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WORLDWIDE EPIDEMIOLOGICAL SPREAD OF PERIODONTAL DISEASE: REVIEW

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Abstract:

Periodontal disease as a spectrum of diseases has a high prevalence all over the world, affecting all ages but even more so the elderly. Although the advancement of the medical field has made many breakthroughs in a multitude of diseases, still a specific and reliable treatment has not been discovered yet in this particular pathology.

Periodontitis is an oral disease which affects the soft and hard tissues surrounding teeth and it causes the gradual attachment loss of dental structures, eventually leading to the complete expulsion of the dental unit. It is defined the formation of periodontal pockets accompanied, or not, by gingival recession.

The etiological factor and the initiators of the disease are microorganisms and their by-products which cause dysbiosis and an exacerbated host inflammatory response. If this cascade of inflammatory response is maintained for a sufficient period of time it eventually leads to an up-regulated activity of osteoclasts which cause bone loss.

Considering the worldwide health burden of this pathology and the many associations and interdependencies with a multitude of other systemic diseases epidemiological analysis have had a pivotal task in aiding the discovery and implication of risk factors for the disease. Furthermore, such studies further the field by assessing the treatment necessities of populations and can offer insight to health regulators.

Keywords: *periodontal disease, etiological factor, epidemiological analysis, ethnicities.*

Epidemiology of periodontitis

Periodontal disease is a widespread disease around the globe, affecting people of different ethnicities and races. Poor oral hygiene, associated comorbidities and pathological conditions, smoking, vicious habits, genetic factors, and many other factors influence the predisposition for periodontal disease and its varies facets and manifestations.[1]

Being a chronic inflammatory disease, it alters the soft and the hard tissues surrounding teeth and is generated by an organized community of bacteria called dental plaque. The microorganisms elicit a response of the host of immune and inflammatory nature that eventually prompts bone loss of the supporting tooth that is not reversible and ultimately leading to edentulism.[2] Affected patients with periodontal disease have elevated systemic levels of acute phase proteins, plasma antibody levels, coagulation factor,

total white blood cell count, neutrophils, C reactive protein (CRP), and cytokines such as Interferon gamma, TNF-α, IL-1β, IL-2 and IL-6, IL-17, to name a few.[3]

Given its wide degree of disease spread, in this paper we sought to make an assessment of the most relevant articles in the literature on the spread and prevalence of periodontal disease by ethnicity.

A study in the International Journal of Health and Sciences in 2017 found that periodontal disease affects about 20-50% of the world's population, taken as a whole.[4]

A recent study published in 2015 by Eke et al., in the Journal of Periodontology, evaluated the prevalence of the disease using combined data from 2009-2010 and 2011-2012 (NHANES), in the last mentioned period being evaluated for the first time a sufficient number of people of Asian origin to provide valid estimates regarding the prevalence of periodontal disease on a diverse and sufficient number of individuals. Furthermore, race was taken into account and the populations were divided accordingly.[5]

The assessment of the disease was made by measuring the gingival recession and the probing depth, the examinations being performed on all teeth present, except the 3rd molar. The study examined a total of 7,066 people in all of the 50 states of the United States, over 30 years old, were divided into 4 groups: Hispanic, Asian-American, white and black people. The examinations were performed in both periods by specialists trained and calibrated prior to the commencement of the study. The study shows that between 2009-2012, 46% of adults over the age of 30 in the United States, representing a total of 64.7 million people, suffered from periodontal disease, a percentage of 8.9 % being affected by a severe form of the disease. The prevalence of the disease was higher in the Hispanic population (63.5%) and people of color (59.1%), followed by non-Hispanic Asian Americans (50%) and the lowest value was found in the non-Hispanic white population (40.8%).[5]

Another study conducted on the population of the United States published in 2016, assessed the prevalence of periodontal disease in a group of 6,256 people, aged between 45 and 84 years and classified by ethnic groups, such as: White, Black, Hispanic or Chinese. In addition to periodontal status, this study also analysed demographic factors, socioeconomic status, psychosocial stressors, and biomedical risk factors. Although the Asian population is representative of the United States, there is little information on the prevalence of the disease for this particular ethnic group.[6]

This study, as opposed to the study by Eke, was based on the participant's declaration of periodontal status, not on a clinical objective evaluation. Participants were placed in a category (healthy or periodontal impaired) answering a question: Has your dentist ever told you that you suffer from periodontal disease? Those who did not know how to answer or were unsure were evaluated at a later time. In addition to these data, others were collected regarding sex, age, BMI index, education, income, health insurance, smoking and diabetes, but also the level of stress and discrimination perceived by individuals.

