Systemic Implications of Oral Health: Diabetes

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Periodontal disease has long been considered a localised infection, however, research over the last few years is now linking the periodontal diseases to a variety of conditions and diseases with systemic implications. These include systemic infections, cardiovascular disease, pregnancy outcomes, respiratory diseases, diabetes and increased all-cause mortality rates. It has been suggested that infection in the periodontal tissues, primarily by gram-negative anaerobic bacteria, can trigger a series of immunologic and inflammatory changes leading to the initiation of systemic disease.1

The interaction between oral infection and systemic health was first described in Ancient Egypt,2 with the concept of focal infection dating back more than a hundred years. Willoughby Dayton Miller again proposed this relationship in an 1891 commentary published in Dental Cosmos.3 By the 1950’s however, the theory was being dismissed.4 More recently the concept has returned to the dental arena. This was partly because of new data reported by Finnish researchers in the late 1980’s when dental infections were found to be statistically linked with heart disease and stroke.5

Diabetes
The effect of diabetes on the oral tissues had long been recognised. Diabetics are said to exhibit poorer oral health than non-diabetics.6,7 Diabetics have been found to have a higher average gingival index and higher or the same plaque index levels relative to controls.8 Periodontitis is now considered the sixth most common complication of diabetes mellitus.9 Persons with non insulin-dependent diabetes mellitus are three times more likely to develop periodontal disease than non diabetic individuals.10

Risk Indicators

The November 2005 edition of the Journal of Periodontology (2005, Vol. 76, No. 11, Pages 1910–1918) featured the results of a study that defined the risk indicators for tooth loss from periodontal disease. Study subjects included 1,775 patients with a total of 3,694 extracted teeth.11

The nine risk factors concluded from the study include: age, anterior tooth type, diabetes mellitus, hypertension, inadequate oral hygiene, lack of professional maintenance, male gender, rheumatoid arthritis and smoking. Periodontal disease accounted for the loss of 2.3 teeth in those with the disease while those without it lost 1.8 teeth. For those subjects older than 35 years, periodontal disease was the reason for 57% of tooth loss with the remaining 43% lost due to other reasons.

Additional results of the study showed that only 16% of study subjects reporting that they brushed their teeth more than twice a day. An amazing 60% admitted to never brushing their teeth or doing so irregularly. Also, 36% of the subjects said that they had never had dental prophylaxis or made a periodontal maintenance visit.

Among the subjects, 31% were either currently smokers or had been in the past. More men (38%) lost their teeth for periodontal problems than women (27%). Finally, 32.5% of the subjects had diabetes mellitus while 13.6% had hypertension.

The research results have bearing due to the fact that risk assessment is an important aspect of dental care. Identifying patients with the highest risk for periodontal disease means a dentist is better equipped to prevent it.
**Glycemic Control**

It is well-established that poor glycemic control is known as an established risk factor for periodontitis. However, there is also same evidence that severe periodontal disease may deteriorate glycemic control. A positive association between variations in the blood glucose level and the degree of periodontal disease was reported in type II diabetes mellitus. One study demonstrated loss of attachment is greater in controlled diabetic ages 30-40 with a disease duration of over ten years. Periodontal treatment has been shown to be associated with improved diabetic control as demonstrated by reduced glycosylated haemoglobin in diabetic patients. In this study, however, periodontal therapy on its own did not significantly affect glycemic control in diabetic patients. This was only achieved when combined with antibiotics. Other studies have shown a reduced need for insulin administration in diabetic patients after receiving periodontal treatment. Further studies are needed to show a consistency in these observations. Other groups also need to be examined such as women and low income groups. Common risk factors also need to be evaluated.

**Common Risk Factors**

Similarities in the aetiology of periodontal disease and other complications of diabetes are emerging. The aetiology of diabetes seems to be a combination of intrinsic (genetic) factors and environmental influences. In much the same way as the periodontal diseases are viewed, diabetes is considered a series of diseases that have glycemic intolerance in common. It is suggested that increased genetic susceptibility, impaired response and excessive production of cytokines in both diseases have in common. These include stress, smoking, dietary intake, socioeconomic status, weight, fear and depression.

**Stress**

Factors such as elevated levels of hormones antagonistic to insulin such as cortisol (stress) also play in the role in the development of insulin resistance and inflammatory disease. Stress has been shown to play a role in affecting glycemic control and also as a negative factor in periodontal treatment outcome.

**Smoking**

Smoking and diabetes are considered to be two major factors in the development of periodontal disease. Smoking is considered to be a major factor in the aetiology of periodontal disease and diabetes. If this is so, then it is likely to include several pathways and that these pathways involve macrophages linking the two diseases. Con- founding risk factors shared by both diseases may explain part of the association. Further research is needed to show a direct causal link and to corroborate existing associations, independent of common risk factors. Studies of wider populations, intervention tri- als and longitudinal studies span- ning years, are necessary in people with and without these diseases are required.

**Obesity**

Obesity has also been linked to the development of diabetes and periodontal disease. The link between obesity, periodontal infections and diabetes has been suggested as being mediated by increased levels of tumour necrosis factor (TNF) which may lead to a hyper inflammatory state. This would in turn increase the risk for periodontal disease and account in part for insulin resistance. Further research is required. Re- cent study has shown that both smoking and obesity are independent risk factors for periodontal disease exhibiting a dose-response relation- ship with peri-odontal disease.

**Healthy Lifestyle**

Maintaining normal weight, engaging in the recommended level of exercise, and eating healthy food are known to improve general health. The impact of these behav- iours on periodontal disease was examined and it was found an in- creased number of health-enhanc- ing behaviours is associated with a lower periodontitis prevalence.

**Conclusion**

It is plausible that there may be a causal link between periodontal disease and diabetes. If this is so then it is likely to include several pathways and that these pathways involve macrophages linking the two diseases. Confounding risk factors shared by both diseases may explain part of the association. Further research is needed to show a direct causal link and to corroborate existing associations, independent of common risk factors. Studies of wider populations, intervention trials and longitudinal studies spanning years, are necessary in people with and without these diseases are required.

**Authors**

The 59th World Health Assembly (WHA) opened on 22 May, 2006 in the afternoon where Dr. Lee, Secretary-General, took the floor to open the 13th session of the WHA. He had worked for WHO for 23 years, at country and regional levels, and at WHO Headquarters in Geneva. He is survived by his wife and son, and the fami- lies of his two brothers and one sister. Dental Tribune Interna- tional extends its sincere con- dolences to Dr. Lee’s family.

**Literature**


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