

Chapter 6

ORAL HEALTH EDUCATION: RISK FACTORS AND PREVENTION OF ORAL DISEASES

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ABSTRACT

Oral health is defined by the World Health Organization as a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal disease, dental caries and tooth loss, and other diseases and disorders that affect the oral cavity. Its importance has been recognized during the years and studies have demonstrated the increase of the prevalence of oral diseases, namely dental caries and periodontal diseases.

Nowadays, oral diseases are the most prevalent chronic diseases worldwide that afflict humanity and affect a high percentage of the world population in industrialized and developing countries, turning out to be a costly burden to health care services. The treatment of oral diseases is expensive, accounting for between 5% and 10% of total health care expenditures in industrialized countries. In most developing low-income countries, the prevalence rate of dental caries is high and more than 90% of dental caries is untreated. An estimated 5 billion people worldwide suffer from dental caries.

Although considerable progress has been made in the prevention and treatment of dental caries, not all segments of the population have benefited equally.

It was long taken for granted that people of lower socioeconomic status have worse health than people of higher socioeconomic status. The epidemiology of oral health

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shows that the prevalence of oral diseases is different among socioeconomic classes, higher mainly among those with lower monthly incomes, lower educational levels and living in rural areas.

This chapter has the objective of explaining the main aspects, definitions and determinants related with oral health and oral disease prevention.

Keywords: Oral health, epidemiology, dental caries, fissure sealants, oral health education, primary preventive dentistry, oral health promotion

DEFINITION AND IMPACT OF ORAL HEALTH

Oral health is defined by the World Health Organization (WHO) *“as being free of chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the mouth and oral cavity”*(1).

Oral health has become an important component of general health. Nowadays, oral diseases such as dental caries and periodontal diseases are still the most prevalent diseases worldwide and WHO considers these pathologies as being important public health issues [1, 2].

The WHO has published important facts about oral health worldwide such as:

- 60–90% of school children and nearly 100% of adults have dental caries.
- Dental caries can be prevented by maintaining a constant low level of fluoride in the oral cavity.
- Severe periodontal disease, which may result in tooth loss, is found in 15–20% of middle-aged (35-44 years) adults.
- Globally, about 30% of people aged 65–74 have no natural teeth.
- Oral diseases in children and adults are higher among poor and disadvantaged population groups.
- Risk factors for oral diseases include an unhealthy diet, tobacco use, abusive alcohol use, poor oral hygiene and other social determinants [2, 3].

In the 1980s, through a political debate, a former surgeon of the United States of America named Everett Koop recognized the link between oral health and general health expressing *“You are not healthy without good oral health”*. Later a general-surgeon named David Satcher, wrote the report entitled: *“Oral Health in America: a portrait of a General Surgeon”*. This report explains the role of oral health in general health, emphasizing that oral health is a mirror for general health since the oral cavity is a main entrance for infectious organisms and disease development [4]. The state of oral health is assessed mainly by the Locker conceptual model, established in 1988. This is model based on the WHO classification and the concepts of impairment, disability and handicap.

This model reveals that oral health problems can lead to several possible consequences, such as:

- functional limitation;
- pain/discomfort;
- physical, psychological and social disability;
- disadvantage.

Basically, the Locker model is an attempt to understand oral diseases and their consequences on the physical, psychological and social levels(5). In terms of public health, it is crucial to understand that since 1989 there are statistical data that reveals that about 51 million school hours are lost annually because of diseases related to dental problems. Several studies also reveal positive correlations between the state of oral health and school performance [4]. Although science and medicine is advanced as to the treatments, the current lifestyles and habits (eating of sugars and fats, smoking, alcohol consumption) leads inexorably to serious oral health problems. Consequently, these problems can disrupt the normal functionality of a person [5].

Various studies have shown that oral health is an important determinant in defining the quality-of-life, namely among children and adolescents, and oral health behaviors developed during childhood influence directly the risk of oral disease development during adulthood [6, 7]. However, oral diseases can be prevented and easily controlled by simple primary prevention methods that include infrequent sugar consumption, tooth brushing effectively and regularly at least twice a day, daily use of dental floss and having a dental appointment regularly to prevent and detect oral diseases in an early stage [2, 8]. The application of topical fluoride supplements and fissure sealants are also considered as being important primary prevention methods in oral health [9, 10].

The impact of oral health is highly related with the quality-of-life [11]. A study developed by Crocombe et al. demonstrates that the improvement of dental visiting behaviors among low socioeconomic status groups would have the greatest effect on improving oral health and reducing oral health impacts [12].

Oral health must focus on prevention and treatment since the burden of oral diseases and other chronic diseases can be decreased simultaneously by addressing common risk factors. These include [1, 2, 13]:

- Reduce sugar intake and maintain a balanced nutritional intake to prevent dental caries and premature loss of teeth;
- Fruit and vegetable consumption that may protect against oral cancer;
- Stop tobacco use and reduce alcohol consumption to reduce the risk of oral cancer, periodontal disease and tooth loss;
- Ensure proper oral hygiene;
- Resource protection and protective equipment to reduce the risk of facial injuries in unsafe physical environments.

DEFINITION OF DENTAL CARIES

Dental caries consists in a post-eruptive bacterial infectious disease characterized by a progressive demineralization process that affects the mineralized dental tissues. It is

considered the most prevalent oral disease and the main responsible for tooth loss among the population [14-16].

