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# The Principles Prevention in Dentistry

Jalaleddin Hamissi

*Department of Periodontics & Preventive Dentistry, Faculty of Dentistry,  
Qazvin University of Medical Sciences, Qazvin  
Iran*

## 1. Introduction

### 1.1 What is health promotion?

Health promotion is the science and art of helping people and society change their lifestyles to achieve optimal health. It places an emphasis on improving quantity and quality of life for all and enables the improvement of health. Therefore, health promotion includes the use of any preventive, educational, administrative policy, program, or law to achieve this outcome. (1, 2, 3) Health promotion practice and policy is currently undergoing a process of fundamental change. The focus of many health education interventions has been on defined diseases, targeted at changing the behaviors of high-risk individuals. Health professionals have dominated this approach in terms of programme development, implementation, and evaluations. This health education model has been very popular with the dental profession as it fits the clinical approach to care and treatment of individual patients. Recent effectiveness reviews of the oral health education and promotion literature have however, recognized the limitations of many educational interventions to produce sustained improvements in oral healths. Another one of the common finding of the reviews was the lack of theory underpinning many interventions (4-8).

## 2. Oral health promotion

### 2.1 What is oral health promotion?

Oral health is a vital part of general health and hence affects the total well-being of individuals; thus, special attention must be given to this subject. Health education is part of the wider aspect of oral health promotion which involves local, national and even international cooperation. Oral health promotion attempts to make the healthier choices (9). Oral health promotion has developed and progressed a great deal in the last 20 years. In line with developments in public health, oral health promotion has changed focus to encompass a broader approach. It is important to highlight these developments as they are very relevant to the way in which oral health promotion interventions are evaluated (10, 11, 12). Oral health promotion is aimed at four preventable oral diseases: dental caries, disease of supporting structures, oral pharyngeal cancers, and craniofacial injuries. The poor, minorities, and the elderly share a disproportionate amount of preventable oral disease. Since prevention is vital to health promotion, the goal of any oral health program should be to empower people to attain equity in health and to reduce the incidence and prevalence of oral diseases through education and interventions (1).

Many oral health professionals may feel very uncertain and anxious about how they can become involved in this health practice, which seems so far removed from prevention and clinical dentistry.

The behavior of oral health providers and their attitudes towards their own oral health reflect their understanding of the importance of preventive dental procedures and improving the oral health of their patients (13, 14).

Oral health related behaviors are not just simple actions, but are enmeshed in more complex socio-environmental conditions (15), which include educational programs, such as tobacco prevention and cessation programmes, and public school oral hygiene instruction.

It is about making wider changes, which will enable people to make healthier choices. Oral health professionals must take an active role in changing the perceptions related to oral health by being involved in local initiatives that promotes health so that oral health becomes an integrated part of general health.

## 2.2 The Ottawa Charter

In 1986, WHO produced a document called *The Ottawa Charter* (16), which set out strategies for effective health promotion, including:

- Building healthy public policy.
- Local authority healthy eating policies.
- Creating supported environments.
- Developing individual knowledge and skill in those who deal with the public, including doctors, dental personnel, pharmacists, caterers, teachers and nursery staff.
- Supporting community action by working with voluntary groups in communities to care for the health in their particular community.
- Re-orientating health services towards prevention and ensuring that all health professionals give the same message.

## 2.3 Describing people's needs

If oral health promotion is to be effective, the Ottawa Charter needs to be in affect (for authorities, organizations, groups and individuals), continually revised, and delivered to the public in acceptable ways. In order to do this, it is necessary to define the needs of the people rather than their 'wants'. Epidemiological surveys show that people in poorer, deprived areas suffer far greater dental disease than those in wealthier areas and needs expressed by people in poorer areas are more likely to be free treatment, rather than water fluoridation. This is known as '*felt need*'.

The overall aim of oral health promotion is to influence the social norms of a community towards change and improvement (e.g. water fluoridation, smoking cessation, etc.).

The need for a dental health programme to target this specific segment of the population should be through systematic public and school oral health promotion programmes. Parents could also benefit from oral health education and should be advised regarding the necessity of regular dental follow-ups with dietary instructions to maintain good oral hygiene (17).

## 3. Oral public health

Nowadays, oral health is recognized as equally important in relation to general health (12). A recent document has set out new oral health objectives for the year 2020 (18). These includes paying special attention to high-risk groups. The current unequal distribution of

caries in developed countries, where the highest percentage is reported, demonstrates the need to identify such risk groups (19).

In terms of prevention of oral diseases, the relationship between periodontal and caries status of professionals is significant. The oral health concern of an individual is dependent on the attitude of a person. These attitudes naturally reflect their own experiences, cultural perceptions, familial beliefs, and other life situations and strongly influence the oral health behavior (20). In numerous developing countries, the prevention of oral health programs does not benefit the general population. This is due in part to the incidence of dental caries that is expected to increase in the near future in many countries as a result of increased sugar consumption and insufficient exposure to fluoride. In addition, with the increased use of tobacco in developing countries, the risk of periodontal disease, tooth loss, and oral cancer is also on the rise. Periodontal disease and tooth loss are also linked to chronic diseases such as diabetes mellitus and in several countries research has shown that the growing incidence of diabetes has a negative impact on the oral health of people.

### **3.1 Oral health education**

#### **3.1.1 What is health education?**

Health education is the profession of educating people about health (21). Areas within this profession include environmental health, physical health, social health, emotional health, intellectual health, and spiritual health (22). Health education also provides the decision-making basics needed for achieving and maintain health. It is a process of communicating information about evidence-based methods of disease prevention and encouraging responsibility for self-care (23).

### **3.2 Oral health**

The major challenges for oral health in the near future will be to turn knowledge and experience of disease prevention into action. Oral health advances and knowledge have yet to be achieved in developing countries. Clear differences have widened the gap between the poor and wealthy countries. In the year 2007, the WHO General Assembly declared that a mechanism to provide essential oral health care coverage for the population so to promote the availability of oral health services should be directed towards disease prevention and health promotion for poor and disadvantage countries. It further stated that for these countries, particularly for schoolchildren, the development and implementation of preventive programmes as a part of activities in schools for promoting health, with aiming to introduce healthy lifestyle and self-care practices in children need to be considered (24, 25).

