Favor Because

- Every child thinks he is free from dental disease. But if told would be more motivated towards oral health.
- The inspection is an opportunity for individual health education and a fact finding experience.
- By doing a dental inspection we can get a baseline data upon which a program can be carried out.
- It serves as a basis for school dental inspection.

Conducting Dental Health Education

- Dental health education includes planning an instructional program based on the interest and needs of each grade group.
- It should be in classroom itself.
- A kit for teachers education on dental concepts should be made available.

Performing Specific Program

- Tooth brushing program.
- Fluoride mouth rinse program.
- Fluoride tablet program.
- School water fluoridation programs.
- Sealant program.

Referral For Dental Care.

- After the school dental programe is over, the child should be referred to a family dentist, if any treatment is required.
- “Blanket Referral”

“Blanket Referral”

- It is referral of a child to a family dentist. In this program all children are given cards to take home subsequently, to the dentist, the dentist would sign on the card after completion of examination or treatment. The sign cards are then required to the class teacher, who plays an important roll for follow up and referral.
Follow Up Of Dental Inspection.

- A good follow up system is necessary to ensure that the defect has been taken care off. The best way, is to appoint a person in charge of conducting a follow up inspection.
- Examples of school dental programs.
  1. Learning about your oral health.
  2. Tattle tooth program .
  3. Askov dental demonstration.
  4. Pre school dental health program.

Incremental Dental Care

- It is defined as the periodic care so spaced that increments of dental disease are treated at the earliest time constant, with proper diagnosis and operating efficiency, in such a way that there is no accumulation of dental needs beyond the minimum.
  - In private-6 months.
  - Public health program-1 year

Advantages

- Avoids high expenditure for initial care.
- Reduces loss of teeth.
- Inculcates a habit of periodic dental visits.

Disadvantages

- Operative dentistry is more time consuming on a piece meal basis than upon a wholesale basis.
- Resources are exhausted even before high school children receive care. They receive no maintenance care at all.
- Attention to deciduous teeth.

Conclusion

- However poorly developed dental services in country may be, an attempt is frequently made to get dental care to school children because of the belief that
  - The community has a social responsibility for its children.
  - If the children can be maintained in a state of good health, it is easy to maintain their dental health in adult life.
  - A regular dental attendance pattern in early life will be continued after school age.
THANK YOU
Social Sciences

Presented by:
Dr. HIMANSHU KUMAWAT
Dept. of Public Health Dentistry

SOCIAL SCIENCES
- It is a complex of psychosocial factors influencing the health of the individual and the community.
- Psycho – socioeconomic environment.
- Unique and includes cultural values, customs, habits, beliefs, attitudes, morals, religion, education, income, occupation, standard of living, community life and the social and political organization.

social sciences and sociology

1. SOCIOLOGY
2. SOCIAL OR CULTURAL ANTHROPOLOGY
3. SOCIAL PSYCHOLOGY
4. ECONOMICS AND
5. POLITICAL SCIENCE.

1. SOCIOLOGY
The study of society and human social action, and includes the examination of the origins, institutions, organization, and development of human life.

Society:
Society is a group of people, but the members of such a group must be mentally aware of each other.
Society is defined as an organization of member agents having social relations amongst themselves.

STRUCTURAL ASPECTS OF SOCIETY
a. SOCIAL INSTITUTIONS:
   It is a social structure and machinery through which human society organizes, directs and executes the multifarious activities required to satisfy human needs.
e.g.: School, Hospital, Parliament etc. family is a social institution
b. COMMUNITY:
   It is defined as the group, small or large, living together in such a way that the members share not one or more specific interests but rather the basic conditions of a common life.
FUNCTIONAL ASPECTS OF SOCIETY

A. SOCIAL NORMS
B. CUSTOMS AND HABITS
C. ETIQUETTES AND CONVENTIONS
D. SOCIAL VALUES

ASSOCIATIONS:

They are the group of people united for specific purpose or a limited number of purposes and are based on utilitarian interest. e.g.: Junior Doctors Association.

When an association serves a broad interests and does so in an accepted, orderly and enduring way, it may be called an institution. e.g.: Indian Dental Association

SOCIAL NORMS

The specified rules of conduct to be followed by the members of a society are technically known as social norms. Which are,

1. FOLKWAYS
2. MORES
3. LAWS

FOLKWAYS:
- Customary ways of behavior
- It is obligatory in the proper situation e.g.: ways of eating, dressing etc.
- They are necessary for the group solidarity.
- Vitality of a group is indicated by the extent to which people follow or abide by folkways.

