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Educational Level as a Social Determinant of Health and Its Relationship to Periodontal Disease as a Health Outcome

Colleen A. Watson DDS^{1*} and Supritha Nilam DDS²

¹Clinical Instructor, College of Dentistry, New York University

²NYU College of Dentistry, New York University

***Corresponding author:** Colleen A Watson, DDS, Clinical Instructor, College of Dentistry, New York University, USA; E mail: caw2008@nyu.edu

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Introduction

Periodontal disease is a chronic inflammatory disease that affects the majority of the world's population [1,5,6,14]. It affects the tissues that surround and support the teeth which are compartmentalized into soft tissue, gingiva (gums), and hard tissue (bone) segments. Periodontal disease is usually preceded by gingivitis, which is caused by a buildup of bacteria that is reversible if the bacteria are removed. Periodontal disease is categorized as mild, moderate and severe. Most adult dental evaluations involve periodontal probing, which is the measurement from the top of the gums to the bone. Measurements of 1-3 mm are considered healthy, 4-5 mm are considered mild periodontal disease, and 6 mm are considered moderate periodontal disease. Any measurement greater than 7 is severe periodontal disease [1,5, 6]. At the severe stage, tooth loss can occur either by self-exfoliation (tooth falling out on its own) or the tooth can be deemed not salvageable and extracted by the healthcare professional. Symptoms of periodontal disease may also include many of the following: bleeding while brushing or while eating harder foods, receded gums, teeth that appear to be spreading, causing a change in the way the individual's teeth come together, pus, and persistent bad breath.

Bleeding while brushing or eating may cause individuals to avoid brushing or avoid hard foods. Receded gums can trigger sensitivity to cold, hot and sweets. Spreading of the teeth can cause esthetic issues, and prevent individuals from chewing certain foods. Pus can alter the taste of foods and is indicative of a larger systemic disease. Bad breath is a result of all of the

above-mentioned symptoms. Due to the described symptoms, individuals with periodontal disease may face uncomfortable social interaction, self-consciousness and avoidance of personal relationships.

The end result of untreated periodontal disease is tooth loss, which can lead to complete edentulism (no teeth present in the mouth). Tooth loss can lead to the inability to chew and digest certain foods, lifestyle choices, thus resulting in improper absorption of nutrients, and other nutritional deficiencies, which can lead to systemic diseases like diabetes and obesity, to name a few [7]. From a social point of view, tooth loss can lead to esthetic problems, difficulty pronouncing words, self-consciousness, and fear of being in a social environment; these problems may lead to unemployment, which can result in a myriad of other psychosocial issues. On a personal level, it can make life unpleasant.

Edentulism can be the penultimate result as well as the solution to treat periodontal disease for several reasons. 1) If the individual is suffering from other systemic illnesses that are unmanageable (i.e. Diabetes). 2) In the case of government sponsored health insurances that will only pay for dentures every few years (e.g. if the patient's oral care is poor and it is estimated that further tooth loss may occur before they become eligible to receive a new set of dentures. 3) The patient might be concerned about the esthetic issues of chronic periodontal disease, and request to have the remainder of their teeth removed in an attempt to improve their appearance, by getting dentures.

This article reviews articles exploring the relationship between one's educational level and oral health, specifically periodontal disease and present suggestions to remedy the effects of poor education on periodontal disease.

Methods

The topic selected to review in this paper is the relationship between the health outcomes of periodontal disease and educational level, a social determinant of health. Education level is determined using Margaret Whitehead's typology of four actions, which can be utilized to address health inequalities (strengthen individuals; strengthen communities; improve living and working conditions; and promote healthy macro-policies) [16]. Articles were searched using Google Scholar and Pub Med, with the reference words "periodontal disease, education, social determinants of health." In Google Scholar, articles that were published in 2012 and onwards were used. In Pub Med, an open-ended search was conducted. Between both search engines, approximately 20 articles of relevance were found. Several of them were eliminated due to age of the study, inability to find a full version of the study in English, or inability to obtain the article. Eight articles were reviewed and selected based on the studies' representation of populations throughout the world, in order to obtain a broader perspective of periodontal disease in the world [2-4,8,9,11,12,16]. One article compared its participants by race, two others compared their participants by country, and three were cross-sectional studies. In each study, a survey was used to document the participants' educational level, income, gender and socio-economic status, while the oral health was assessed by intra-oral examination.

Results and Discussion

There are a number of risk factors for periodontal disease. Knowing and understanding these risk factors is helpful in the prevention and treatment of the disease. As previously mentioned, bacteria are the one consistent element of periodontal disease. The degree of periodontal disease that an individual may have is based on controlling the presence of the bacteria and the inability to remove the bacteria. These risk factors can be biological or they can be life-style related. Biological risk factors include diseases such as diabetes, osteoporosis, obesity, heart disease and cancer; but hormonal changes such as during puberty, pregnancy, menstruation, menopause, and general aging, are also biological risk factors [1]. Other risk factors, including physical and psychological stress, previous and current use of alcohol and tobacco products, medications (polypharmacy), mechanical clenching and grinding of the teeth, are related to life style.

