

Oral Health and Related Factors: An Update

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Abstract:

Oral health is a state of being free from chronic mouth and facial pain, oral and throat cancer, birth defects such as cleft lip and palate, periodontal disease, tooth decay, and tooth loss. Oral health can affect many aspects of a person's life. Professional oral health support can help in developing and or improving caries preventive interventions. In addition, oral health education, early referral to a dental practice, dietary regulations promote community oral health status. This review article aimed to provide a brief update to oral health.

Key Words: Dental caries, gingivitis, oral health, periodontitis

Background

Oral health means a state of being free from any diseases or disorders which affect the oral cavity including tooth decay and tooth loss, periodontal (gum) disease, any kind of oral lesions/cancers, and birth anomalies such as cleft lip and palate. Some risk factors have been known for oral diseases such as tobacco use, alcohol consumption, poor oral hygiene, and unhealthy diet.¹ Oral health can affect different aspects of person's life such as health, speech, mastication, learning, and employment.² Nowadays, dental caries and its complications are the main reasons to visit dentists and affect any age group. Dental caries in children is more important as affects both primary and permanent dental systems.³ Dental caries in preschool children is an important public health issue which is increasing during the past two decades as the preschool children receive fewer oral health services. This is because of two reasons. First, the parents and professionals are more concerned with permanent dentition. Second, access to primary schools is easier than that to child care centers. It is worthy to note that dental caries and pain have a great impact on children daily life. Besides eating and chewing problems, toothache plays a crucial role in the child's emotional status, sleep pattern, ability of learning, and usual activities. In addition, discolored or misshaped teeth cause a child to be embarrassed.^{4,5} Dental

appearance has a psychosocial impact on people's life which can increase the motivation.⁶ Taken together, dental diseases in primary dentition affect both children's current quality of life and their future. Nowadays, the level of caries in permanent teeth in 6-12-year-old children has recently been decreased by 6%, and the number of extracted teeth has become 2-3 times lower.³ Due to the importance of oral health in people's life, this review article was carried out to provide a brief update to oral health.

Materials and Methods

In this review article, a relevant English Literature search in PubMed, ScienceDirect, and Google Scholar was performed from 1990 to mid-2016. The key words: Oral health and dental health were searched in title/abstract of publications. All relevant articles were selected and reviewed.

Results

Enamel

Enamel is the only tissue which constantly exchanges calcium and phosphorus ions despite the absence of blood vessels and nerves. In addition, enamel is the hardest tissue in the body and composed of 97% mineral. The maximum enamel thickness can be seen on the occlusal surfaces which is about 1.7 mm. The enamel at the gingival margin is the thinnest layer (0.01 mm). Previous studies indicated that the thickness of the enamel layer is maximal in the area of chewing tubercles of permanent teeth (2.3-3.5 mm) but it does not exceed 1 mm in primary teeth.³ Thin layer of enamel on primary teeth leads to progression of dental caries more quickly than in adult teeth, resulting in severe pain, destruction of the dental system, and systemic infection.⁵ The shape and structure of enamel differ in different ages. Over time, especially in the over 45-age group, significant attrition of dental cusps and incisal edges occurs. In addition, a significant number of fissures and cracks can be seen.⁷ The demineralization and remineralization processes occur during the life; therefore, the degree of enamel remineralization is an important factor for dental caries resistance assessment.⁸ The enamel permeability increases in caries due to some factors such as the composition of oral fluid, and pH of the saliva.⁹

Saliva

Saliva has different functions. For example, saliva acts as a lubricant to facilitate speaking, swallowing, and eating.¹⁰ Other functions of saliva are clearance of food debris, buffering action to neutralize acids, elimination of microorganisms, and maintaining tooth structure.^{11,12} The saliva is saturated with Ca

and P ions 2.0-2.5 times as much as the blood serum, which are necessary for maintaining enamel composition relatively constant.¹³

Dental plaque

Since the 1950s, *Streptococcus mutans* has been known as the etiologic factor of dental caries.¹⁴ Children acquire *S. mutans* through the vertical transmission of infected saliva from mother with untreated caries.¹⁵ Then, bacteria adhere to the surfaces of the child's teeth. Later, cariogenic feeding practices in the 1st year of life enhance the risk of developing of early childhood caries.¹⁶ Dental plaque also known as microbial plaque is a biofilm of bacteria which grows on surfaces of the oral cavity. That is commonly found between the teeth and along the cervical margins. Low pH in dental plaque biofilm enhances tooth caries.¹⁷ A previous research has shown that higher calcium concentration in the plaque is associated with low incidence of caries.¹⁸

Dental caries

Dental caries is the most common disease worldwide. It not only destructs the tooth structure but also causes periapical infection.¹⁹ Besides coronal lesions, root surface caries can also be found in older adults. However, in 60% of the cases, there is no correlation between coronal caries and root surface caries.²⁰

Oral microbiome

The human oral cavity contains different microorganisms such as viruses, fungi, protozoa, archaea, and bacteria. The bacteria can cause the two most common diseases in the human: Tooth decay, and the periodontal (gum) diseases.²¹ Bacterial colonies in the buccal mucosa, gingiva, and hard palate are similar, while the saliva, tongue, tonsils, throat, and supra- and sub-gingiva plaques have distinctive colonies.²²

Gingivitis and periodontitis

Gingivitis and periodontitis are caused by microbial biofilm that accumulates in the region of the gingival crevice and induces inflammatory responses.²³ Destruction of gingiva and periodontal tissue is a consequence of host- bacteria interaction.²⁴ A variety of cells are responsible for the pathogenesis of periodontal diseases including activated monocytes, macrophages, and fibroblasts which produce different cytokines such as tumor necrosis factor- α , interleukin-1 β , and interleukin-6.²⁵