It is recognized as the most common oral disease worldwide and is the key factor responsible for dental pain and tooth loss in populations throughout the world [2, 17].

This disease is also considered as being the most prevalent chronic disease in developed societies, being influenced by numerous genetic, cultural and social factors, which may explain, in part, large variations in the prevalence and incidence globally [2].

The absence of oral treatments invariably leads to an increase in lesion size progressing towards the dental pulp, resulting in a progressive development of pulpal inflammation accompanied by pain symptomatology and possible infection. Dental caries consists in a oral disease that is the main responsible for most of the consumption of biomaterials and human resources used in dental medicine, therefore dental caries have serious economic repercussions related to the high costs of their treatment and also with professional and school absenteeism [18-20].

Dental caries is a result of a very complex interplay of multiple determinants and what has been experienced is a highly fortunate decrease in the rate which caries lesions develop and progress in children's dentition. However, much of the available evidence today indicates that dental caries, unless carefully controlled, will continue to develop and progress throughout life. Thus, what has been considered an eradication of the disease should merely be considered a postponement of the time in life where the disease manifests itself with symptoms from lesions penetrating so deep into the dental hard tissue that cavities form [17].

It is considered as being a major biosocial disease which complications have a significant impact on the overall health of individuals and the community and a strong socioeconomic impact that affect the quality-of-life of people, particularly children and adolescents [16, 21]. Caries lesions can be classified according to their anatomical site. There is nothing chemically special about these sites, they simply reflect the location of a metabolically active biofilm. Thus, lesions may commonly be found in pits and fissures or on smooth surfaces. Smooth-surface lesions may start on enamel (enamel caries) or on the exposed root cementum and dentin (root caries) [18]. Primary caries is used to differentiate lesions on unrestored surfaces from those that develop adjacent to a filling, which are commonly referred to as recurrent or secondary caries [17].

Caries lesions may also be classified according to their activity. A lesion considered to be progressive would be described as an active caries lesion. In contrast, a lesion that may have formed years previously and then stopped further progression is referred to as an arrested or inactive caries lesion [17, 18]. Rampant caries is the name given to multiple active carious lesions occurring in the same patient. This frequently involves surfaces of teeth that do not usually experience dental caries. Patients with rampant caries can be classified according to the assumed causality: bottle or nursing caries, baby caries, early childhood caries, radiation caries and drug-induced caries [17].

Action Mechanisms That Lead to Dental Caries Development

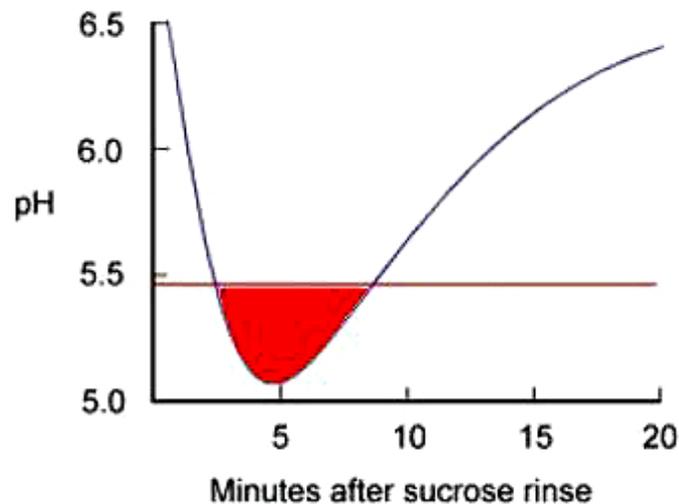
Dental caries are clinically characterized by a large polymorphism and a very complex etiology. Dental caries begins when there is a favorable interaction between multiple

etiologiological factors that create an imbalance in the oral cavity which allows the development of the disease [16].

A carious lesion initiates with the production of organic acids by the microorganisms of the oral cavity that synthesize the extracellular carbohydrates of the individual's diet [16, 22]. The presence of the organic acids produced will decrease the pH in the interface between the tooth surface and the bacterial plaque which permits the development of the demineralization process on the tooth enamel [14]. In the mouth, these changes over time are known as Stephan responses or Stephan curves [23]. The pH of dental plaque under resting conditions (when no food or drink has been consumed), is fairly constant. The response after exposure of dental plaque to a fermentable carbohydrate is that pH decreases rapidly, reaching a minimum in approximately 5 to 20 minutes. This is followed by a gradual recovery to its starting value, usually over 30 to 60 minutes, although this can be longer in some individuals. When the oral cavity has a pH below 5,5 (considered the critical pH), the saturation of the dental tissues initiates causing desmineralization. If this process is frequent and constant, an initial lesion will initiate and it may become the precursor of a dental cavity [17, 18].

Prevention methods have the main goal of decreasing the time of exposure of the tooth tissues to the low values of pH, therefore, it is strictly necessary the frequent removal of bacterial plaque, avoiding an increase contact with tooth surfaces [24].

The buffering action of saliva must also be considered. However, in the physiological pH range (6.5-7.4) for saliva, a high saliva buffer capacity, mostly due to HCO_3^- concentration, is protective against dental caries, possibly reducing the rate of tooth demineralization.



Graph 1. Stephan curve. Demonstration of the decrease of pH according to the time after sucrose rinse. The red zone corresponds to the critical pH (below 5.5) that takes place in the oral cavity and causes desmineralization of tooth enamel.