Each of these risk factors may result in either heavy accumulations of bacteria, or the non-removal of accumulated bacteria. Medication for heart disease, seizure disorder, depression and other psycho-social disorders, can cause dry mouth, and increased accumulation of bacteria, through increased plaque and calculus. Non-removal of accumulated bacteria can be triggered by the inability to purchase the proper cleaning implements, depression, poor-manual dexterity, and negligence of personal hygiene due to lack knowledge of proper self-care.

In the case of biological risk factors, periodontal disease may

develop simultaneously with the systemic disease, or as a result of the systemic disease. When this occurs, the diseases are referred to as co-morbidities. If the periodontal issue is controlled, it can help to improve the symptoms of the systemic disease. It is important that the health professionals that are treating these patients be knowledgeable about the relationship between periodontal disease and systemic diseases.

After reading and analyzing these articles, it is clear that periodontal disease is tied to many factors. The one general theme is education. Three articles that were reviewed, named education specifically as influential in an individual developing periodontal disease. The other articles list other factors such as income, living in a crowded environment, and smoking, as causes of periodontal disease. These causes can also be traced back to educational level. Generally speaking, most individuals with higher education earn a higher income, live in less crowded environments, because they can afford to be more selective in their housing choices, and are less likely to smoke.

Two of the studies from Brazil found that being male was a social determinant of health for periodontal disease [8,15]. Two studies, one based in Sweden [9], and the other based in Brazil, Carvalho Bonfirm [3] found that being female was a social determinant of health for periodontal disease. These four articles also indicated that the findings were also linked to income, education, smoking or poor living conditions.

The exception to the findings on education level being a strong indicator for periodontal disease is a study by Borrell, et al [2]. The results stated that Black Americans with higher education levels were more likely to suffer from periodontal disease than their White and Mexican counterparts. This was interesting because it implied that there are additional influences for periodontal disease for Blacks. Pascoe and Smart-Richman in 2009, discussed the psychological and physiological response to stress that Blacks may experience due to social discrimination and its effect on heightening the body's stress response [11]. This could explain this finding.

The Elani, et al article was selected because it discussed the frequency of edentulism [4]. Although it is not indicated in the article how the individuals became edentulous, it was implied that there was periodontal disease, based on the fact that the other factors that were being studied were disease of the teeth or solutions for tooth disease. This article also listed educational level, income and place of birth as social determinants of periodontal disease.

Two articles [4,12] discussed socio-economic inequalities by comparing the loss of teeth to periodontal disease and other dental maladies over a given period of time. Elani, et al, which compared Canada to the US, concluded that even though there was a decrease in inequalities for both Canada and the US from 1972, the start of the study and 2007-08, its conclusion, the rate of edentulism increased in the US for socially disadvantaged

groups [4]. Peres, et al compared income related inequalities in inadequate dentition in Australia, Brazil and the US. The study assessed that the inadequate dentition was reduced in Australia and Brazil, but not the US. Relative Inequalities were highest for Brazilian women and the poor [12]. These studies were particularly apt and thought provoking as they compared the rates in the United States rates to the rest of the world.

Conclusion

Many of these risk factors mentioned in these studies relate directly to education or indirectly through other social determinants such as, income, age, poor nutrition and genetics (Figure). It is also important that we address the education of the individual who is suffering from periodontal disease. Although the risk factors are not necessarily quantifiably measureable, as addressed by Steele et al [13], it is important to consider the qualitative and clinical implications of the risk factors to address the oral health deficits. As mentioned before the, Margaret Whitehead's typology of four actions [16] can be utilized to address health inequalities (strengthen individuals; strengthen communities; improve living and working conditions; and promote healthy macro-policies).

Strengthen individuals

Oral care is one of the most basic forms of hygiene. It can be done at very little cost to the individual. It is a matter of developing a habit early that will persist for the rest of one's life. A plausible way do this is to teach children how important oral care is to their general health. In order to reinforce the teaching, the parents should also be included in order to establish this important habit. This type of presentation can be done through schools, community centers, houses of worship, etc. where healthcare professionals can demonstrate for families the proper oral care techniques, and explain the importance of healthy eating habits. These presentations should not be one-time events, but should be reinforced on a regular basis, in order to create a sustainable resource. Since children are very impressionable, this is an opportunity to make them feel important and be proud

of what they have learned. The child should be encouraged to remind the family of proper eating habits, how to brush and care for their teeth. Having the family visit the dental office after the presentation at the child's school can validate the child's oral health habits, build their self-esteem and create healthy habits for the family.