The Chinese population showed the highest value of declared periodontal impairment (39.8%), followed by the population of Color (32%), White subjects (26%), and lastly the Hispanics having the lowest prevalence (17.4%). The White and Chinese population presented the lowest prevalence in the oldest age group, while Blacks and Hispanics, the highest prevalence in the same age group. Women in the Black and White group had a higher prevalence as opposed to Chinese and Hispanic women. In all ethnic groups, the highest prevalence was in subjects with low education. In all groups, those who

reported a high level of stress had a higher prevalence.[6]

In spite of a substantial study population (6256 participants), one major drawback of this study is that it uses self-assessment by subjects to record periodontal status, as opposed to clinical trials such as NHANES that use measurements, which could influence the veracity of the results.

Surprisingly, the Chinese population with the highest prevalence of the disease had a higher level of education, less stress, fewer smokers and less obesity than the general study population, a profile that should suggest low levels. These results indicate that the Chinese population and possibly other Asian subgroups may have specific additional risk factors that require further evaluation.[7]

Another region very diverse from a demographic point of view is Latin America which includes inhabitants of indigenous origin, but also European, Asian and African origin. In general, a high variability of the disease has been observed in adults in this area. These estimates are influenced by different assessment methods applied in various studies, but also regarding the expression of the disease in different populations in Latin America. The study of the association between periodontal disease and ethnicity or skin color in Latin America is very complex due to the population consisting of a mixture of different races.

Studies in Brazil have shown a higher probability of periodontal disease in people of color than in white people. Data based on values published by Oppermann et al., shows that gingival bleeding and tartar are found in the vast majority of populations in Latin America. Moreover, studies on the prevalence of destructive periodontal disease highlight an increased prevalence and low extent of moderate to severe periodontal attachment loss. The authors observed that attachment loss is more prevalent in Latin America than in the United States and Europe.[8]

Given the limitations of existing data in the literature, it appears that loss of attachment is more prevalent in Latin America than in the United States and Europe. Comparison with other regions is difficult due to insufficient data. Periodontal disease prevalence compared to other developing countries such as Asia and Africa is similar for this population. In spite of all this, epidemiological data on oral hygiene and gingivitis are low and thus further large scale studies are necessary.[9]

Regarding the United Kingdom, a 2016 study highlighted major differences in the periodontal damage of the different ethnic groups present on this territory. The study looked at 1925 adults between the ages of 16 and 65. Participants were placed in 26 possible ethnic groups that were later reorganized to generate 5 groups with a total of 12 subgroups: White British, Eastern Europeans and others: Black Africans, Caribbean and others; Pakistani Asians, Indians, Bangladesh and others; mixed and others. The white-other subgroup includes Western Europeans, Mediterranean, North and Latin Americans, combined due to the small number of subjects which were included in the study. The black-other subgroup includes blacks of color, Europeans and Americans, while others-Asians include British Asians, Arabs/East Orientals, Chinese and Japanese.[10] Participants were evaluated for attachment loss> 4mm and probing depth> 4mm. All teeth were evaluated, including the third molars. Evaluations were performed for each tooth in 2 sites: mesial and distal, buccal at the upper teeth and lingual in the lower ones.

The study found great variability in periodontal health between groups of different ethnicities. All 4 Asian groups showed more periodontal impariement than white British, while Eastern Europeans, Black Africans and those from

Bangladesh had more teeth with loss of attachment compared to White British.[10]

These differences between ethnicities in periodontal disease are probably due to cultural, behavioural, and educational differences rather than genetic differences. Another study also shows significant differences in disease between subjects belonging to different ethnic groups which are exposed to the same environmental factors.[11]

In the study done in the United Kingdom, the White population of Eastern Europe presented 55% more attachment loss with a value >4mm compared to White Britons. Such major differences between people of the same race suggest that differences in periodontal measurements are due to other factors. This adds to the fact that not all population groups of color (Caribbean and others) showed greater attachment loss when compared to white British. [10]

On the polar opposite of these mixed, multiracial societies are isolated, mostly primitive communities. Regarding the assessment of the periodontal status of isolated populations worldwide one must first find appropriate candidates, as such a task is extremely tedious. First off, finding such an unaffected population by the modern life is a task in of its own; second of all, investigating it is a whole specific issue.