In relation to tooth demineralization, it should be stressed that the saliva concentration of HCO_3^- is strongly dependent on the secretion rate, and the lowest concentrations are found at low secretion rates. Salivary pH and the output of calcium and phosphate are very dependent on the secretion rate, with the lowest values found at low secretion rates [17].

ETIOLOGICAL FACTORS OF DENTAL CARIES

Primary Etiological Factors

The researcher Paul Keyes developed a diagram that describes the multifactorial etiology of dental caries. In this diagram, we can observe that there are three main etiological factors that are essential for the initiation and development of the disease:

- Susceptible host;
- Cariogenic oral microflora;
- Substrate that depends on the host's diet, which is then metabolized by the microorganisms that constitutes that bacterial plaque [16].

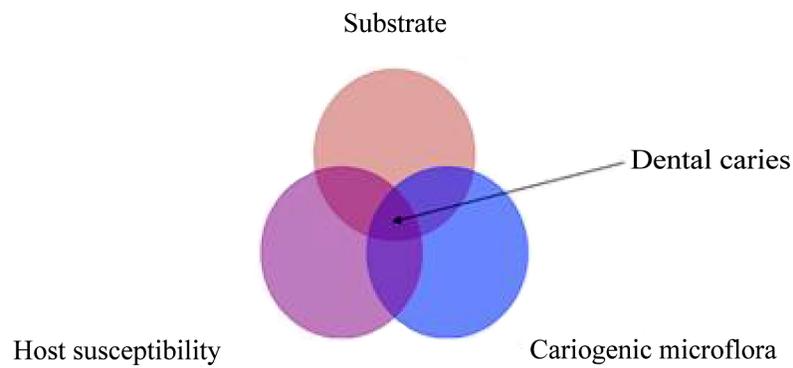


Figure 1. Diagram proposed by Keyes about the multifactorial character of dental caries. Adapted: Lima et al., 2007.

Host Susceptibility

Refers to the characteristics that the individual's dental tissues may influence on the susceptibility to acid dissolution developed by the microorganisms in contact with the substrate [14]. The presence of dental caries in dental morphology is influenced by the type of oral microflora, by immunological factors in the saliva, by food intake and dietary influences and the fluorides or a combination of these and other individual factors.

We must also take into account the susceptibility of the individual, which is directly related to socioeconomical and cultural factors and that translates into specific individual behaviors, namely related with oral health [16].

Dental Plaque and Oral Microflora

The oral cavity is inhabited by hundreds of bacterial species that play vital roles in maintaining oral health or in shifting to a diseased state such as dental caries and periodontal disease [25, 26].

The term biofilm is used to describe communities of microorganisms attached to a surface. Such organisms are spatially organized into a three-dimensional structure enclosed in a matrix of extracellular material derived from both the cells themselves and the environment. Dental plaque is considered as being a microbial biofilm and its development can be divided into several stages:

1. Pellicle formation;
2. Attachment of single bacterial cells (0-4 hours);
3. Growth of attached bacterium leading to the formation of distinct microcolonies (4-24 hours);
4. Microbial succession and co-aggregation leading to increased species diversity concomitant with continued growth of microcolonies (1-14 days);
5. Climax community/mature plaque (2 weeks or more).

It should be appreciated that plaque formation is a highly dynamic process, and that attachment, growth, removal and reattachment of bacterium may occur at the same time [17].

Dental caries, as a infectious disease, with bacterial etiology, correlates directly with bacterial strains that co-exist in the oral cavity, like *Streptococcus mutans* and *Lactobacillus* [17]. The cariogenic properties of *Streptococcus mutans* and *Lactobacillus* are widely recognised and, as significant oral pathological agents, the former group is linked to enamel lesion formation while the latter is associated with cavity progression [27].

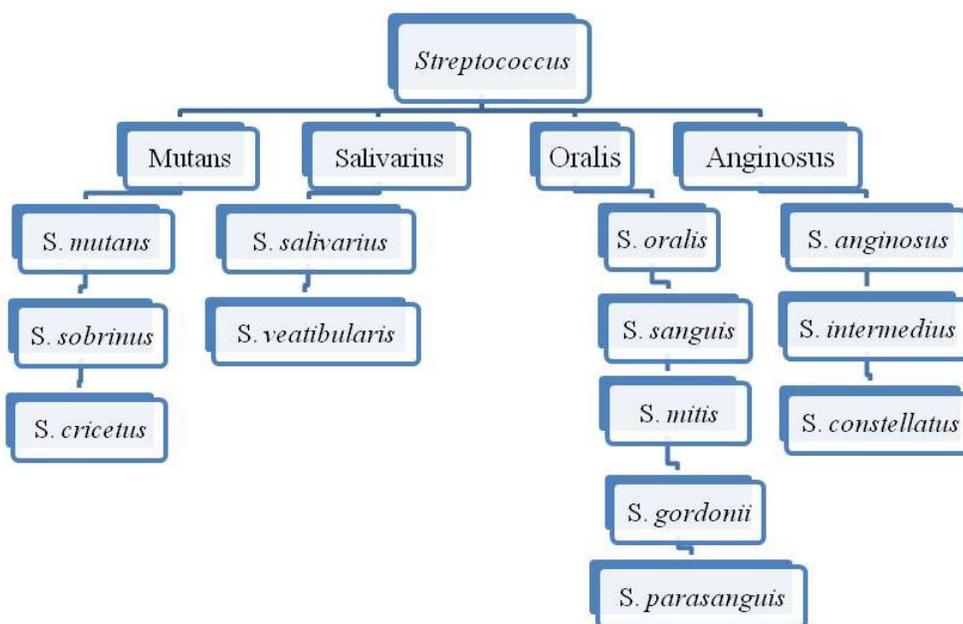


Figure 2. Diagram presenting the various strains of Streptococcus present mostly in the oral cavity.