In the twenty-first century in the USA, a healthy smile is necessary for social mobility and acceptance, interpersonal relations, employability, and a good self-image. Poor oral health may lead to pain and infection, absence from school or work, poor nutrition, poor general health, an inability to speak or eat properly, and even early death. Studies done in the late 1990s showed that poor oral health may also lead to low birth-weight babies, heart disease, and stroke. Up until the late 1990s, when the new HIV medications became available, over 90 percent of persons with AIDS had HIV-related oral diseases; therefore, it is clear that oral diseases play a significant role in compromising the overall health potential of individuals.

Oral health promotion as an emerging discipline needs to be based upon an appropriate, rigorous, high quality theory if it is to develop and mature. Within public health, discussions and debates are focusing on the value of new theories and concepts. It is important that oral health promoters engage in an informed debate over the theoretical

nature of their work. As Hochbaum and colleagues have stated 'Any profession that is not based on sound and continuously evolving theories that yield new understanding of its problems and yields new methods, is bound to stagnate and fall behind in the face of changing challenges.(26).

### 3.3 Oral health prevention programs

Oral disease, affects children, adults and families across the world every day, although they are nearly 100% preventable. While oral diseases are significant, their relationship to overall general health is often overlooked. It is the role of the dental public health to prevent and control dental diseases and promote dental health through organized community efforts.

This type of Oral Disease Prevention Program should be part of the Center for Health Promotion at all Departments of Health in the Ministry of Health and Medical Education. Moreover, this public health program should work to build the substructure and capacity of oral health within the community.

For those that have the Oral Disease Prevention Program (ODPP) in place, it works with partners throughout to reduce the prevalence and impact of oral disease. It also works to improve oral health care access and addresses oral health disparities in many countries.

Priority is given to diseases linked by common, preventable and lifestyle related risk factors (e.g. unhealthy diet, tobacco use, etc.), including oral health. Key socio-environmental factors involved in the promotion of oral health are also identified.

High relative risk of oral disease relates to socio-cultural determinants such as poor living conditions, low education, and lack of traditions, beliefs and culture in support of oral health. Communities and countries with inappropriate exposure to fluorides imply higher risk of dental caries and settings with poor access to safe water. Furthermore, control of oral disease depends on availability and accessibility of oral health systems but reduction of risks to disease are only possible if services are oriented towards primary health care and prevention.

Clinical and public health research has shown a number of individual, professional and community preventive measures are effective in preventing most oral diseases. This, together with insufficient emphasis on primary prevention of oral diseases, poses a considerable challenge for many countries, particularly the developing countries and countries with economies and health systems in transition.

Most of the evidence relates to dental caries prevention and control of periodontal diseases. Gingivitis can be prevented by good personal oral hygiene practices, including brushing and flossing which are important also for the control of advanced periodontal lesions. Community water fluoridation is effective in preventing dental caries in both children and adults. Water fluoridation benefits all residents served by community water supplies regardless of their social or economic status. Salt and milk fluoridation schemes are shown to have similar effects when used in community preventive programmes. Professional and individual measures, including the use of fluoride mouth rinses, gels, toothpastes and the application of dental sealants are additional means of preventing dental caries. In a number of developing countries the introduction of affordable fluoridated toothpaste has been shown to be a valuable strategy, ensuring that people are exposed appropriately to fluorides.

Individuals can take actions for themselves and for persons under their care, to prevent disease and maintain health. With appropriate diet and nutrition, primary prevention of many oral, dental and craniofacial diseases can be achieved. Lifestyle behavior that affects general health such as tobacco use, excessive alcohol consumption and poor dietary choices affect oral and craniofacial health as well. These individual behaviors are associated with

increased risk of craniofacial birth defects, oral and pharyngeal cancers, periodontal disease, dental caries, oral candidiasis and other oral conditions.

Opportunities exist to expand oral disease prevention and health promotion knowledge and practices among the public through community programmes and in health care settings. Oral health care providers can also play a role in promoting healthy lifestyles by incorporating tobacco cessation programmes and nutritional counseling into their practices. However, there are profound oral health disparities across regions, countries and within countries. These may relate to socioeconomic status, race or ethnicity, age, gender or general health status. Although common dental diseases are preventable, not all community members are informed of or are able to benefit from appropriate oral health-promoting measures. Under-served population groups are found in both developed and developing countries. In many countries, moreover, oral health care is not fully integrated into national or community health programmes.

The major challenges of the future will be to translate knowledge and experiences about disease prevention into action programmes. Social, economic and cultural factors and changing population demographics impact the delivery of oral health services in countries and communities and how people care for themselves. Reducing disparities requires far-reaching wide-ranging approaches that target populations at highest risk of specific oral diseases and involves improving access to existing care. Meanwhile, in several developing countries the most important challenge is to offer essential oral health care within the context of primary health programmes. Such programmes should meet the basic health needs of the population, strengthen active outreach to the community, organize primary care, and ensure effective patient referral.

To implement oral disease prevention programmes globally, existing partnerships must be strengthened, notably with national and international nongovernmental organizations and WHO Collaborating Centers on Oral Health. The WHO Regional Offices play an important roles in the implementation process. WHO coordinates, in collaboration with the international oral health community, global alliances with a view to sharing responsibilities for implementation of a global strategy. One major responsibility for WHO is map the changing patterns of oral diseases and to analyze their determinants, with particular reference to poor or disadvantaged populations. WHO's work for oral health also focuses on devising tools for intersectoral collaboration, community participation, supportive policy decisions, oral health care reform, and development of community-based strategies for oral disease control.