Strengthen communities

This is meant to show community support for the individual. It gives them a feeling of being part of something bigger and also makes it easier to comply with certain expectations that may not be exciting to do on their own. In addition to the community-based presentations, and in keeping with focusing on the child, having children brush their teeth in school daily. In this way, it would be fun and exciting; it would create a sense of belonging and it would insure that each child would be brush their teeth at least once daily. NYU College of Dentistry had a four-year program on the island of Grenada in the West Indies, which began in 2010. This program sought to reduce the rate of dental decay in children and achieved a 75% reduction in the number of new cavitations and new de-mineralizations developed in the first molars [17]. One of the techniques that were instituted was to give the students oral hygiene instructions at school and have them brush their teeth in school daily. Originally, the brushes were kept in school in order to insure that brushes would not be misplaced. What resulted was a group activity that significantly reduced dental caries in school-aged children [10].

Improve living and working conditions

This can be accomplished by insuring that individuals have the proper supplies to be able to perform the dental techniques for bacteria removal. There are several manufacturers of dental supplies who donate their products to organizations and community groups. These donations of toothbrushes, dental floss, etc., can be distributed to the participants of the community-based programs. They can be used during the presentation to demonstrate proper dental techniques and the participants can leave with them. This is similar to what is done

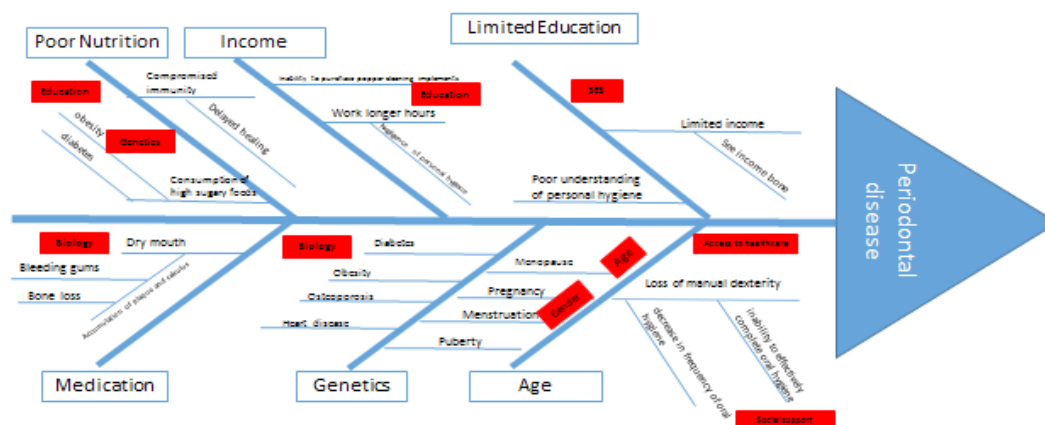


Figure: Risk factors leading to periodontal disease

at a semi-annual dental check-up when oral hygiene instructions are demonstrated for the patient, following which the patient is then asked to perform the same technique to show the dentist/hygienist that they understand how to brush and floss. Upon returning in 6 months, oral hygiene instructions are reviewed, and the patient leaves with a new toothbrush, toothpaste and dental floss.

Promoting healthy macro-policies

These policies are most effective if they transcend across the population at large and do not specifically target those in a lower socioeconomic group. It is a great idea to target the population at large, because as the Borrell, et al article suggested, all negative health problems are not selective of only the individuals in a low socioeconomic group [2].

In the current structure of private and government-based health insurance programs, dental care is not included under medical insurance. Dental care is a separate type of insurance, which is sold or applied for separately. In the case of the Medicaid recipients, sometimes they may qualify for Medicaid for medical conditions, but not for dental. This forces the individual to have to choose between paying for other necessities of life and paying for their oral care. Dental care and periodontal disease management should be incorporated into medical care. The diseases of the mouth, especially periodontal disease, can have adverse effects on the entire body and its immune system.

Other actions we can take to address these health inequalities includes more frequent dental visits for those individuals who take medications which cause dry mouth as well as those with genetic factors that may make them more vulnerable to periodontal disease. Oral hygiene instructions should be reviewed at each visit for reinforcement. Individuals, who are experiencing hormonal changes, should also be monitored by their medical caregiver, in addition to their oral care professional, for periodontal disease. The different healthcare providers should have a working relationship in order to manage the patient's condition. Nutritional counseling should be given to all individuals who fall into these categories. These interventions will help them understand and learn how to better manage their condition. It will give them a sense of responsibility and control over their lives. This will build their self-esteem, and create a desire to continue to improve their condition. The aforementioned changes are the fundamental in creating a solid oral health environment and promoting a dental care.

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