Recent studies have proven that *Streptococcus mutans* can also be a potential risk factor for other diseases such as the aggravation of ulcerative colitis [28].

Actinobacillus actinomycetemcomitans is one of the most completely studied periodontal bacterial strains. It stays in the periodontal pocket of the oral cavity and damages tooth

supporting tissues being considered as the major cause of periodontitis [29]. Kaplan et al. and his colleagues found that *Actinobacillus actinomycetemcomitans* strains comprised three major phylogenetic lineages suggesting its potential virulence. Periodontitis is a bacterial infection of tooth-supporting tissues which may lead to tooth loss [30].

A study developed by Hart et al. identifies the top 10 bacterial species or groups according to the score that have been definitely and/or that could be possibly implicated in caries onset and progression which included *Streptococcus mutans* and *Lactobacillus spp* [31].

Aas et al. confirms in their study that there is a distinctive predominant bacterial flora of the healthy oral cavity that is highly diverse and can be site and subject-specific. It is important to fully define the human microflora of the healthy oral cavity before we can understand the role of bacterium in oral disease [32].

It has concurrently been clearly established that social, economic, cultural, ethnic, and environmental factors also play an important role in the progression of dental caries and also influences the individual oral microflora highly related with oral health behaviors [33].

Other bacterium are present in the oral cavity: other *Staphylococcus spp.* strains, which forms part of the oral normal microbial population; *Actinomyces spp.* which exists in large quantity in the dental plaque; the *Eubacterium spp.* found in periodontitis and abscesses; *Neisseria spp.* that are early colonizers of the oral cavity; the *Veillonella spp.* which is isolated from all surfaces of the oral cavity and there is a large number present in the tongue and dental plaque; *Haemophilus spp.* that is often present in saliva, dental plaque and epithelial surface; the *Eikenella spp.* which is most often present in the subgingival plaque, and their number increases in gingivitis; the *Capnocytophaga spp.* predominantly present in periodontal disease; the *Aggregatibacter spp.* that lives isolated from periodontal pockets and is implicated in juvenile periodontitis; *Porphyromonas spp.*, *Prevotella spp.* and *Fusobacterium spp.*, that are three bacterial strains isolated from subgingival plaque and implicated in the etiology of periodontitis in adults [34].

Cariogenic Diet

The level of cariogenic diet is determined by the presence of carbohydrates or refined sugars, especially sucrose, which serves as a substrate for microorganisms of the oral cavity [35]. The oral microflora synthesizes extracellular polysaccharides that play a key role in dental plaque formation and also in the production of organic acids that promote and facilitate enamel demineralization and, thereby, the development of dental caries [16, 22, 36]. The sugar intake alone without the presence of the other factors mentioned would be unable to induce caries. Thus, for the genesis of the disease there is required in addition to cariogenic diet microorganisms to metabolize the substrate, and a host susceptible to the damaging effects of metabolism [37].

Today the world faces two kinds of malnutrition, one associated with hunger or nutritional deficiency and the other with dietary excess. Urbanization and economic development result in rapid changes in diets and lifestyles, which may be reflected by a higher risk of dental caries development. A study developed in Scotland confirms a lower prevalence of dental caries in the rural areas, mainly justified by that fact that adolescents may practice a better and healthier diet when compared with adolescents living in urban areas

[38]. Market globalization has a significant and worldwide impact on dietary excess leading to chronic diseases such as obesity, diabetes, cardiovascular diseases, cancer, osteoporosis and oral diseases. Diet and nutrition affects oral health in many ways. Nutrition, for example, influences cranio-facial development, oral cancer and oral infectious diseases. Dental diseases related to diet include dental caries, developmental defects of enamel, dental erosion and periodontal disease.

The nutrition transition is a relevant example on how common risks influence public health, including oral health. The public health community involved with oral health should gain an understanding of the health effects of these complex developments in order to prevent or control oral diseases [13].

Secondary Etiological Factors

Time

The time factor has an important role in the manifestation of clinical signs of the development of caries lesions [14]. This factor was added by Newbrun to the primary etiological factors identified by Keyes, since these need to be present for a certain period of time, so that the progressive demineralization of enamel may develop [18, 39].

Fluorides

Research has shown that fluoride is most effective in dental caries prevention when a low level of fluoride is constantly maintained in the oral cavity. The goal of community-based public health programmes, therefore, should be to implement the most appropriate means of maintaining a constant low level of fluoride in the oral cavity [35, 40]. Fluorides can be obtained from fluoridated drinking-water, salt, milk, mouthrinse or toothpaste as well as professionally applied fluorides, or from combinations of fluoridated toothpaste with either of the other two fluoride sources [40]. Fluoride is being widely used on a global scale, with much benefit. Millions of people worldwide use fluoridated toothpaste. Recent local studies have shown that affordable fluoridated toothpaste is effective in caries prevention and should be made available for use by health authorities in developing countries. The WHO Global Oral Health Programme is currently undertaking further demonstration projects in Africa, Asia and Europe in order to assess the relevance of affordable fluoridated toothpaste, milk fluoridation and salt fluoridation [1, 13].