#### **4. Major oral diseases**

Oral disease is one of the most prevalent diseases in the world, causing considerable morbidity, particularly for disadvantaged populations and it has many risks common to other diseases affected by lifestyles. There are many different types of oral diseases, but they are generally differentiated as being of hard / soft tissue in origin. Hard-tissue oral diseases are those of the teeth, supporting bone and jaw; whereas soft tissue diseases affect the tissues in and around the mouth, including the tongue, lips, cheek, gums, salivary glands, and roof and floor of the mouth. Some oral diseases may result in both hard and soft tissue disorders and conditions such as cleft palate or oral-facial injuries. The major oral diseases and conditions are:

- Dental caries (tooth decay, cavities)
- Periodontal disease (gum disease)

- Malocclusion (crooked teeth)
- Edentulism (complete tooth loss)
- Oral cancer
- Craniofacial birth defects such as cleft lip and cleft palate
- Soft tissue lesions
- Oral-facial injuries
- Temporomandibular dysfunction (TMD)

#### 4.1 What is caries?

Caries is the progressive destruction of enamel, dentine and cementum, initiated by microbial activity at a susceptible tooth surface. *Caries* is a Latin word meaning *decay*.

### 5. Dental caries & tooth loss

#### 5.1 Overview

Dental caries is commonly known as tooth decay. In the minds of the lay person, and surprisingly even within dentistry, dental caries is often thought of as holes in the teeth rather than an entire disease process. Although dental caries is the most commonly investigated oral disease, most studies have only focused on children and thus studies on caries among adolescents and young adults are scarce. It is still one of the most common chronic diseases affecting children and adolescents in the world today (27, 28). Dental caries is a disease which afflicts humans of all ages, in all regions of the world. Subsequently, several studies have been carried out around the world to assess dental caries prevalence among children. In particular, there has been some discussion of early sociobiological factors affecting dental caries later in life.

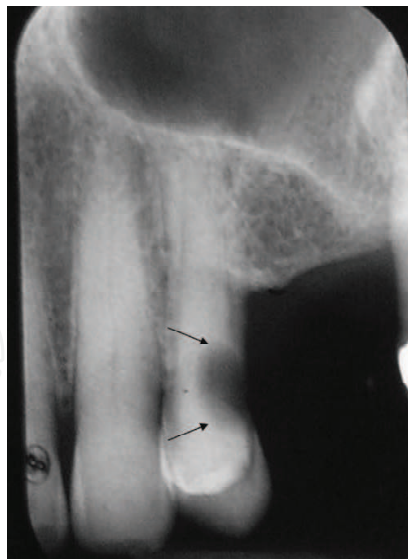


Fig. 1. Radiograph illustrating a large carious lesion on the distal root surface of a maxillary first bicuspid tooth (arrows)

The current unequal distribution of caries in developed countries, where the highest percentages has been reported demonstrates the need to identify such risk groups. With the enlarged use of fluoride, the detection of caries is not as simple as before. Yet, in 2009 many of us are still diagnosing caries the same way as in the early 1900s. The goal now is to be

minimally invasive – to catch caries at its earliest stages and attempt to remineralize incipient caries in teeth through the use of ozone and MI paste. Decay is difficult to detect in radiographs unless they are larger than 2 to 3 mm deep into dentin, or one-third of the buccolingual distance. A sharp explorer has a high specificity, but a low sensitivity for caries. Therefore, a lot of incipient caries can be missed if we rely on an explorer and radiographs alone. However, it has been known for over 100 years that dental decay is caused by multifactorial, transmissible diseases that involve dissolution of mineralized tooth structure by acids produced by dental plaque bacteria (29). Two groups of bacteria are responsible for initiating caries: *Streptococcus mutans* and *Lactobacillus*. If left untreated, the disease can lead to pain, tooth loss and infection (30).

A substrate (fermentable carbohydrate) and a susceptible host. The results of bacterial metabolism of carbohydrates include lactic acid and uric acid, which can lead to demineralization of the enamel and dentin. When the tooth root is exposed, the cementum covering the root surface is also affected. Dental caries can occur as coronal caries, root caries (Fig 1) and recurrent caries (caries associated with existing dental restorations).

## 5.2 Types of caries

There are three main types of caries as follows:

1. *Smooth surface caries* (Fig .2).
2. *Pit and fissure caries*-common in newly erupted teeth (Fig .3).
3. *Root caries*-Common in elderly, when root surfaces are exposed (Fig .4).  
*Gross caries* (Fig.5).

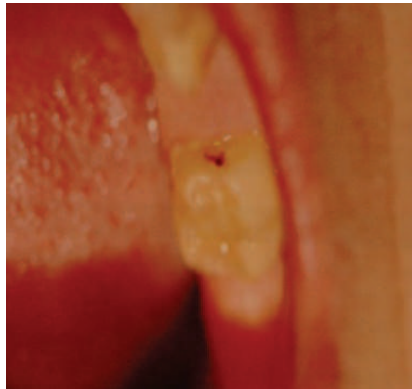


Fig. 2. Smooth surface caries on lower molar

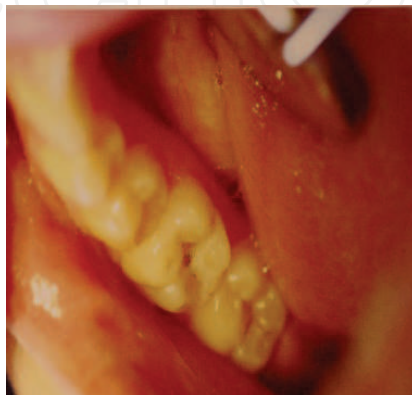


Fig. 3. Pit and fissure caries in lower molar



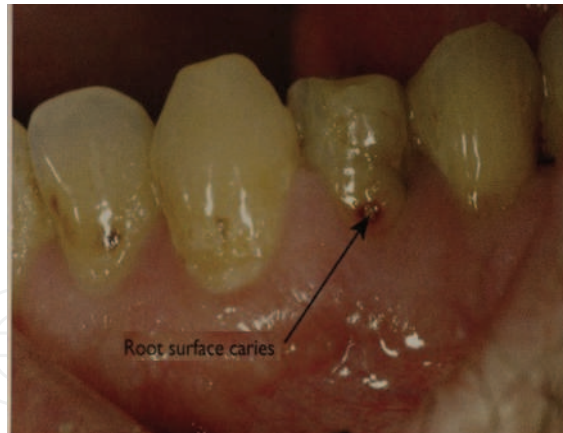


Fig. 4. Root Caries



Fig. 5. Gross caries with collapse of overlying tooth cusp

### 5.3 Development of caries

There are four factors to develop dental caries:

- Susceptible tooth
- Bacterial plaque
- Bacterial substrate (fermentable carbohydrate, which feeds plaque bacteria).
- Time.