The role of diet on tooth and supporting tissue structures

A low calorie diet reduces gingival bleeding on probing. Animal studies have shown that periodontal destruction was significantly decreased in low-calorie-diet.^{26,27} In chronic inflammatory diseases, such as rheumatoid arthritis and periodontitis, fish oil rich in omega-3 polyunsaturated fatty acids protects from bone loss through modulating inflammatory reactions.²⁸ Besides, calcium and vitamin D are essential for bone health in patients with periodontitis.²⁹ Insufficient vitamin

C increases the periodontal breakdown.³⁰ Vitamin B-complex supplements in combination with access flap surgery results in gaining superior clinical attachment levels.³¹ Green tea contains catechins, which are able to reduce collagenase activity and destruction of the gingiva tissue.³² A mechanical treatment and the local application of green tea catechins reduce pocket depth and proportion of Gram-negative anaerobic rods such as *Porphyromonas gingivalis* and *Prevotella* spp.³³ The garlic extract inhibits total protease activity of *P. gingivalis*, therefore, inhibits the growth of oral pathogens.³⁴

The role of oral microbiome in diseases

Viruses have a crucial role in destructive periodontal diseases. For instance, human cytomegalovirus, Epstein Barr virus, and other herpesviruses are associated with active periodontitis.²¹ Human papillomavirus causes some diseases such as papillomas, condylomas, and focal epithelial hyperplasia.³⁵ Periodontitis is a risk factor for systemic diseases, such as cardiovascular disease,^{36,37} diabetes,³⁸ and chronic obstructive pulmonary disease.³⁹ A previous study found an association between chronic apical periodontitis and coronary artery disease. The authors proposed that a localized bacterial infection results in the release of cytotoxins into the systemic circulation.⁴⁰ In addition, another study found a significant association between preterm birth and/or low birth weight and periodontitis.⁴¹

There is also an association between Alzheimer's disease and periodontitis. Two mechanisms may explain this association. First, cytokines produced by oral microorganisms can enter systemic circulation which comprises blood brain barrier. Second, the microorganisms in the dental plaque enter the brain through blood system or through peripheral nerves.⁴² Some microorganisms such as *Capnocytophaga gingivalis*, *Prevotella melaninogenica*, and *Streptococcus mitis* have been detected in oral squamous cell carcinomas.⁴³ Other studies have been detected *Helicobacter pylori* in oral tissue samples including squamous cell carcinoma, lymphoma, ulcer, Sjögren's syndrome, chronic sialadenitis, lichen planus, and lichenoid reaction.^{44,45}

The role of different diseases in oral health

Dental abnormalities have been observed in hereditary diseases such as amelogenesis imperfecta, dentinogenesis imperfecta, and dentin dysplasia.⁴⁶ Congenital neutrophil defects such as Chediak-Higashi syndrome are associated with early onset of periodontitis affecting both primary and permanent dentitions of children.^{47,48} Furthermore, oral lesions may occur in any type of leukemia. The most common oral lesions occurring in leukemia are mucosal pallor due to anemia, bleeding and petechiae of tongue, palate, lips as the result of thrombocytopenia, ulcer and gingival hyperplasia due to the infiltration of malignant cells.^{49,50} Besides, children with cleft lip and palate are at high risk of developing dental caries.⁵¹ In a previous research, *S. mutans* has been detected in the saliva of

45% of children with cleft lip and/or cleft palate.⁵² Oral fungal and bacterial infections have been reported in patients with diabetes. Other oral manifestations of diabetes are delayed mucosal wound healing, and dental caries.⁵³ A previous study found an increased risk of tooth extraction associated with diabetes mellitus, hypertension, and coronary artery disease after nonsurgical endodontic treatment.⁵⁴ Recurrent aphthous stomatitis and enamel defects were found in 44% and 48% of the children with celiac disease, respectively. In this study, malabsorption of iron, calcium folate, and fat-soluble vitamins was considered as the etiological factor for enamel defects.⁵⁵ Characteristic dental findings in patients with vitamin D-resistant rickets include dentin defects. A large pulp chamber and enlarged pulp horns, and in some cases hypoplastic enamel have been reported as well. It is worthy to note that the dental problems are more frequent in the primary dentition compared to permanent dentition in these patients.⁵⁶ Obesity is a metabolic disease which leads to many medical complications such as cardiovascular disease, cancer, arthrosis, and diabetes.⁵⁷ In the oral cavity, it is also considered as a risk factor for periodontitis due to secretion of some cytokines and hormones which are involved in inflammatory process.⁵⁸ Finally, stress is another factor responsible for periodontitis. Recently, one study showed low levels of salivary cortisol among the people with job stress.⁵⁹ Another study has suggested an association between psychosocial factors such as depression, stress and anxiety, and adult-onset rapidly progressive periodontitis.⁶⁰

Discussion

This study provided detail regarding oral health and related factors. Several dental related risk factors cause local or systemic diseases. Besides, many local or systemic factors lead to destruction of dental and supporting structures. These facts prove that the interaction between the oral cavity and the other organs can risk the peoples' life. In addition, several genetic disorders affect the oral cavity. Identifying the related factors in maintenance of oral health and understanding the mechanisms which the factors affect the oral cavity can help to improve oral status.

Conclusion

Professional oral health support can help to develop and improve oral health status and caries preventive interventions. In addition, oral health education, early referral to a dental practice, dietary regulations promote community oral health status.

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