There is clear evidence that long-term exposure to an optimal level of fluoride results in diminishing levels of caries in both child and adult populations [14]. However, populations in many developing countries do not have access to fluorides for prevention of dental caries for practical or economic reasons [14].

There are some undesirable side-effects with excessive fluoride intake. Experience has shown that it may not be possible to achieve effective fluoride-based caries prevention without some degree of dental fluorosis, regardless of which methods are chosen to maintain a low level of fluoride in the mouth. The public health administrators must seek to maximize caries reduction while minimizing dental fluorosis [41].

Saliva

The mixed fluid in the mouth in contact with the teeth and oral mucosa, referred to as whole saliva, is derived predominantly from three paired major salivary glands: the parotid, submandibular and sublingual glands, but also from the minor salivary glands in the oral mucosa [14, 17]. Normally, the daily production of saliva ranges between 0.5 and 1.0 liter and is composed of more than 99% water and less than 1% solids, mostly proteins and electrolytes [17]. The multiple functions of saliva relate to both its fluid characteristics and specific components. Examples of the former are:

- Rinsing effect;
- Solubilization of food taste-substances;
- Bolus formation;
- Food and bacterial clearance;
- Dilution of detritus;
- Lubrication of oral soft tissues;
- Facilitation of mastication;
- Swallowing;
- Speech [17].

Other important functions of saliva consists in the protection of the teeth by neutralization of acid by buffering actions, by maintaining supersaturated calcium phosphate concentrations with regard to hydroxyapatite, and by participating in enamel pellicle formation. Furthermore, saliva components participate in mucosal coating and antimicrobial defense as well as digestive actions. Thus, saliva plays a major role in oral health and changes affecting salivary function, it may also compromise hard and soft oral tissues and functions [17].

The oral cavity is constantly exposed to many different kinds of substances, some of which influence the caries process to a great extent. An important function of saliva is therefore to dilute and eliminate substances introduced into the oral cavity, a physiological process usually referred to as salivary clearance or oral clearance [17, 18]. In patients with reduced quantity of saliva the mechanistic and cleaning properties of saliva in the mouth are impaired. With regard to prolonged oral clearance, a low oral sugar clearance inevitably increases the risk of caries development. Concerning this relation, the unstimulated flow rate has been found to be diagnostically more important than the stimulated one [17].

Oral Hygiene

There is a strong correlation between oral hygiene and the prevalence of dental caries [42]. Good oral hygiene habits help to prevent the development of caries by reducing the build-up of dental plaque [23].

The composition of the dental plaque varies not only from individual to individual, but also upon the location of the oral cavity and tooth surface. Control of bacterium plaque through proper hygiene, performed individually by each individual and complemented with the intervention of a dental professional are key preventive primary measures for the improvement of oral health and disease prevention, including dental caries [14].

EPIDEMIOLOGY OF DENTAL CARIES

Although there has been notable national and international survey activity for some years, the study of dental epidemiology is a relatively new development in dentistry stimulated by increasing concern about public health. Epidemiology is fundamental to understanding the clinical and the public health importance of the disease, as well as providing insights for devising and assessing methods of caries control. Epidemiology can be defined literally as the study of health and disease and their determinants in populations and groups. This science has a variety of well-developed study designs in public health medicine, many of which can be usefully applied in dentistry.

To understand the disease process and how caries presents in different groups in society, one needs to know about the disease in various communities, as opposed to just at the individual patient level which normally concerns the clinician providing dental care. The average levels of disease seen in the inherently atypical groups of self-selected and/or referred patients attending dental clinics frequently give a false picture compared with the wider population. The mean levels and distribution of disease seen in representative samples of the total population will usually be different. The existence of this inherent and explainable difference is a key issue that dental students, dentists and public health planners must understand [17].

Globally, it is estimated that 60-90% of young people (children and adolescents) and 100% of the adult population experience dental caries. Dental caries and periodontal diseases are common in industrialized countries and has been referred its increase in developing countries [2].

Analyzing the global caries burden for 12-year-old children in the six regions defined by the WHO, the highest values of the decayed, missing and filled permanent teeth index (DMFT index) were found in the regions of North America, Central America and South America (AMRO) with 2.35 and Europe (EURO) with 1.95, followed by the Southeast Asia (SEARO) registering 1.87, regions of the East Mediterranean (EMRO) with 1.63, Western Pacific (WPRO) with 1.39 and Africa (AFRO) with an average score of 1.19. Globally it is estimated that the DMFT at 12 years of age is 1.67 [43]. This value achieved in 2011 reflects an increase in the overall DMFT, considering that in 2004 it was 1.6 [2, 44].