**Susceptible tooth + bacterial plaque + substrate + time = Caries**

The most common sites where caries can occur are:

1. Occlusal surfaces of newly erupted pre-molars and molars
2. Contact areas between adjacent teeth
3. Exposed root surfaces

**The least common sites for caries to occur are smooth surfaces**

Improved ways for the detection of caries include the use of devices that detect caries through fluorescence and a low power laser to scan for tooth decay. New methods will soon appear to improve the ability of dentists to detect caries earlier than before. With this enhanced knowledge, dentists will be able to establish better protocols for caries intervention and treatment.

### 5.4 Epidemiology of caries

*Epidemiology* is the study of the incidence and severity of diseases within population groups. A number of studies have contributed to existing knowledge of the cause and development of dental caries.

Dental caries remain a major problem in many developing countries. Although decaling in most western countries over the past decades, caries continue to be the principal reason for dental treatment and tooth loss.

The application of specific agents for caries prevention in children and adolescents has been on the increase in the dental profession. These techniques include professional or at-home applications of fluorides, dental sealants, antimicrobials such as chlorhexidine, and xylitol chewing gum with studies supporting their use. For caries prevention, in order for these regimens to be as effective as possible, this evidence must transfer into increased use in the practice of clinical dentistry.

## 6. What is Gingivitis?

**Gingivitis** (*inflammation of the gingival tissue*) is a term used to describe non-destructive periodontal disease (31). The most common form of gingivitis is in response to bacterial biofilms (also called plaque) adherent to tooth surfaces, termed *plaque-induced gingivitis*, and is the most common form of periodontal disease. In the absence of treatment, gingivitis may progress to periodontitis, which is a destructive form of periodontal disease (32). While in some sites or individuals, gingivitis never progresses to periodontitis (33), data indicates that periodontitis is always preceded by gingivitis (34). According to the World Workshop in Clinical Periodontics in year 1999; there are two primary groups of gingival diseases, each with numerous subgroups (35):

### 6.1 Dental plaque-induced gingival diseases

- Gingivitis associated with plaque only
- Gingival diseases modified by systemic factors
- Gingival diseases modified by medications
- Gingival diseases modified by malnutrition

### 6.2 Non-plaque-induced gingival lesions

1. Gingival diseases of specific bacterial origin
2. Gingival diseases of viral origin
3. Gingival diseases of fungal origin
4. Gingival diseases of genetic origin
5. Gingival manifestations of systemic conditions
6. Traumatic lesions
7. Foreign body reactions
8. Not otherwise specified

### 6.3 Symptoms

- Bleeding
- Bright red or red-purple appearance ( Healthy gums are pink and firm in appearance)
- Tender when touched, sometimes painless

- Mouth sores
- Swollen gingiva
- Shiny appearance

#### 6.4 Treatment

The objectives of treatment are to reduce inflammation. The teeth are cleaned with scaling or root planning thoroughly by the dentist or dental hygienist. Careful oral hygiene is necessary after scaling and polishing. It is recommended that professional tooth cleaning be done twice per year or more frequently for severe cases in addition to brushing and flossing, antibacterial mouth rinses or other aids that may be suggested.

Orthodontic appliances may be advised for the treatment of malpositioned teeth or replacement of dental and other related illnesses.



Fig. 6. Severe gingivitis before (**top**) and after (**bottom**) a thorough mechanical debridement of the teeth and adjacent gum tissues.

#### 6.5 Complications

- Recurrence of gingivitis
- Periodontitis
- Infection or abscess of the gingiva or the jaw bones

#### 6.6 Prevention

Good oral hygiene is the best prevention against gingivitis because it removes the dental plaques that causes the disorder. The teeth should be brushed at least twice daily and flossed at least once per day. For people who are prone to gingivitis, brushing and flossing may be recommended after every meal. Regular scaling and polishing professionally is

important to removes plaque that may develop even with careful brushing and flossing. Many dentists recommend having the teeth professionally cleaned at least every 6 months.

## 7. What is periodontal disease?

**Periodontal disease** is a type of disease that affects one or more of the periodontal apparatus tissues:

- alveolar bone
- periodontal ligament
- cementum
- gingiva

While many different diseases affect the tooth-supporting structures, plaque-induced inflammatory lesions make up the vast majority of periodontal diseases (34) and have traditionally been divided into two categories (36):

1. Gingivitis
2. Periodontitis.

Although in some sites or individuals, gingivitis never progresses to periodontitis (33), data indicates that gingivitis almost always precedes periodontitis.

### 7.1 Epidemiology of periodontal disease

As recently as the mid-1960s, the main model for the epidemiology of periodontal diseases included these principles:

1. All individuals were considered more or less equally susceptible to severe periodontitis;
2. Gingivitis usually progressed to periodontitis with consequent loss of bony support and eventually loss of teeth;
3. Susceptibility to periodontitis increased with age and was the main cause of tooth loss after age 35 (37-40).

Data on the prevalence of periodontitis are dependent on how the disease is defined and the age group from which they were taken. Some 5% to 20% of any population suffers from severe, generalized periodontitis, although mild to moderate periodontitis affects a majority of adults. For those who are most susceptible, periodontitis becomes evident in teenage and early adult years rather than the later years. There are some risk factors for periodontitis include smoking, genetic predisposition, probably psychosocial stress, diabetes, and several uncommon systemic diseases. Improved molecular biology techniques for measuring bacteria and inflammatory cytokines have aided recent research in both epidemiology and clinical studies, and in the future are likely to permit more accurate diagnosis in the clinic (41).

### 7.2 Periodontal disease and associated factors

Plaque is the primary cause of gingival disease. There are factors that can contribute to periodontal disease which includes:

- **Hormonal changes**, such as those occurring during pregnancy, puberty, menopause, and monthly menstruation, make gingiva more sensitive, which makes it easier for gingivitis to develop.
- **Illnesses** may affect the condition of gingiva gums. This includes diseases such as cancer or HIV that interfere with the immune system. Since diabetes affects the body's ability to use blood sugar, patients with this disease are at higher risk of developing infections, including periodontal disease.

