

The Relationship Between Periodontal Disease And Blood Glucose Level Among Type II Diabetic Patients

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Abstract

The aim of this study was to determine the relationship between periodontal disease and the blood glucose level among type II non-insulin dependent diabetic mellitus (NIDDM) subjects. Forty subjects, 20 in each group, of healthy and diabetic subjects, ages ranged 20-70 years, were examined at King Saud University, College of Dentistry. Clinical examination included frequency of oral hygiene practices, periodontal status by using the Community Periodontal Index of Treatment Needs (CPITN), fasting blood glucose level (FBGL), and random blood glucose level (RBGL). Unstandardized orthopantomograms (OPGs) were taken for radiographic findings. The number of missing teeth (tooth loss) was assessed from the radiographs. The results showed that periodontal disease severity was high among diabetic subjects. Diabetic subjects brushed less frequently, and they had a higher blood glucose level than healthy subjects. The mean CPITN score was compared with mean blood glucose level and the severity of periodontal disease. There was a steady increase in blood glucose level with increase in CPITN scores, i.e., CPITN score 13.5 to 19.12 corresponded with 142 mg/dl and 173.2 mg/dl FBGL, and 184.2 and 199.12 mg/dl RBGL among diabetic subjects. The study indicated that diabetic subjects should improve their oral hygiene practices and control of blood glucose levels should be emphasized. Further studies are needed among diabetics and healthy subjects from the general population with better sampling techniques and a larger sample size.

Keywords: Periodontal disease, diabetes mellitus, blood glucose level, oral hygiene, Saudi Arabia

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Introduction

Periodontitis has been defined as an inflammatory disease of specific bacterial origin that progresses with episodic attachment loss. The destructive process of periodontitis is thought to begin with the accumulation of biofilms, which contain significant bacterial masses on the tooth surface at or below the gingival margin.¹ Continued destruction is thought to occur as a result of the host inflammatory response against these bacteria and from the release of toxic products from the pathogenic plaque bacteria.² Periodontal disease often involves numerous and complex causes and symptoms. Ultimately, decisions regarding the diagnosis and treatment of disease in an individual patient must be made by the treating practitioner in light of the specific facts presented by that patient.³

Dentists frequently treat patients with systemic diseases, such as diabetes, that can affect the course and management of periodontal disease. Systemic conditions, 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 etiologic factor. Current emphasis is on evaluating risk factors for periodontal disease.⁴

Several investigators have reported a higher incidence and severity of periodontal disease in type II diabetic patients as compared with non-diabetic controls.³⁻⁹

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 diabetics ages 30-40 with a disease duration of over ten years.⁹ More gingival sites with bleeding on probing have been reported in poorly controlled diabetics than in well-controlled or moderately controlled groups.¹⁰ Periodontitis now is considered the sixth common complication of diabetes mellitus.¹¹

The aim of the pilot study was to assess the relationship between periodontal disease and blood

glucose level among type II diabetic Saudi subjects examined at the College of Dentistry, King Saud University in Riyadh, Saudi Arabia.

Materials and Methods

Forty Saudi subjects were chosen as a convenient sample for this study. They were divided into two groups of twenty subjects each. One group consisted of non-diabetic subjects and the other group were diabetics. The age range was between 20 to 70 years. The subjects were informed about the study and consent was obtained from each patient before the start of clinical examination. A standardized periodontal evaluation form was used. Periodontal status was assessed using the Community Periodontal Index of Treatment Needs (CPITN) and oral hygiene habits, such as brushing frequency, were asked of each patient. The clinical examination was supplemented with non-standardized orthopantomographs (OPGs). The fasting blood glucose level (FBGL) and random blood glucose level (RBGL) were assessed by "One Touch TM®" complete blood glucose monitoring system, Johnson & Johnson, California, USA.

The study was completed in two months. The data was analyzed by using common statistical software. Frequency distributions were generated for descriptive data analysis.