Table 1. WHO Region specific weighted DMFT among 12-year-old children

WHO Regions	DMFT	
	2004(44)	2011(43)
AFRO	1.15	1.19
AMRO	2.76	2.35
EMRO	1.58	1.63
EURO	2.57	1.95
SEARO	1.12	1.87
WPRO	1.48	1.39
Global	1.61	1.67

The most significant decrease in the DMFT index was registered in Europe, which registered an average score in 2004 of 2.57, and of 1.95 in 2011. In the East Mediterranean, Africa and Southeast Asia there was an increase in the DMFT index from 2004 to 2011, which proves the increase in the prevalence of dental caries among the developing countries, contrasting with a decrease verified in the developed regions like Europe and North America. However, these last two WHO regions still register the highest DMFT index scores in the world [43]. Despite the fact that various studies have demonstrated in the last years an increase in the prevalence of dental caries among children and adolescents in developed countries, caries levels have a tendency to increase with age and remain a problematic public health issue in adults [45, 46].

Various studies demonstrate the existence of problematic situations in certain countries when analyzing the prevalence of oral diseases and the lack of correct oral health behaviors.

In a study developed in Thailand, it was found that 96.3% of children under 6 years of age had dental caries and the DMFT and dmft index in children 12 years was 8.1 and 2.4 respectively. In the same study it was found that 53% of children under the age of 12 reported toothache in the last 12 months. Of these, only 66% had a dental appointment in the last year. A large number of children who participated in this study consumed daily sugary foods and this has been correlated with the onset of dental caries [47].

Traebert et al. conducted a study in the municipality of Santa Catarina, Brazil, and found that the prevalence of caries in the primary dentition in children aged 6 years was 60.9% in public schools, enrolling more disadvantaged children (dmft index 2.98) and 34.9% in private schools (dmft index 1.32) [48].

In another study designed to compare the prevalence of dental caries among children in specific regions of Estonia and Denmark, there were significant differences. Thus, 83.8% of children 7 years of age had caries in Estonia while in Denmark this prevalence was only 62.1% in the same age group [49]. Conclusions of this study highlight the unsatisfactory level of oral hygiene of children in Estonia, as described in other studies, and its relation to excessive intake of foods and sugary drinks. Szoke and Petersen found in Hungary prevalence of caries of 73% and 84.5% in children six and twelve, respectively. It is a high prevalence reflecting the need to implement measures to promote oral health at community level [50].

Sweden is a country that has the lowest prevalence of caries worldwide, having been recorded in the last decades a significant decrease in prevalence, especially among younger [51]. However, in this country, there is still a prevalence of caries of 10% among adolescents, although cases are derived predominantly from immigrant families according to the authors [52]. A Swedish study developed by Hasselkvist et al. concludes the association between certain unhealthy lifestyle habits and poorer oral health, mainly related with the consumption of soft drinks [46].

PREVENTION AND NON-INVASIVE TREATMENTS OF DENTAL CARIES

Primary prevention means taking measures to prevent disease or ill health. An example would be immunizations, which attempt to prevent people from developing disease in the first place. This is in contrast to secondary prevention, which involves strategies to diagnose and

treat an existing disease in its early stages before it results in significant morbidity. An example of this would be a mammogram, which is aimed at finding breast cancer in its earliest stage.

Tertiary prevention, then, involves treatment of established disease by restoring function and reducing disease-related complications. This, unfortunately, is the focus of most physician practices, and involves already established disease that is already causing health problems [23, 53].

Primary prevention in dentistry essentially covers the following methods: brushing, use of dental floss, regular dental appointments, fluoride administration, application of fissure sealants; balanced and non-cariogenic diet. The applications of these methods are dependent of the knowledge about primary prevention and oral health and sociodemographic and cultural factors of the community [23, 24].

Sociodemographic Aspects

The increased risk of oral disease is associated with low socioeconomic status, low educational level and cultural factors that often determine a greater difficulty in access to information and health [21, 37, 54, 55]. Overtime, and despite the continuing high prevalence of dental caries worldwide, the prevalence of the disease has declined from high to low and moderate in most developed countries [18, 56]. There is a persistence of oral problems in many communities, particularly among the less privileged with worse socioeconomic status, both in developed and in developing countries [19, 54].

In some industrialized countries, the decrease of the prevalence of dental caries and other oral diseases is explained largely by the interventions achieved through oral health promotion programs [2, 13]. This pattern of evolution of the prevalence of dental caries is directly related to the many preventive measures implemented in recent years, as the fluoridation of public water supply, administration of fluoride mouthwashes and fluoride toothpastes and the improvement in standards of oral hygiene. In addition to these factors, some authors cite improvements in the provision of oral health services as responsible for the decline of dental caries [57].

As an example, the large decrease in the prevalence of dental caries in the Scandinavian countries (Sweden and Finland), Australia and New Zealand, achieved through the implementation of programs aimed at the prevention of dental caries [2, 51].

However, in many developing countries whose populations do not have access to oral healthcare and where there are systematic health and economic transition systems is insufficient attention to the need for primary prevention towards oral diseases [21, 58]. In some of these countries there has been an increase in the prevalence of dental caries justified by the direct influence of the existing socioeconomic conditions in these populations. The exceptions are the countries where has been implemented programs to promote oral health and disease prevention [22, 59].

Self-perception of oral health that every individual has is also associated with demographic and socioeconomic status [60, 61]. The attitude of the individual towards their own oral health as well as health care provided by professionals significantly influences the vision of oral health among the population.

The impact of oral diseases both at individual and community level, in terms of pain and suffering, disability and reduced quality of life is quite considerable. This impact is also higher in developed countries [3, 58].

A cross-sectional study developed by Peres et al. with 695 adolescents showed that the higher the prevalence of dental caries the higher the dissatisfaction levels related with chewing function. This situation occurred in most public schools, attended mostly by disadvantaged children, than in private schools [41].