MORES
- Socially accepted ways of behavior that involve moral standards.
- Each more is believed to be essential for social welfare.
- There is greater feeling of horror about violating mores and greater unwillingness to see them violated.
- Taboos are specific types of mores expressed in negative. e.g.:

LAWS
- Some important mores are converted in to laws in order to ensure implementation

CUSTOMS
- Practices that have been repeated by a number of generations.
- Practices that tend to be followed simply because they have been followed in the past.
- Customs have traditional, automatic, mass character.

HABITS
- A habit is a purely personal affair, not entailing any obligation.
  e.g.: Smoking a cigarette after dinner, Bathing daily etc.

2. ANTHROPOLOGY

Anthropology (from the Greek word ἄνθρωπος, "human" or "person") consists of the study of humanity

Anthropology is the study of man and his works.
3. Social psychology
1. It deals with human nature and attitudes in general.
2. It helps us to know how and why perceptions, thoughts, opinions, attitudes and behavior vary in different groups and societies. i.e. it studies the effect of social environment on individual psychology.

4. Economics
1. It studies the economic aspects of man i.e. production, distribution and consumption of the three basic essentials for his living namely food, shelter, clothing.

5. Political science
1. It deals with the constitution, the government and the laws of the state which impose some sort of discipline on mans movements or behavior.

Social classes and relation to dental care
1. UPPER MIDDLE CLASS
2. LOWER MIDDLE CLASS
3. UPPER LOWER CLASS
4. LOWER CLASS

Attitudes of the Underprivileged people towards health care
Trithart in 1968
1. Castration complex: There is reluctance to be complete mercy of the health practitioner. This is marked by reluctance to have a general anesthetic or sedation for dental or surgical procedures.
2. Contradiction Of Common Sense: Some dental or medical procedures such as the continuation of a drug after acute symptoms have subsided seem to contradict common sense.
3. **Coming In Crowds**: disadvantaged people do not like to be outnumbered by the people providing treatment. For this reason, they tend to come in crowds, with family and friends, to private dental offices or public clinics.

4. **The Last Ditch Effort**: The disadvantaged people often turn to medical or dental treatment by health professionals as a resort after all individual efforts have failed.

5. **If it hurts, you are a quack**: There general feeling is that medical and dental treatments should be painless.

6. **Unclean or dirty feeling**: The aseptic cleanliness of a dental office may convey the feeling of personal uncleanliness.

7. The clinic was built there not here.

8. Cold professional attitudes: many disadvantaged people complain about the cold, impersonal objective attitude and conduct of health professionals.

9. Difference in pain threshold: the pain threshold for those in poor health may also be low.

10. The pills don’t work

11. Appointments are not important

12. Teeth lost anyhow

13. Traditions
**VITAMINS & IT'S GROWTH**

Presented by:

DR. HIUMANSHU KUMAWAT
Dept. of Public Health Dentistry

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**Historical Perspective:**

- Funk (1912) - introduced the term *vitamine*, meaning “vital amine”
- Later the word *vitamin* was adopted, also referring to the Latin term *vita* for “life”

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**Vitamin Definition:**

- Organic compounds essential for normal growth and maintenance of life
- Required only in minute amounts
- Do not contribute energy, but some are critical to metabolism of energy
- Some are metabolic, but not dietary, essentials due to synthesis in the body
- Although some are chemically similar to each other, there is no common chemistry of vitamins

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**Vitamin Nomenclature:**

- Vitamins were originally categorized as:
  - Fat soluble: extractable with lipid solvents
    - vitamins A, D, E, K
  - Water soluble: extractable in water solution
    - vitamin C and the B-complex group

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**Vitamin A:**

- **Functions** – 1) It is indispensable for normal vision.
  2) Necessary for maintaining the integrity and normal functioning of glandular and epithelial tissues.
  3) It supports skeletal growth.
- **Major sources** – 1) Animal food-liver, eggs, milk & milk products.
  2) Plant food-spinach, papaya, mango.
**Deficiency symptoms:**
1) Night blindness  
2) Bitot’s spots  
3) Corneal xerosis  
4) Keratomalacia  
5) Hyperkeratosis & hyperplasia of gingival tissue

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**Vitamin D:**
- **Functions:**
  1) Calcium and phosphorus absorption and metabolism.  
  2) Used in maintenance of calcium homeostasis & skeletal integrity.
- **Major sources:**
  1) Food: fish liver oils, butter, egg yolk, milk.  
  2) Sunlight: It is synthesized by the body by action of U/V rays of sunlight on 7-dehydrocholesterol, which is stored in large abundance in skin.
- **Forms of vitamin D:**
  - vitamin D2 (calciferol)  
  - vitamin D3 (cholecalciferol)

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**Deficiency symptoms**
1) **Rickets:** Observed in young children.
2) **Osteomalacia:** Observed in adults.

