RELATIONSHIP BETWEEN BLOOD SUGAR LEVEL AND PERIODONTAL STATUS

Baharuddin, Mohamad Zayadi, Mat Daud
Faculty of Dentistry,
University of Malaya, Kuala Lumpur

Abstract

The aim of this study was to investigate the relationship between random blood sugar level and periodontal status in Malaysian subjects. A total of 20 patients between the ages of 30 to 60 years old participated in this study. Ten type II diabetes mellitus patients (test group) were matched for age, gender and sex. Periodontal status was measured by Community Periodontal Index where the scores were used as indicators for disease severity. Blood glucose level was determined by Random Blood Sugar Level using self monitoring blood glucose system. The results showed that for the test group, the mean of Random Blood Sugar Level was 11.47±3.44 mmol/L, and 70% of the sextants had moderate to advanced periodontitis. On the other hand, the control group had the mean of Random Blood Sugar Level of 5.49±0.57 mmol/L and 31.7% of the sextants had moderate and advanced periodontitis. Hence, there was a positive relationship between the mean of Random Blood Sugar Level and periodontal status for both test and control group.

Key words: periodontal status, diabetes mellitus

INTRODUCTION

Chronic Inflammatory Periodontal Disease (CIPD) is an inflammatory condition which is characterized by destruction of periodontal tissues (gingivae, periodontal ligament, alveolar bone and cementum).1

It is well accepted that bacterial plaque is the main aetiology for CIPD.2 The idea is supported by gramnegative animal study and static crevicular fluid (SCF) studies in human.3 Though bacteria is responsible for initiating and sustaining the disease, the manifestation and progression of disease is very much dependent on the patient’s innate susceptibility in response to the microbial challenge.

Systemic conditions, as defined as naturally occurring or induced states that exert general effects throughout the body, are now considered to be secondary factors modulating periodontal disease initiation, rather than the primary aetiological factors. There has been emphasized to evaluate risk factors for periodontal disease.4 Risk factors such as smoking, drugs, nutrition, stress, hormone and systemic diseases are capable of modifying the disease mainly through their effects on the normal inflammatory defense. Subsequently, these risk factors may predispose, accelerate, or otherwise increase its progression towards periodontal tissue destruction.5

Studies have shown that diabetes mellitus is one of the concerned systemic diseases that has a great influence on CIPD.6 Diabetes mellitus is a metabolic disorder characterized by hyperglycemia due to defective secretion or activity of insulin. It could be further complicated by poor regulation of protein and lipid metabolism. A conclusive diagnosis of diabetes mellitus is made by assessing glycaated hemoglobin levels. In those people with diabetes, sequential fasting plasma glucose levels will be more than 7 mmol/L or more. Diabetes mellitus is a chronic condition affecting up to 5% of the general population and over 124 million populations worldwide. In Malaysia, the prevalence of diabetes for Malaysian population was 8.3% based on The Second National Health and Morbidity Survey.7 The prevalence could be higher as in many people the disease remains undiagnosed.8

The surveys by the USA National Health and Nutrition Examination Survey (1971-1974) and the USA Hispanic Health and Nutrition Survey (1982-1984) reported a higher prevalence of periodontal pockets in people with diabetes than in the rest of the population.9
A positive association between variations in the blood glucose level and the degree of periodontal disease was observed in type II diabetes mellitus. Several investigators have reported a higher incidence and severity of periodontal disease in type II diabetic patients as compared to healthy controls. In a large cross-sectional study, Grossi and others showed that diabetic patients were twice as likely as non-diabetic subjects to have attachment loss. In another cross-sectional study, it was found that diabetes affected all periodontal parameters, including bleeding scores, probing depth, loss of attachment and missing teeth. In fact, diabetes patients are 5 times more likely to be partially edentulous than healthy patients. Patient with type I and II diabetes appears equally susceptible to periodontal disease and tooth loss. It also has been shown to increase the risk of the developing periodontal disease in adults regardless of age, race, sex and oral hygiene measures. Consequently, the strong relationship between diabetes and periodontal disease has led to recognition of periodontal signs and symptoms as the 'sixth complication' of diabetes. The aim of this pilot study was to assess the relationship between periodontal disease and random blood glucose level in type II diabetes mellitus Malaysian subjects examined at the Faculty of Dentistry, University of Malaya, Kuala Lumpur.

MATERIALS AND METHODS

Twenty (12 females, 8 males) Malaysian subjects were chosen as convenient samples for this study. The test group consists of ten Type II diabetes mellitus subjects who were matched for age, sex and gender for the control group. The age range was between 30 to 60 years. The subjects were informed about the study and consent was obtained from each patient before the start of clinical examination.

Periodontal status was assessed using Community Periodontal Index (CPI). For the periodontal measurement, there was a total of 59 sextants for the test group compared to 60 sextants in the control group. Random blood sugar level (RBSL) was assessed using a complete blood glucose monitoring system Johnson & Johnson, California, USA.

RESULTS

Twenty subjects with a total of 119 sextants were examined. Ten subjects were diabetics and ten non diabetics.

