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Review Article

Dental Caries: A Review

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Abstract

Introduction: Dental caries is the most prevalent chronic disease worldwide. It's an infectious disease characterized by a multifactorial etiology and slow evolution that leads to the destruction of dental hard tissues. The implementation of preventive measures, the need of investing in education for the correct maintenance measures of oral health, associated with preventive and continuos medical and dental care, are key to the awareness of populations of its existence and to the decline of its prevalence. Throughout this article we intend to review some important aspects about dental caries and the main etiological factors envolved so that health professionals can intervene in the treatment and prevention of diseases.

Materials and Methods: To carry out this review article the search strategies included electronic databases, such as Pubmed, Cochrane Library and Science Direct, reference lists of articles, and selected textbooks. Articles and textbooks used in this study were mainly reached by using the following keywords: "oral health", "dental caries", "etiological factors", "risk factors", "primary dental prevention". Selection criteria included articles published from 1990 to the present year of 2016 that described the definition, etiology and other characteristics associated with the disease dental caries. At the end of the search, 16 scientific articles were selected.

Results: Dental caries is a disease that develops through gradual complex biological interactions of acidogenic bacteria, fermentable carbohydrates and host factors such as the teeth and saliva, during time. The disease developes due to multifactorial aspects, since biological to social aspects that the oral health professional should be aware of.

Discussion: The implementation of preventive measures, the need of investing in education for the correct maintenance measures of oral health, associated with preventive and continuos medical and dental care, are key for the awareness of populations of its existence and contribute for the decrease of the prevalence of oral diseases.

Conclusions: Dental caries should be seen as a fairly common condition that can greatly affect the health and quality of life of patients, so it is extremely important to increase the knowledge towards their mechanisms, focusing on prevention and the correct therapeutic approach. However, it is necessary to be aware of the hard work ahead in the future related with education and oral health promotion.

Keywords: Oral health, Dental caries, Etiological factors, Risk factors, Prevention, Treatment

Introduction

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 to be the most prevalent oral disease worldwide and the main cause of tooth loss among the population [1,2].

Dental caries are responsible for a high rate of morbidity among the population and are associated with a reduced quality of life. It is known that the prevalence of dental caries among the general population has been linked to socio-economic and demographic conditions, as well as behavioral aspects [3].

Therefore, in most developed countries, the prevalence of dental caries show a clear tendency to decline in the last three decades of the twentieth century and early twenty-first century [2].

Throughout this article we intend to review some important aspects about dental caries and the main etiological factors envolved so that health professionals can intervene in the treatment and prevention of diseases.

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Materials and Methods

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Results

Dental caries is a disease that develops through gradual complex biological interactions of acidogenic bacteria, fermentable carbohydrates and host factors such as the teeth and saliva [1]. For decades, the acidogenic bacterial species *Streptococcus mutans* has been considered the main causal agent of dental caries. Most of the diagnostic and therapeutic strategies have been directed against this microorganism. However, recent studies on DNA-based carious lesions and bacterial RNA have disclosed an ecosystem which this bacterium is only a small fraction of the whole bacterial community (microflora). Thus, it is known that dental caries is derived from the collective action of a wide range of micro flora [4].

A large number of studies have identified various molecular mechanisms by which pathogenic microorganisms have the ability to increase the biomass of oral biofilm in the presence of sucrose, and the ability to promote biological changes of the oral environment, causing dental caries [5].

In addition, there is a vast body of evidence that give great importance to the role of saliva in the development of caries. The role of saliva in the self-cleaning of the tooth surface, the pH regulation and control of oral microflora have the ability to reduce the cariogenic potential of the dental plaque [5,6].

The risk for the development of dental caries derived from a synergy among physical, biological, environmental and behavioral factors related to the individual´s lifestyle, including the number of cariogenic bacteria, low salivary flow, and display to insufficient fluoride, poor oral hygiene and food consumption. All these factors are transversal to any individual [1]. The approach in a primary prevention phase should be made based on the most common risk factors. Prevention and treatment should focus on the management of the dental caries risk factors and process according to the individual patient´s profile. This prevention and treatment should ideally be the least invasive as possible while preserving the maximum dental hard tissue [1,7].

It is significant to note that dental caries and tooth loss are important oral health indicators of oral and general health status [8].

Keyes in 1960 formulated a model that attempts to explain the disease. This researcher considered that dental caries should result of the interaction between the following determinants: substrate, the host and microorganisms [3,9,10]. The host is characterized by teeth and saliva. The morphology and chemical composition of the teeth are etiological factors of extreme importance related with dental caries. The saliva present in the oral environment, more specifically its acid component is an important factor for the development of dental caries. When saliva is in its healthy state, it presents a buffering action promoting the neutralization of acids.