One of these studies examined Mayan Indians in Guatemala and found that virtually all subjects had attachment losses greater than 4 mm.[12] In this particular study, the proportion of subjects with some degree of periodontal destruction may appear high but those with generalised disease are in the small minority, perhaps as a result of the absence of smoking. Highly mobile teeth were uncommon and tooth loss was minimal.

Another study conducted in Brazil, evaluated an isolated population living in the Atlantic forest in the south-eastern part of the country and showed that the loss of attachment greater than 5 and 7 mm, respectively, was present in large numbers in subjects older than 30 years.[13] The high values of attachment loss in young age groups and the confirmation of traditional risk indicators for attachment loss in the aforementioned study suggest that other factors, for example host susceptibility, may be required to demonstrate the increased levels of attachment loss observed. Age, as well as certain behavioural elements, were risk indicators correlated significantly with the attachment loss observed in this population and may be valuable indicators of high-risk subjects for periodontal diseases.

A study by Ronderos et al., characterized the periodontal condition of an indigenous population in a remote region of the Amazon rain forest and determined the association of periodontal disease with various demographic, behavioral and environmental factors. 40.6% of Indians living in the Amazon Rainforest reported loss of attachment with values between 4-6 mm, estimates that increased from 23.1% to 66.7% in subjects aged 20-29 compared to those for over 50 years. The authors concluded that periodontal disease in this population was mainly associated with gingival recession rather than deep pockets. Most people had clinical attachment loss but despite poor oral hygiene and extensive gingival inflammation, they did not have very severe periodontal destruction.[14]

When considering the socioeconomic factors more closely, developed countries as opposed to developing ones have a higher prevalence of calculus and bleeding on probing among adolescents. The proportion of adolescents with calculus deposits varies between 35 and 70% in developing countries, while in developed countries it has values between 4 and 34%. Similarly, between 14 and 47% of the adult population in developed countries have calculus deposits, compared to 36-63% of adults in developing

countries. However, developed countries have a higher percentage of individuals with periodontal pockets of 4-5 mm. A higher percentage of older people (65-74 years) have periodontal pockets of 6 mm or more compared to the adult population, both in developed and developing countries.[4]

The world has seen important cultural, social and political transformation, as well as economic progress, in the last two decades and yet it is a very heterogeneous place. Within-country differences are as profound as between-country disparities and should not be overlooked. In this context, any serious strategy to reduce the burden of disease should be based on minimizing social inequalities and strengthening health-promotion initiatives.[15]

An alarming prevalence of periodontal destruction was observed in most studies, with increased variability on the estimates. Studies using inadequate sampling strategies, inadequate examination protocols and poor data analysis provide biased estimates and should be avoided. Whereas all populations clearly share the most important risk factors for periodontal disease, namely biofilm, smoking and diabetes, it is also evident that certain regions may have specific expression of the disease and exposure to risk factors. Population diversity, heterogeneous adoption of western culture, and inherent economic and social inequality provide unique circumstances for the study of social, demographic and economic factors and their interactions with traditional biological and environmental risk factors.[8]

To advance epidemiological knowledge, large population-based cross-sectional and longitudinal studies using appropriate methodology ought to be the future target of researchers and public health planners.

As time passes the severe of form of this disease is found more frequently. This is due to the fact that being an intermittent, episodic disease its effects are accumulative in time. Furthermore, periodontal disease is affected by a multitude of systemic diseases and conditions and, vice versa, has an effect on the overall systemic health.

In conclusion, we can say that periodontal disease is a widespread disease worldwide, affecting all races and ethnicities, being found in both developed and developing countries. Based on the evaluated studies we noticed that it is not possible to classify and pinpoint the most affected ethnic groups, which highlights the fact that, in addition to a possible genetic influence, there are a multitude of factors involved in the onset and evolution of periodontal disease.

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