- **Medications** could affect oral health because some drugs could lessen the flow of saliva, which has a protective effect on teeth and gums. Some drugs, such as the anticonvulsant medication *Dilantin* and the anti-angina drug *Procardia* and *Adalat* can cause gingival hyperplasia.
- **Bad habits** such as smoking make it harder for gum tissue to healing itself.
- **Poor oral hygiene habits** such as not brushing or flossing on a daily basis make it easier for gingivitis to progress.
- **Family history of dental disease** can be a contributing factor for the development of gingivitis and periodontitis.

## 8. Malocclusion

Malocclusion is the misalignment of the upper and lower teeth when biting or chewing. A malocclusion is a misalignment of teeth and/or incorrect relation between the teeth of the two dental arches. The term was coined by Edward Angle, the "father of modern orthodontics" (42).

### Alternative Names

Crowded teeth; Misaligned teeth; Crossbite; Overbite; Underbite; Open bite

### How to identify Malocclusion?

- Pain arising from pressure to the jaw
- Problems in speech and ability to eat
- Breathing through the mouth
- Difficulty in keeping the lips closed

## 8.1 Cause

### Causes and symptoms

Malocclusions are most often inherited, but may be acquired. Inherited conditions include too many or too few teeth, too much or too little space between teeth, irregular mouth and jaw size and shape, and atypical formations of the jaws and face, such as a cleft palate. Malocclusions may be acquired from habits like finger or thumb sucking, tongue thrusting, premature losses of teeth from an accident or dental disease, and possibly from medical conditions such as enlarged tonsils and adenoids that lead to mouth breathing.

Malocclusions may cause no symptoms, or they may produce pain from the increased stress on oral structures. Teeth may show abnormal signs of wear on the chewing surfaces or decay in areas of tight overlap and chewing may be difficult. Crowding of teeth is recognized as an affliction that stems in part from a modern western lifestyle. It is unknown whether it is due to the consistency of western diets, a result of mouth breathing; or the result of an early loss of deciduous teeth due to decay.

Other theories state that the malocclusion could be due to trauma during development that affects the permanent tooth bud, ectopic eruption of teeth, supernumerary teeth, and early loss of the primary tooth.

### Causes of malocclusion include:

- Childhood habits such as thumb sucking, tongue thrusting, pacifier use beyond age 3, and prolonged use of a bottle

- Extra teeth, lost teeth, impacted teeth, or abnormally shaped teeth
- Ill-fitting dental fillings, crowns, appliances, retainers, or braces
- Misalignment of jaw fractures after a severe injury
- Tumors of the mouth and jaw

During active skeletal growth (43) mouth breathing, finger sucking, thumb sucking, pacifier sucking, onychophagia (nail biting), dermatophagia, pen biting, pencil biting, abnormal posture, deglutition disorders and other habits greatly influence the development of the face and dental arches (44).

Pacifier sucking habits are also correlated with otitis media. Dental caries, periapical inflammation and tooth loss in the deciduous teeth alter the correct permanent teeth eruptions.

### Complications

- Tooth decay
- Discomfort during treatment
- Irritation of mouth and gums (gingivitis) caused by appliances
- Chewing or speaking difficulty during treatment

## 8.2 Treatment of malocclusion

Crowding of the teeth are treated with orthodontics, often with tooth extraction and dental braces, followed by growth modification in children or jaw surgery (orthognathic surgery) in adults. This could be as follows:

- **Use of brackets**  
Malocclusion is commonly treated by using dental brackets. The constant and gently pressure provided by braces will enable teeth straightening and help push teeth back to their correct position. Braces consist of brackets that are fixed to the teeth, and wires that connect the brackets. Since the braces cannot be removed, extra attention should be paid in keeping the teeth clean and getting rid of food particles that are likely to get stuck in the braces.
- **Removal of teeth**  
This will help in instances of overcrowding, where it would make room for the other teeth to move into the correct position.
- **Reshaping, and bonding or capping teeth**  
This will treat rough or irregular teeth removing resistance in forming a proper bite.
- **Surgery**  
Requirement of surgery is rare. Surgery can be used to reshape the jaw or to stabilize the jaw bone through wires, plates or screws where required.  
Malocclusion can be treated in the majority of cases. Consulting a dentist early when malocclusion is suspected can ensure proper and effective treatment which will help in maintaining proper dental health.

## 8.3 Prevention

Many types of malocclusion are not preventable. Control of habits such as thumb sucking may be necessary in some cases. However, early detection and treatment may optimize the time and method of treatment needed.

## 9. Edentulism

Edentulism or tooth losses is considered as a major health problem that has serious emotional, social, and psychological consequences affecting a person's self-confidence, self-esteem, and overall health. Edentulism is a condition when one or more teeth are missing, have fallen out, or need removing due to injury or some dental disease. It can be full or partials, depending on the severity of the condition.

**Edentulism** is the condition of being toothless to at least some degree; it is the result of tooth losses. Loss of some teeth results in *partial edentulous*, while loss of all teeth results in *complete edentulism*. Organisms that never possessed teeth can also be described as *edentulous*.

Tooth loss among elderly people is usually attributed to plaque accumulation, gum recessions, and dry mouth.

### 9.1 Cause

The etiology, or cause of edentulism, can be multifaceted. While the extraction of non-restorable or non-strategic teeth by a dentist does contribute to edentulism, the predominant cause of tooth loss in developed countries is periodontal disease. While the teeth may remain completely decay-free, the bone surrounding and providing support to the teeth may reabsorb and disappear, giving rise to tooth mobility and eventual tooth loss. In the photo at right, tooth #21 (the lower left first premolar, to the right of #22, the lower left canine) exhibits 50% bone loss, presenting with a distal horizontal defect and a mesial vertical defect. Tooth #22 exhibits roughly 30% bone loss (45).