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**Vitamin E:**
- **Functions:** antioxidant, normal reproduction and hatchability.
- **Major sources:** vegetable oil, cotton seed, sunflower seed, egg yolk, butter.
**Deficiency symptoms**

1. Hemolytic & hypoplastic anemia.
2. Degenerative lesions in skeletal muscles & heart.
3. Anatomic changes in nervous system.

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**Vitamin K**

- **Functions** - Prothrombin formation for normal blood clotting & release of certain coagulation factors.
- **Major sources** - 1) Vitamin K₁: Fresh green vegetables, cow’s milk. 2) Vitamin K₂: Synthesized by intestinal bacteria.

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**Deficiency symptoms**

1. Bleeding
2. Prothrombin content of blood is markedly decreased & the blood clotting time is considerably prolonged.

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**Vitamin C (ascorbic acid)**

- **Functions** - 1) Vitamin C has an important role in tissue oxidation. 2) It is needed for formation of collagen.
- **Major sources** - Citrus fruits; tomatoes; green, leafy vegetables; amla, guava.

Vitamin C is the most sensitive of all vitamins to Heat.
**Deficiency symptoms:**

1. **Scurvy**: Signs are swollen & bleeding gums, delayed wound healing, anemia, weakness.

**Thiamine (B1):**

- **Functions** – Essential for utilization of carbohydrates. It is involved in direct oxidative pathway for glucose.
- **Major sources** – 1) whole grain cereals, wheat, gram, yeast, oil seeds, nuts. 2) meat, fish, eggs.

**Deficiency symptoms:**

1. Beriberi & Wernicke’s encephalopathy. - Dry beriberi form is characterized by nerve involvement. - Wet beriberi form is characterized by heart involvement. - Infantile beriberi seen in infants between 2 & 4 months of life.

2. Wernicke’s encephalopathy characterized by ophthalmoplegia, polyneuritis, ataxia.

**Riboflavin (B2):**

- **Functions** – energy transfer, protein metabolism.
- **Major sources** – milk, cheese, liver, kidney, eggs, fish, green forages, oil meals.
Deficiency symptoms:

1) Angular stomatitis - 2) Cheilosis - 3) Glossitis

Niacin

Functions:
- Essential for metabolism of carbohydrate, fat, & protein.
- Essential for normal functioning of the skin, intestinal & nervous system.

Major sources:
- milk, meat, eggs, green vegetables, peanut butter, animal and fish byproducts.

Deficiency symptoms:

1) Pellagra:

2) It is characterized by three D's - Diarrhoea, Dermatitis, Dementia

3) Glossitis

4) Stomatitis

Nicotinic Acid (niacin):

Pyridoxin (B6):

Functions:
- It plays an important role in metabolism of amino acids, fats & carbohydrates.

Major sources:
- yeast, liver, meat, egg yolk, milk, cereal grains, vegetables.
**Deficiency symptoms**

1) Peripheral neuritis

2) Glossitis

Biotin:

- **Functions** - 1) FAT SYNTHESIS  
  2) DEAMINATION OF AMINO ACIDS.

- **Deficiency symptoms** - Dermatitis, loss of hair, nervous system disturbances, porosis in chicks.

- **Major sources** - whole grains, milk, yeast, organ meats.

Folic Acid:

- **Functions** – 1) Synthesis of nucleic acids.  
  2) for normal development of blood cells in the marrow.

- **Major sources** - green, leafy vegetables; organ meats; cereals; soybeans; animal byproducts.
Cyanocobalamin (B12):

- **Functions**: carbohydrate and fat metabolism, nucleic acid synthesis.
- **Major sources**: milk, meat and animal byproducts, fish meal.

**Deficiency symptoms**:

- Megaloblastic anemia.
- Demyelinating neurological lesions in spinal cord.
- Infertility.

Choline:

- **Functions**: maintenance of cell structure, fat metabolism in liver, transmission of nerve impulses
- **Deficiency symptoms**: fatty liver, renal tubule degeneration, enlarged spleen, kidney hemorrhage
- **Major sources**: milk, meat, eggs, fish, fats.

- www.google.com
THANK YOU