The mean RBSL and SD for test group was 11.47 ± 3.44. On the other hand, the mean RBSL and SD for the control group was 5.49 ± 0.57 (Table 1).

Table 1. Mean, standard deviation (SD) and range for RBSL in test (n=10) and control (n=10) groups

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random Sugar</td>
<td>Test</td>
<td>11.47</td>
<td>3.44</td>
<td>8.70-18.70</td>
</tr>
<tr>
<td>Blood Sugar</td>
<td>Control</td>
<td>5.49</td>
<td>0.57</td>
<td>4.50-6.20</td>
</tr>
</tbody>
</table>

For the test group, 26.7% of the sextants had gingivitis compared to 31.7% and 38.3% of the sextants had moderate and advanced periodontitis respectively. As for the control group, 58.3% of the sextants had gingivitis compared to 20.0% and 11.7% of the sextants had moderate and advanced periodontitis respectively.

DISCUSSION

The study was carried out to determine the relationships between random blood sugar level (RBSL) and periodontal disease among type II diabetes mellitus Malaysian subjects. It is generally accepted that marginal periodontitis and cardiovascular diseases share some common risk factors such as diabetes mellitus, smoking and poor oral health status.

In this present study, the subjects for test and control groups were matched for age, sex and gender. The mean RBSL values for the test group was higher i.e. 11.47±3.44 mmol/dL.
compared to 5.49±0.57 mmol/dL for the control groups. It is well understood that poor glycaemic control is known as an established risk factor for periodontitis. However, there is evidence that severe periodontal disease may deteriorate glycaemic control. It is poorly understood whether the changes in lipid and glucose metabolism are the cause or consequence of periodontitis.

In this study, it was observed that the severity of periodontal disease increased with the increasing random blood sugar level. Seventy percent of the sextants in the test group had moderate and advanced periodontitis. On the other hand, only 31.7% of the sextants in the control group had moderate to advanced periodontitis. This finding suggested that control of periodontal disease may play a role in the control of diabetes. Thus, dentist must be aware of the signs and symptoms of diabetes, and understand the importance of maintaining periodontal health for anyone with diabetes. Studies have shown that periodontal therapy influences glycemic control in people with diabetes mellitus.

There should be proper and organized efforts to improve general oral health status to avoid the complications of diabetes mellitus. In terms of community health among diabetics, there is a need to obtain cooperation from the medical colleagues in referring diabetes mellitus patients to the dentist for periodontal control. As far as diabetic patients are concerned, proper oral health message should be conveyed as in managing periodontal health. This is especially important with the increasing prevalence of periodontal disease among Malaysian i.e. 92.8% based on survey conducted by the Ministry of Health.

The results of the study are consistent with previous studies. It was reported that diabetes patients with moderate to deep periodontal pockets (≥6mm) presented with a high mean RBSL value. Similarly, another study on Minnesota population reported that 60% of diabetics had at least one site with probing depths ≥4 mm.

The complications of diabetes are related to long-term elevation of blood glucose concentration (hyperglycemia). Hyperglycemia results in the irreversible advanced glycation end products (AGEs) formation. These AGEs act on "prime" endothelial cells and monocytes, making them more susceptible to stimuli that induce the cells to produce inflammatory mediators. This in turn makes the host more vulnerable to periodontal infection. There are some speculations that AGE-enriched gingival tissue has greater vascular permeability, experiences greater breakdown of collagen fibers and show accelerated destruction of both non-mineralized connective tissue and bone. In terms of oral manifestations, the patient may experience delayed wound healing and xerostomia, as well as increased susceptibility to periodontal disease.

The AGEs also causes altered in host’s collagen metabolism, thus impairing the periodontal healing process from taking place. Accumulations of AGEs in the plasma and tissues of diabetic patients have been linked to diabetes complications.

In this study, the fact that pool samples were patients who came for periodontal treatment could have introduced bias as to the prevalence of periodontal disease. The sample could have had periodontal disease right before diabetes mellitus was diagnosed. Although the subjects in this study were matched for sex, gender and race, other factors such as socioeconomic status, psychological and environmental conditions that could have influenced their oral hygiene status. For example, high socio-economic status population has been shown to have high awareness on their periodontal condition.

Analytical statistics were not used due to the small sample size. Although the sample size is small, a relationship between periodontal status and diabetes mellitus is apparent. Further research is needed in the general population with better sampling and larger sample sizes.

Within the limitations of this study, the following conclusions can be drawn: diabetes mellitus subjects had higher mean CPI scores as compared to healthy patient. Diabetes mellitus subjects had higher mean RBSL as compared to healthy patient. The severity of periodontal disease increased with the increasing Random Blood Sugar Level. Prevention and control of periodontal disease must be considered as an integral part of diabetes control.

In general, further research is needed with better sampling techniques and larger sample size. Furthermore, it is worth looking at relationship between Fasting Blood Sugar Level and periodontal disease.

ACKNOWLEDGEMENTS

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References