### 9.2 Other causes of edentulism

Other causes of edentulism include the following:

- **Poor oral hygiene habits:** Not brushing or flossing daily can cause the development and progression of tooth decay and gingival disease, increasing the risk of tooth loss.
- **Poor diet:** Foods and drinks high in sugar, carbohydrates and acid may cause irreversible tooth and gum damage, resulting in tooth loss.
- **Bad habits:** Smoking, chewing tobacco and/or drug use can damage teeth to the point of tooth loss.
- **Lack of education about tooth loss:** A lack of education about the causes and consequences of tooth loss prevents people from taking the proper preventative lifestyle and oral health care measures, or from getting periodic dental maintenance or necessary restorative treatment.
- **Fear and embarrassment:** Many people suffer from dental phobia, or anxiety/fear of going to the dentist, and do not seek dental treatment, even do they know they have a problem or pain. Others are embarrassed or ashamed to seek dental treatment because they feel they will be blamed for the condition of their teeth. Ignoring tooth decay or other serious dental problems can prolong and aggravate the condition and eventually lead to tooth loss.
- **Finances:** Some people have to postpone or forgo dental visits and treatments, including regular check-ups and cleanings, due to high dental care costs and/or lack of insurance coverage. Unfortunately, prolonging or eliminating dental care increases the chances of developing serious problems and, subsequently, greater expense for treatments.

- **Trauma:** Babies and young children are most susceptible to losing teeth prematurely due to trauma, because their tooth roots and gums are still developing. If parents do not take the proper and often immediate steps to deal with dental trauma, their children's oral health can be permanently affected. Adults, particularly those who participate in sports or suffer accidents affecting the face, also are at risk for tooth loss.
- **Systemic conditions:** Such as heart disease, respiratory disease, diabetes, HIV infection, malnutrition and immunosuppression are all associated with forms of periodontitis that often result in tooth loss.
- **Medical treatments:** Certain treatments, such as chemotherapy, head radiation therapy and immunosuppressive medications, weaken the immune system. These treatments may increase the risk of tooth infections and, therefore, the need for tooth extraction.

### 9.3 Treatments for tooth loss

- Patients and their dentists should develop a treatment plan that emphasizes prevention and early detection of oral diseases in order to keep the remaining teeth, especially in cases of partial edentulism. Prevention and detection strategies include patient education about edentulism causes, consequences and treatments, and following preventive oral health practices (e.g., daily oral health care), as well as preventative and therapeutic treatment.
- However, if tooth loss is unavoidable, there are several options for restoring your teeth and your smile.
- **Dental implants** are artificial tooth roots surgically attached to the jaw to secure a replacement tooth, bridge or denture. Permanent and stable, implant-supported restorations look, feel and function like natural teeth. Dental implants also can be used with a denture for better stabilization. Some implants take two to six months for the bone and implant to bond together (osseointegrate). During this time, a removable temporary tooth replacement can be worn over the implant site. Research also has advanced to where an implant can be placed immediately following tooth extraction in certain cases.
- **Dentures** are removable replacements for missing teeth and adjoining tissues. Partial dentures fill in the spaces created by missing teeth, keep remaining teeth from shifting and are an option if you have some natural teeth remaining. If you have lost most or all of your teeth, complete or full dentures are recommended. "Immediate" dentures are inserted immediately after removal of the natural teeth; "conventional" dentures are placed in the mouth about three to six months after tooth removal.
- A **dental bridge** is a false tooth that is fused between two porcelain crowns to fill in or bridge the space left by a missing tooth. The two crowns holding the dental bridge in place are cemented to your teeth on each side of the space; the bridge is secured into place and is irremovable. Some bridges also may contain two or more false teeth between the crown components, depending on the case.

### 9.4 Edentulism affects several areas of life

- **Low self-esteem:** Edentulism prevents people from feeling confident about their appearances. Many adults hesitate to venture into the public without teeth. They feel embarrassed to talk, smile and lack the confidence to meet people.
- **Impaired speech:** Edentulism affects speech; a lot of sounds and words we utter, depend on our front teeth. Using dentures too affects speech, especially if the dentures



are not well fitted. The individual usually tenses the facial muscles to hold the dentures in place, or constantly uses the tongue to rearrange it; resulting in slurred speech and clicking noises.

- **Increased health risk:** Edentulous individuals are at an increased risk for cardiovascular diseases.
- **Changed appearance:** Edentulous individuals have to deal with altered appearance, loss of teeth, and changes in their facial structure such as recessed cheeks, unsupported lips, collapsed jawline, which makes the chin and nose to appear closer. There is a huge change in a person's looks because the teeth, which support the facial muscles, are no longer present.
- **Facial ageing:** Total tooth loss accelerates facial ageing because the bone reduces in height and thickness; jawbone begins to shrink making the face look older.

## 10. Oral cancer

Cancer is one of the most common worldwide causes of morbidity and mortality today, with more than 10 million new cases and more than 6 million deaths each year (45). More than 20 million people around the world live with a diagnosis of cancer, and more than half all cancer cases happen in the developing countries; about 20% of all deaths in high-income countries and 10% in low-income countries. By the year 2020, there will be every year 15 million new cancer cases and 10 million cancer deaths. The cancer epidemic in high-income countries, and increasingly in low/middle-income countries, is also due to high or increasing levels of prevalence of cancer risk factors (46). It is estimated that around 43% of cancer deaths are due to *tobacco use, unhealthy diets, alcohol consumption, inactive lifestyles and infection* (47). And the world's most avoidable cause of cancer is tobacco user. In addition to lung cancer, tobacco consumption causes cancer of the oral cavity, pharynx, larynx, esophagus, stomach, pancreas, liver, kidney, ureter, urinary bladder, uterine cervix and bone marrow (myeloid leukemia). Exposure to environmental tobacco smoke (passive smoking) increases risk of lung cancer. Tobacco user and alcohol consumption act synergistically to cause cancer of the oral cavity, pharynx, larynx and esophagus. Cancer incidence and survival rates are clearly linked to socioeconomic factors. Infectious agents are responsible for almost 25% of cancer deaths in the developing and 6% in industrialized countries (47, 48).