Results

This study revealed the following results:

- Forty subjects who exhibited periodontal disease within the age range from 21-70 years were examined.
- Twenty subjects were diabetic and 20 non-diabetic.
- Of the 40 subjects, 7.5% presented with gingivitis.
- Nearly 67.5% presented with mild to moderate periodontitis and only 25% exhibited severe periodontitis. (Figure 1)

The mean CPITN score was 17.2 (4.54). The highest CPITN score 21.4 (1.81) was among non-toothbrush users. (Figure 2)

Ten percent of the non-diabetic subjects had severe periodontitis, while 40% of the subjects in the diabetic group had severe periodontitis. (Figure 3)



Figure 1. Prevalence of periodontal disease severity by age group

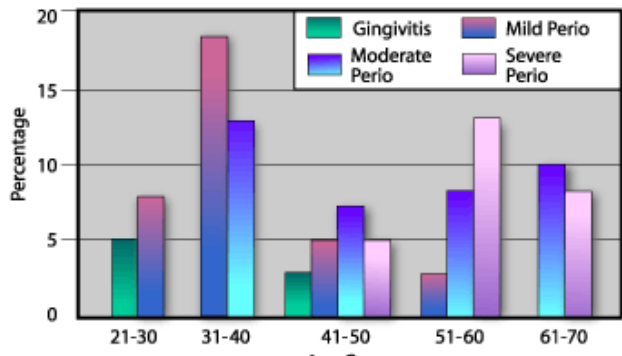


Figure 2. Frequency of toothbrushing by mean CPITN score

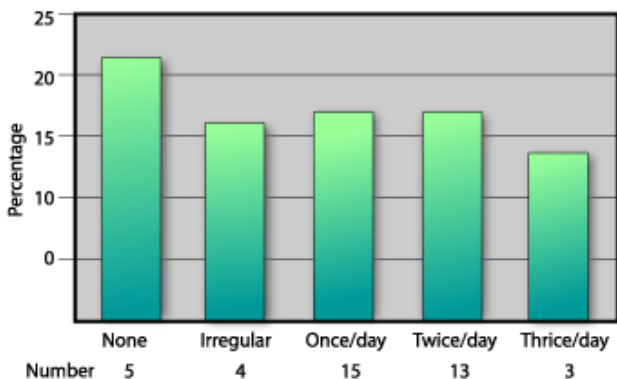
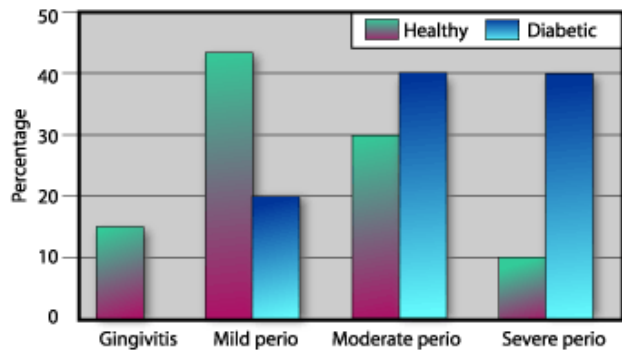


Figure 3. Prevalence of periodontal disease severity among healthy and diabetic subjects



None of the healthy subjects had all teeth present. In the non-diabetic group, 58% of the subjects had 1-8 teeth missing, while 19% had 9-20 teeth missing. In the diabetic group 81% had 9-20 teeth missing. (Figure 4)

The frequency of toothbrushing was high among non-diabetic subjects. Eighty percent of the non-brushers were in the diabetic group. The majority of subjects who brushed twice daily were in the non-diabetic group. (Figure 5)

Figure 4. Frequency of missing teeth among healthy and diabetic subjects

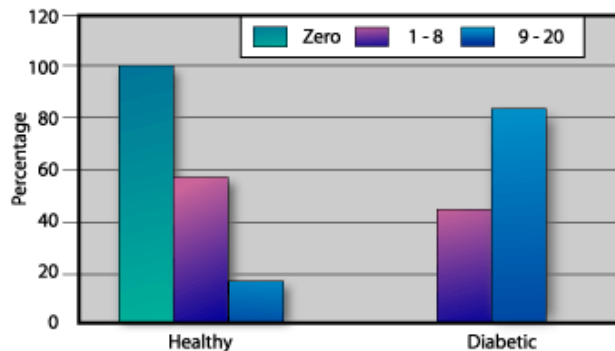
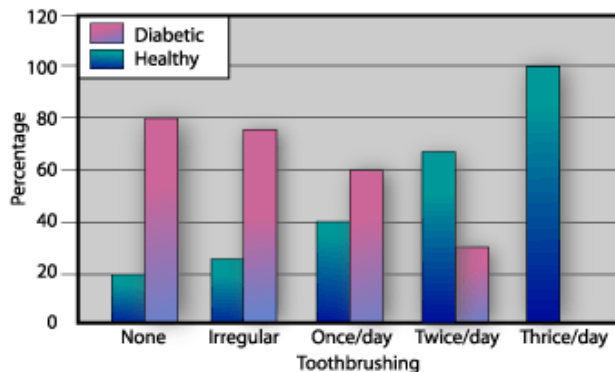