Microorganisms related to caries are Streptococcus mutans, Streptococcus sobrinus and Lactobacilli. These are present in the dental plaque formed along the tooth and in accordance with the low pH of the saliva and the lack of fluorine the development of the dental caries can be initiated. The absence of a balanced diet containing the consumption of fruits and vegetables and a high intake of sugary products can easily initiate dental caries development since the microorganisms need fermentation of carbohydrates to form a low pH environment to achieve dental desmineralization.

In 1978, Newbrun adds to the three main factors of Keyes the time factor which increases the multifactorial nature of dental caries. The formation of dental caries is not a continuous process but a cyclical episode where there is a predominance of demineralization at the expense of remineralization. Enamel is an acellular structure that has no vessels or nerves which may be the explanation for the cavity to develop without creating any initial inflammatory process [3,9,10].

In addition to these factors, there are other external factors. Socio-economic and behavioral factors may influence the development of dental caries. The age, gender, scholarship, the presence of fluorides, oral hygiene habits, among others are all factors that influence the development of dental caries [9,10].

We can conclude that primary preventive measures prove to be extremely important. The risk factors have a major influence on the variation in prevalence. Oral health programs implemented in some regions helping in the education for oral health among communities are important primary prevention methods. The difficulty of access to dentists also has some influence, because when they are not treated in an early stage, dental caries tend to develop increasingly. We also have to consider the individual´s caries risk, which indicates the likelihood that an individual will develop new cavitated lesions, and this factor is of the utmost importance since it allows the adjustment of the therapeutic approach based on the individual risk of dental caries development. Thus, treatment and prevention are more effective, since they are adjusted to the own individual´s needs [10].

Discussion

In the last century, several studies have increased the scientific knowledge of the etiology and pathogenesis of dental caries. The deepening of evidence regarding the dynamic process of desmineralization and remineralization has led to a consensus that the resulting dental destruction due to bacterial action can be stopped or reversed by taking primary preventive measures such as fluoride applications associated with daily regular oral hygiene habits [7]. Recent studies report the importance of proper oral hygiene since a young age, in that it tends to perpetuate itself efficiently by adulthood, resulting in significant reduction in the risk of oral disease development.

Dental caries is the most common disease of the oral cavity and one of the main concerns consists in the lack of information and knowledge of parents and consequente lack of transmission

of health education information to their children [9,10].

The World Health Organization promotes the maximum non-invasive restorative treatment entirely feasible for the treatment of dental caries.

Studies have been conducted that show that the survival of a non-invasive restoration is not significantly lower than conventional amalgam restorations [9].

Regarding the prevention of this disease, currently, there is a consensus that fluoride is important when properly maintained in the oral cavity. And only in this way can interfere with the dynamic desmineralization process, reducing the amount of minerals lost during demineralization and enhancing remineralization [11].

It can thus be said that fluoride alone does not prevent the caries, being very important for the control of dental plaque a careful consumption of sweet food and maintenance of a balanced diet [10].

Recent studies demonstrate the development of three intraoral devices which slowly release fluoride: fluoride glass devices, microcapsules presented as tablets membrane and reservoir devices. These devices work by releasing small amounts of fluoride into the saliva during long periods of time (2-3 years).

In the future, these applications may be indicated for patients with high risk of dental caries development, adolescents with orthodontic appliances in cases where the proper hygiene of the oral cavity becomes more difficult and also patients who have some kind of mental and/or physical disability [12-15].

It has been developed a new technology based on remineralization of casein phosphopeptides obtained from the casein of cow's milk. These phosphopeptides are present multifosfoseril sequences which have the ability to stabilize the calcium phosphates in nanocomplex solutions as amorphous calcium phosphates [13].

The nanocomplex casein phosphopeptides and amorphous calcium phosphate demonstrated an anti-cariogenic potential in laboratory experiments in animals and in humans in situ [12,13]. Conservative new therapies should also be studied, and is also very important that parents have the notion that their children should have a dental appointment during the first year of life, in order to avoid more invasive treatments [15,16].

Conclusion

Dental caries should be seen as a condition that can greatly affect the health and quality of life of patients, so it is extremely important to increase the knowledge towards their mechanisms, focusing on prevention and the correct therapeutic approach. However, it is necessary to be aware of the hard work ahead in the future in education and oral health promotion.

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