The worldwide occurrence of oral cancer is high particularly among men; it is the eighth most common cancer (49, 50, 51). Cancer is one of the major threats to public health and increasingly in the developing world. Cancer is a silent epidemic that has not yet attracted major attention among health policy-makers and public health administrators.

### 10.1 Treatment and prevention

Treatment aims and therapy of disease prolong life and improve the quality of life. The most efficient treatment care is early detection programmes and following evidence-based standards. Treatment guidelines and praxis guides improve treatment outcome by setting standards for patient management. The formulation of guidelines and their adaptation to various resource settings help to assure quality including equitable and sustainable access to treatment resources.

To ensure that prevention of oral cancer is an integral part of national cancer control programmes, and to involve oral health professionals or primary health care personnel with

relevant training in oral health in detection, early diagnosis and treatment, the WHO Global Oral Health Programme. intends to work for the integration of oral cancer prevention into cancer prevention.

## **10.2 Craniofacial birth defects such as cleft lip and cleft palate**

Craniofacial defects such as cleft lip and cleft palate are among the most common of all birth defects. They can be isolated or one component of an inherited disease or syndrome. Both genetic and environmental factors contribute to oral clefts. Although clefts can be repaired to varying degrees with surgery, researchers are working to understand the developmental processes that lead to clefting and how to prevent the condition or more effectively treat it.

Cleft lip and cleft palate are birth defects that occur when a baby's lip or mouth do not form properly. Together, these birth defects commonly are called "orofacial clefts". These birth defects happen early during pregnancy. A baby can have a cleft lip, a cleft palate, or both.

Children with a cleft lip with or without a cleft palate or a cleft palate alone often have problems with feeding and talking. They also might have ear infections, hearing loss, and problems with their teeth.

The Centers for Disease Control and Prevention (CDC) recently estimated that each year 2,651 babies in the United States are born with a cleft palate and 4,437 babies are born with a cleft lip with or without a cleft palate (53). Cleft lip is more common than cleft palate. Isolated orofacial clefts, or clefts that occur with no other birth defects, are one of the most common birth defects in the United States. About 70% of all orofacial clefts are isolated clefts.

### **10.2.1 Cleft lip**

The lip forms between the fourth and seventh weeks of pregnancy. A cleft lip happens if the tissues that make up the lip do not join completely before birth. This results in an opening in the upper lip. The opening in the lip can be a small slit or it can be a large opening that goes through the lip into the nose. A cleft lip can be on one or both sides of the lip or in the middle of the lip, which occurs very rarely. Children with a cleft lip also can have a cleft palate.

### **10.2.2 Cleft palate**

The roof of the mouth is called the "palate." It is formed between the sixth and ninth weeks of pregnancy. A cleft palate happens if the tissue that makes up the roof of the mouth does not join correctly. Among some babies, both the front and back parts of the palate are open. Among other babies, only part of the palate is open.

### **10.2.3 Causes and risk factors**

Just like the many families affected by birth defects, CDC wants to find out what causes them. Understanding the risk factors that can increase the chance of having a baby with a birth defect will help us learn more about the causes. CDC currently is working on one of the largest studies in the United States—the National Birth Defects Prevention Study—to understand the causes of and risk factors for birth defects. This study is looking at many possible risk factors for birth defects, such as orofacial clefts.

The causes of orofacial clefts among most infants are unknown. Some children have a cleft lip or cleft palate because of changes in their genes. Cleft lip and cleft palate are thought to

be caused by a combination of genes and other factors, such as exposures in the environment, maternal diet, and medication use (54).

Recently, CDC reported on important findings about some factors that increase the risk of orofacial clefts:

- **Smoking**—Women who smoke during pregnancy are more likely to have a baby with an orofacial cleft than women who do not smoke (55).
- **Diabetes**—Women with diabetes diagnosed before pregnancy have been shown to be an increased risk of having a child with a cleft lip with or without cleft palate (56).

CDC continues to study birth defects, such as orofacial clefts and how to prevent them.

#### 10.2.4 Causes of cleft lip and cleft palate

The specific causes or risk factors for developing cleft lip or palate are not well understood. Potential causes/risk factors include:

- **Genetics** - Sometimes cleft lips/palates run in families.
- **Syndromes** - A cleft lip and/or palate may occur with other birth defects as part of a genetic syndrome.
- **Environment** - Some studies suggest a link between maternal drug use (such as antiseizure medication), alcohol abuse, or smoking, maternal illness or infection, or deficiency of folic acid may be related to the development of a cleft lip or palate.
- **Spontaneous** - Most cleft lip/palate anomalies occur randomly and without any clear cause or fault.

#### 10.2.5 Diagnosis

Orofacial clefts sometimes can be diagnosed during pregnancy, usually by a routine ultrasound. Most often, orofacial clefts are diagnosed after the baby is born. However, sometimes minor clefts (e.g., submucous cleft palate and bifid uvula) might not be diagnosed until later in life.

#### 10.2.6 Treatments

Services and treatment for children with orofacial clefts can vary depending on the severity of the cleft; the presence of associated syndromes or other birth defects, or both; and the child's age and needs. Surgery to repair a cleft lip usually occurs in the first few months of life and is recommended within the first 12 months of life. Surgery to repair a cleft palate is recommended within the first 18 months of life (57). Many children will need additional surgeries as they get older. Although surgical repair can improve the look and appearance of a child's face, it also may improve breathing, hearing, speech, and language. Children born with orofacial clefts also might need different types of treatments and services, such as special dental or orthodontic care or speech therapy (58).

Because children and individuals with orofacial clefts often require a variety of services that need to be provided in a coordinated manner, services and treatment by cleft teams is recommended. Cleft teams provide a coordinated, interdisciplinary team approach to care for children with orofacial clefts. These teams usually consist of experienced and qualified physicians and health care providers from different specialties. Cleft teams and centers are located throughout the United States and other countries. Resources are available to help in choosing a cleft team. With treatment, most children with orofacial clefts do well and lead a healthy life.