Figure 5. Frequency of toothbrushing among healthy and diabetic subjects



The mean CPITN score was 16.10 [5.11 among non-diabetics and 18.30 (3.70) among diabetics]. (Table 1)

In non-diabetic subjects with severe periodontitis, the mean FBGL was 102.5 mg/dl and the RBGL was 116.5 mg/dl. In diabetic subjects with severe periodontitis the FBGL was 173.2 mg/dl and the RBGL was 199.1 mg/dl. (Table 2)

Discussion

This study was conducted to see the relationship between the periodontal disease and blood glucose level among type II diabetic subjects. It is known that periodontitis is considered the sixth greatest complication of diabetes mellitus.¹¹ It is well-established that marginal periodontitis and cardiovascular disease share some common risk factors such as diabetes mellitus, smoking, and poor health care habits.¹²⁻¹⁴ In the present study, the age and social groupings of subjects were balanced in both study groups. Values of FBGL and RBGL were higher among diabetics than non-diabetic subjects. It is well-established that poor glycaemic control is known as an established risk factor of periodontitis.¹⁵⁻¹⁶ However,

Table 1. Mean CPITN score among healthy and diabetic subjects.

| Patient Condition | Mean | Number of Subjects | Std. Deviation ± |
|-------------------|---------|--------------------|------------------|
| Healthy | 16.1000 | 20 | 5.1186 |
| Diabetics | 18.3000 | 20 | 3.7006 |
| Total | 17.2000 | 40 | 4.5462 |

Table 2. Distribution of periodontal disease severity with CPITN and blood glucose level.

| Patient Condition | Periodontal Diagnosis | CPITN | RBGL | FBGL |
|-------------------|------------------------|---------|---------|---------|
| Healthy | Mild periodontitis | 14.6667 | 90.222 | 84.556 |
| | Moderate periodontitis | 19.5000 | 87.000 | 82.333 |
| | Severe periodontitis | 22.0000 | 116.500 | 102.500 |
| | Gingivitis | 9.6667 | 101.000 | 92.667 |
| | Total | 16.1000 | 93.500 | 86.900 |
| Diabetics | Mild periodontitis | 13.5000 | 184.250 | 142.000 |
| | Moderate periodontitis | 19.8750 | 212.500 | 184.125 |
| | Severe periodontitis | 19.1250 | 199.125 | 173.250 |
| | Total | 18.3000 | 201.500 | 171.350 |

there is also some evidence that severe periodontal disease may deteriorate glycaemic control.^{17,18} It is not clear yet whether the changes in lipid and glucose metabolism are the cause or the consequence of periodontitis.⁹ The CPITN was used to have a quick assessment of periodontal status, using the full mouth screening method.¹⁹

In this study, it was observed the severity of periodontal disease increased with the increase in the blood glucose level. This finding is an indicator of the need for improving oral health status among diabetic patients. In terms of community health among diabetics, there is a need for a mass media campaign advocating diabetes control as well as the control of other related risk factors related to periodontal disease. Toothbrushing frequency and efficacy should be strongly emphasized. Since tooth mortality or the number of missing teeth are good indicators of past periodontal disease, the number of lost teeth should be integrated in health messages to the general population. Medical colleagues and diabetic patients should be urged to consider oral health as an important factor for periodontal disease control.

Analytical statistics were not used due to the small sample size. Results of the present study is in accord with previous studies.^{2,12} Although the sample size of the study was small, a correlation between periodontal status and diabetes seems apparent.

Among the Saudi population, there is a need for organized efforts to improve oral health to avoid the complications of diabetes mellitus, especially cardiac risk. The clinical relevance of oral health should be emphasized to diabetic patients. Further research is needed in the general population with better sampling techniques and larger sample sizes. Further studies should also consider the plaque control, previous history of periodontal treatment, metabolic control, and duration of the disease.

Conclusion

Within the limitations of this study, the following conclusions can be drawn:

1. Periodontal disease was most common among 30-50 years of age group.
2. None of the subjects with severe periodontitis had all teeth present in their mouth.
3. Severe periodontitis was most common among none or irregular toothbrush users.
4. The mean CPITN score was lowest among subjects having more than three times the number of toothbrush users in the group.
5. Diabetic subjects had more missing teeth as compared to healthy subjects.
6. Diabetics had higher mean CPITN scores as compared to healthy subjects.
7. FBGL and RBGL were higher among diabetic subjects when compared to healthy subjects.
8. In the general population further research is needed with larger sample sizes and better sampling techniques.

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