In a study by Bastos et al. it was found that individuals with better socioeconomic status and higher levels of education may develop more healthier level of oral health behaviors, and these, a greater possibility of purchasing products for hygiene oral [62].

One of the main problems in the unequal general and oral health situation is related with socioeconomic status and social inequalities. Social exclusion has a devastating effect on health. The damage to health combines the deprivation of goods and services necessary to minimize physical, psychological and social problems that is a major characteristic of poverty [59]. The socioeconomically disadvantaged seek less healthcare services and have less access and interest in information, having a higher predisposition in developing health risk behaviors [11]. They very easily find themselves in a worse nutritional condition, have less access to early diagnosis, fewer therapeutic resources and poorer prognosis due to a higher risk of disease development [53].

Brushing

Brushing is the best form of mechanical removal of dental plaque and food debris and is seen to be the primary method of oral hygiene, when complemented with the use of a fluoride toothpaste [24]. The use of fluoride toothpaste with brushing allows an increasing abrasive action of the bristles of the brush and the release of chemicals in the prevention and control of dental plaque. Several authors conclude that the recommended frequency of daily brushing should be at least twice a day and the hygiene should be applied also on other oral structures such as the tongue, gums and palate [14, 24, 51].

In the last national prevalence study of oral diseases, it was demonstrated that nearly 50% of children aged 6 years and 67 % and 69% of youth 12 to 15 years, respectively, toothbrush at least twice a day, with a fluoride toothpaste. Brushing their teeth at bedtime was made, always or almost always, by only 50% of children and adolescents that participates in the national survey [63].

Dental Floss

Dental floss is a key addition to oral hygiene, allowing the hygiene of interdental spaces with difficult access to the brush bristles. The use of dental floss daily to prevent the development of caries in the interproximal surfaces of the teeth and periodontal diseases is highly recommended [14, 23].

The most difficult areas to remove dental plaque are the interproximal surfaces that lie at the level of interdental spaces [64, 65]. Dental floss is a key addition to oral hygiene, allowing the cleaning of interdental spaces with difficult access during brushing [64].

The efficient use of dental floss allows the:

- Removal of plaque and food debris that adheres to the tooth surface restorations, orthodontic appliances, fixed prostheses, soft tissue located in the interproximal spaces and implants;
- Assistance in identifying the presence of subgingival calculus, interproximal carious lesions or unadapted dental restorations;
- Reduce gum bleeding [64, 65].

However, flossing is not widely used by the population, especially by adolescents. There is a clear need to educate the communities for daily use of dental floss and focus its importance as a complement in oral hygiene [64].

In the last national study of the prevalence of oral diseases, the daily use of dental floss was reported by 14 % and 10 % of young people between 12 and 15, respectively [63].

Dental Appointments

Regular dental appointments is critical and must occur at least once every six months, because it allows early detection of oral diseases, provides specific guidance on certain oral hygiene procedures and apply a set of other primary preventive measures such as topical application of fluoride and fissure sealants [1, 12]. Regarding the periodicity of routine appointments there are different opinions about what would be more appropriate. However, the same frequency should take into account the needs of each population [14].

The self-perception of the need for regular dental healthcare, level of education and socioeconomic status, the high cost of medical and dental appointments and phobia are often associated with dental appointments [22, 51, 62, 66].

One of the main reasons for going to the dentist is the emergence of pain [19]. A toothache among children and adolescents has been classified as a major public health problem and is associated with poor oral health behaviors, including irregular attendance to the dentist [67, 68].

Children and adolescents with better socioeconomic conditions, those who live in urban areas and whose parents perform medical and dental appointments regularly are those who visit the dentist more frequently, favoring medical and dental care prevention [2, 67].

Accessibility to medical and dental care, at 12 and 15 years, was reported by more than 85% of young people in the last national prevalence study of oral diseases in 2008. In this study, the main reasons for a dental appointment were routine appointment or check-up and for dental treatments, not in an emergency situation [63].

Fluoride Applications

Maintaining adequate levels of fluoride in the oral cavity is achieved not only through the application of fluoride by brushing with a fluoride toothpaste, but also by the periodical use of fluoride mouthwashes and fluoride gel application during a dental appointment [23, 24].

A study by Schulte et al. in Germany and France reveals the importance that the application of fluoride has on the reduction of dental caries in children 12 years of age [69].

Maintaining adequate levels of fluoride in the oral cavity is an important determinant of oral health and contributes to the prevention of dental caries. The preventive and therapeutic action of fluoride is achieved predominantly for its topical action, both in children and in adults, through three different mechanisms:

- Inhibition of demineralization process;
- Potentiation of remineralization process;
- Inhibition of dental plaque formation [40, 70].

Between 1987 and 2005 , the guidelines of oral health programs developed in Portugal advocated the intake of fluoride by children, in the form of oral drops (6 months to 2 years) and tablets (from 2 to 16 years) , whose dosage could reach 1mg/day, depending on the age and contents of this element in public water supplies. This administration could be taken in schools. In the primary schools, the strategy was complemented by a rinse with a solution of sodium fluoride 0.2%, every two weeks [40].