### 10.3 Soft tissue lesions

Oral malignancies are the sixth most common cancer around the globe (59). Oral mucosal lesions could be due to infection (bacterial, viral, fungal), local trauma and or irritation (traumatic keratosis, irritational fibroma, burns), systemic disease (metabolic or immunological), or related to lifestyle factors such as the usage of tobacco, areca nut, betel quid, or alcohol (60).

#### 10.3.1 History of the procedure

Benign soft tissue tumors are fairly common and are treated with surgery alone. Prior to the 1970s, surgery was the primary therapy for malignant soft tissue tumors, and most patients with high-grade tumors had a poor prognosis and a significant mortality rate. Since the mid-1970s, radiation therapy, chemotherapy, and advanced surgical techniques have helped increase long-term survival and decrease the need for ablative surgery (61). Future advances in molecular oncology may further improve diagnostic, prognostic, and treatment protocols for patients with soft tissue sarcomas (62, 63).

#### 10.3.2 Epidemiology

Overall, age-adjusted annual incidence of soft tissue sarcomas range from 15-35 per 1 million population. The rate increases steadily with age and is slightly higher in men than in women. Moreover, malignant soft tissue tumors occur twice as often as primary bone sarcomas.

Approximately 45% of sarcomas occur in the lower extremities, 15% in the upper extremities, 10% in the head-and-neck region, 15% in the retro peritoneum, and the remaining 15% in the abdominal and chest wall. Visceral sarcomas, arising from the connective tissue stroma in parenchymal organs, are not common.

The different types of soft tissue tumors have distinct age distributions.

- Rhabdomyosarcoma is seen more frequently in children and young adults.
- Synovial sarcoma arises in young adults.
- Malignant fibrous histiocytoma and liposarcoma generally occur in older adults.

Benign deep masses in adults usually are due to intramuscular lipoma.

In general, the prognosis in older patients with a diagnosis of high-grade sarcoma is poor. and the incidence of soft tissue tumors is slightly higher in males than in females (64, 65, 66).

## 11. Oral-facial injuries

### 11.1 Oral Injury prevention and emergency care

Oral and facial trauma surgery involves procedures that repair injuries to the face or mouth. The extent and types of surgery depend on the degree and forms of injury. In all traumatic injuries, it is important to recognize whether other structures may have been damaged such as the face, jaws or teeth.

### 11.2 Temporomandibular dysfunction

**Temporomandibular joint disorder (TMJD or TMD), or TMJ syndrome**, is a term covering acute or chronic inflammation of the temporomandibular joint, which connects the mandible to the skull. The disorder and subsequent dysfunction can result in major pain and damage. Since the disorder exceeds the boundaries between several health-care areas in particular, dentistry and neurology, there are different treatments.

The temporomandibular joint is predisposed to many conditions that affect other joints in the body, including ankylosis, trauma, arthritis, dislocations, developmental anomalies, and neoplasia. An older name in 1934 was characterized by James B Costen as Costen's syndrome (67, 68).

### Symptoms

The symptoms associated with TMJ disorders may be:

1. Biting or chewing difficulty and discomfort
2. Clicking, popping, or grating sound when opening / closing the mouth
3. Earache (particularly in the morning)
4. Headache (particularly in the morning)
5. Hearing loss
6. Migraine (particularly in the morning)
7. Reduced ability to open and close the mouth
8. Tinnitus
9. Neck and shoulder pain
10. Dizziness
11. Jaw pain or tenderness of the jaw
12. Dull, aching pain in the face

### Causes

There are many external factors that place excessive strain on the TMJ. These are not limited to the following:

Bruxism has been exposed to be a contributory factor in the majority of TMD cases (69). Over-opening the jaw beyond its range for the individual or unusually aggressive or repetitive sliding of the jaw sideways (laterally) or forward (protrusive). These movements may also be due to parafunctional habits or a malalignment of the jaw or dentition. This may be due to:

- Bruxism (repetitive unconscious clenching or grinding of teeth, often at night).
- Trauma
- Malalignment of the occlusal surfaces of the teeth due to defective crowns or other restorative procedures.
- Jaw thrusting (causing unusual speech and chewing habits).
- Excessive gum chewing or nail biting.
- Size of food bites eaten.
- Degenerative joint disease, such as osteoarthritis or organic degeneration of the articular surfaces, recurrent fibrous and/or bony ankylosis, developmental abnormality, or pathologic lesions within the TMJ
- Myofascial pain dysfunction syndrome
- Lack of overbite

Patients with TMD often experience pain such as migraines or headaches. There is evidence that some people who use a biofeedback headband to reduce night time clenching experience a reduction of TMD (70). The dentist must ensure a correct diagnosis and not mistake trigeminal neuralgia as a temporomandibular disorder (71, 72).

### Treatment

If the occlusal surfaces of the teeth or supporting structures have been changed due to inappropriate dental treatment, periodontal disease, or trauma, the proper occlusion may

need to be restored. Patients with bridges, crowns, or onlays should be checked for bite differences. These discrepancies, if present, may cause a person to make contact with posterior teeth during sideways chewing motions. These unsuitable contacts are called interferences, and if present, they can cause a patient to subconsciously avoid those motions, as they will have a painful response. The result may cause spasms of the chewing muscles. Treatment could be including of adjusting the restorations or replacing them.

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## **Oral Health Care - Pediatric, Research, Epidemiology and Clinical Practices**

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Oral health care in pediatric dentistry deals with complete oral health, including preventive aspects for children right from their conception to adolescence, encompassing all the spheres of dentistry including various specialties. It also includes planning a preventive program at individual and community levels. The current research interests in oral health care include studies regarding the role of stem cells, tissue culture, and other ground-breaking technologies available to the scientific community in addition to traditional fields such as anatomy, physiology, and pharmaceuticals etc of the oral cavity. Public health and epidemiology in oral health care is about the monitoring of the general oral health of a community, general afflictions they are suffering from, and an overall approach for care and correction of the same. The oral health care-giver undertakes evaluation of conditions affecting individuals for infections, developmental anomalies, habits, etc. and provides corrective action in clinical conditions. The present work is a compendium of articles by internationally renowned and reputed specialists about the current developments in various fields of oral health care.

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Phone: +86-21-62489820  
Fax: +86-21-62489821

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