Nutrition education and practice of oral hygiene by brushing with a fluoride toothpaste twice a day, has proven a collective means of preventing dental caries, with great effectiveness and low cost, and should be considered in strategies of community oral health programs. The fluoride content of toothpastes should be 1000 to 1100 ppm (or 0.10% to 0.11%), ranging between 500 and 1500 ppm [40].

Before the widespread use of fluoridated toothpaste, use of fluoride mouthwash was considered of great importance, especially in terms of use at a community level due to its low cost, high efficiency and simplicity of use with the great advantage that it can be used outside the clinical context. A prescription of mouthwash solutions should be made by the dentist according to the individual risk of each patient. The daily rinses usually have a sodium fluoride concentration of 0.05% and weekly or biweekly using a concentration of 0.2%. It is recommended from the age of 6, make a mouthwash, fortnightly, with a solution of sodium fluoride 0.2% [40].

Currently it is considered that the benefits are primarily fluorides of its topical action on the tooth surface, whereas their systemic action (pre-eruptive) is much less important [23, 40].

Fissure Sealant Application

Fissure sealants are resinous materials professionally applied on the occlusal surfaces of the posterior teeth. Several epidemiological studies show an association between the morphology of the occlusal surface and the risk of developing dental caries [24]. Dental anatomy is characterized by the presence of a complex set of pits and fissures with variable depth and is characterized by their locations with increased susceptibility to the development of caries due to the greater difficulty of cleaning these areas and greater bacterial and plaque retentiveness [24]. Thus, the sealants are indicated when there are pits and fissures very deep and narrow creating a physical barrier to the buildup of plaque in these specific anatomical regions of the tooth preventing the formation of dental caries [18]. The placement of fissure sealants in these areas of high susceptibility to caries is considered a primary preventive measure to reduce the risk of dental caries allowing the decrease of the incidence of dental caries in pits and fissures, preventing the need to perform more dental restorations. Therefore, the application of sealants is covered by community oral health programs being considered an effective and economical method for primary prevention of dental caries [14].

It was concluded in the last national study of the prevalence of oral diseases in 2008, at age 12, 38 of subjects had one or more teeth with fissure sealants [71].

A study developed in Greece with twelve- and fifteen-year-olds was able to show that fissure sealants had a positive effect on the decrease of dental caries development [72]. In general, we can establish that fissure sealants is an effective way to prevent caries in

permanent teeth, and one which exhibits its greatest benefits in childhood and adolescence, and which can prevent the appearance of carious lesions on permanent molars [10].

Decrease of Cariogenic Foods and Beverages

The use of cariogenic foods with a high content of carbohydrates, is an important risk factor for the development of dental caries and premature loss of teeth has been a problem in increasing development, mainly in industrialized countries [2, 37, 46, 73]. It is important to regular consumption of some foods, such as fruits and vegetables, which also contribute to the prevention of the structures of the oral cavity and is fundamental for the prevention of cancer diseases [2, 37].

Several studies also indicate that there is a association between obesity and oral diseases [74-76]. However, the relationship between obesity and dental caries is not clear. The presence of a common risk factor, which is the high intake of sugary foods, appears to be a justification to explain the relationship between obesity and dental caries [74, 77].

Food hygiene is to prevent the frequent consumption of sugary foods or drinks, especially in the period between meals. It is important to regular consumption of some foods, such as fruits and vegetables, which also contribute for the prevention of oral cancer [2, 3].

There is evidence that the nutritional status influences the formation and development of the teeth, observing an increased risk for the occurrence of caries in individuals who experience episodes of mild to moderate malnutrition in the first year of life [55]. Therefore, the more economically advantaged groups would have greater opportunity to have a better nutritional/immune status and consequently lower risk of caries and dental pain [19, 55]. On the other hand, the socioeconomically wealthier groups consume more foods with high sugar contents which do not cease to be an influential factor in oral health oral, considering that they also practice better oral health habits. A study developed by Zaborskis et al. show that children and adolescents from higher socioeconomic levels have worse care of their food, which translates to higher consumption of cariogenic foods [78].

CONCLUSION

The inequalities in oral health can be reduced with simple primary prevention measures that can be instructed to the community by oral health education programs.

It is extremely important to focus on the oral health of the younger, namely, children and adolescents. Oral diseases, such as dental caries, can be devastating to both children and adolescents. Dental caries may interfere with a child and adolescent's ability to eat, sleep and learn, and it can have a significant impact on their self-esteem.

Much has to be done in order to decrease the severity of oral diseases among the population, especially, the younger. Various resources may lead to better oral health status, such as:

- Oral health education;
- Improvement of oral health behaviors;
- Better knowledge about the oral microflora and environmental factors that influence directly and indirectly oral health;

- Innovation and technological application in biomaterials used in dental medicine to decrease the risk of oral disease development.

Oral health is a major public health issue worldwide. With simple daily habits, the prevention of oral diseases development is possible. Various oral health promotion strategies should be developed based on the following topics: oral health education for children and adolescents in schools and public institutions; oral health promotion for teachers and parents; technology application in oral health education; education and motivation for oral health behaviors given by health professionals. Community programs should be considered and developed in order to improve knowledge and behaviors related to adolescents' oral health, drawing special attention to the intervention of various health professionals, teachers and parents in the oral health education that should be transmitted to children and adolescents. Therefore, oral health education activities directed towards the prevention of risk factors for developing oral diseases should involve both parents and their children, because parental behavior is a significant predictor of children and adolescent oral health.

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