

Severity and Bidirectional Link between Periodontal Disease and Type 2 Diabetes Mellitus in Saudi Patients

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Abstract

The present research was conducted to study, evaluate and compare the severity of periodontal disease among Diabetes Mellitus (DM) type 2 patients in Saudi Arabia.

100 uncontrolled diabetic patients, who had periodontal disease and were aged between 30-65 years, were selected according to the Annual Classification of Periodontal Disease, 1999. All subjects were examined for periodontal parameters. All patients have no other medical problems. They were divided into four groups. The first two groups have good oral hygiene, the third group has acceptable oral hygiene, but the fourth group has poor oral hygiene. Every group was compared, regarding the way of treatment except the antibiotic intake, with 5 patients having the same severity of gingival and periodontal affection, but medically free from DM.

Group I: Consisted of 13 patients with chronic gingivitis, with good oral hygiene. Group II: consisted of 15 patients with mild chronic periodontitis, with good oral hygiene. Group III: consisted of 30 patients with moderate chronic periodontitis, with acceptable oral hygiene. Group IV: consisted of 42 patients with severe chronic periodontitis, with poor oral hygiene.

All the subjects were subjected to clinical assessment which included plaque index (PI), gingival index (GI), pocket depth (PD) and clinical attachment level (CAL).

The result revealed that, a significant increase in PI and CAL was observed in gingivitis and this increase progressed towards the various levels of periodontitis. However, the difference in PI scores between gingivitis, mild and severe periodontitis is not significant as compared to the difference in the PI scores of moderate chronic periodontitis.

Keywords: Diabetes Mellitus Type 2; Groups of Periodontal Diseases; Clinical Parameters; Treatment Scheme

Introduction

Diabetes affects millions each year. Diabetes can lower your resistance to infection and can slow the healing process.

Physicians and dentists have long known that the health of an individual's mouth can have significant effects on the health of the rest of the body. The link between periodontal disease and heart disease is one of the most commonly known associations, but researchers found many more medical reasons to maintain good oral hygiene, as it is the bidirectional factor for diabetic patients.

Diabetes is certain to be one of the most challenging health problems in the 21st century and one of the most common non-communicable diseases in the world [1]. Diabetes is the fourth leading cause of death in most developed countries, and there is substantial evidence that it is epidemic in many developing and newly industrialized nations [2].

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Diabetes, the focus of much attention lately due to its rising incidence, appears to have a particularly close relationship with conditions within the oral cavity. This relationship seems to go both ways-diabetes can lead to unwanted changes in the gums and periodontal tissues, and periodontal diseases-including gingivitis and severe periodontitis-can make it more difficult to control diabetes.

Researchers examining the influence of periodontitis on diabetes have assessed how treatment of periodontitis influences glycemic control. Taylor and Borgnakke [2] reviewed the influence of periodontitis on glycemic control in diabetes mellitus, as well as the association of periodontitis and other clinical complications of diabetes mellitus, so they identified periodontal disease as a possible risk factor for poor metabolic control in people with diabetes mellitus. The effect of periodontitis on diabetes mellitus is believed to result from the nature of the inflammatory response in the periodontal tissues. A number of proinflammatory cytokines produced in inflamed periodontal tissue, including tumour necrosis factor- α , interleukin 6 and interleukin 1, antagonize insulin [3]. These mediators gain access to the circulation via the periodontal microcirculation and can affect tissues and organs at distant sites. In a literature review, Taylor and Borgnakke [2] found that in seven randomized controlled trials researchers examined the effect of periodontal therapy on glycemic control, and the results from four demonstrated a positive effect as indicated by a reduction in HbA1c. In four of the seven studies, antibiotics were used systemically (three studies), or were delivered locally (one study), and the results from three of the four studies (two systemic, one local) indicated a beneficial effect. Taylor and Borgnakke [2] also examined 13 periodontal treatment studies that were not randomized controlled trials and found that the results of eight indicated a beneficial effect of treatment on glycemic control.

A number of observational studies provide further evidence to support the concept that periodontitis can adversely affect glycemic management. Taylor and colleagues [4] reported that when they compared patients with and without periodontitis who had moderate-to-good glycemic control, the patients with periodontitis had a greater likelihood of having poor glycemic control.

A number of related questions have been raised regarding the data supporting a bidirectional relationship between diabetes mellitus and periodontitis [5]. Periodontitis is a clinical complication of diabetes mellitus. Furthermore, approximately 30 percent of people with periodontitis have undiagnosed diabetes mellitus. Therefore, the dental office is a health care site that can help identify undiagnosed diabetes mellitus, which can lead to better management of the care of patients with diabetes.

This bidirectional relationship between periodontal disease and diabetes mellitus makes this later of importance to dentists, dental hygienists and to patients. The evidence suggests that oral health care providers can have a significant, positive effect on the oral and general health of patients with diabetes mellitus [2].

Aim of the Study

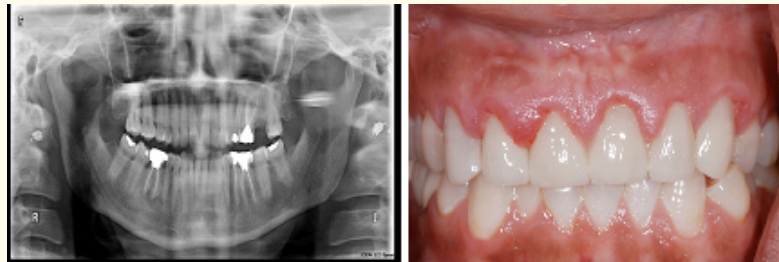
The aim of this research is to study the severity of periodontal disease in Diabetes Mellitus Type 2 patients, its bidirectional effect, and the best way of treatment, in Saudi Arabia.

Materials and Methods

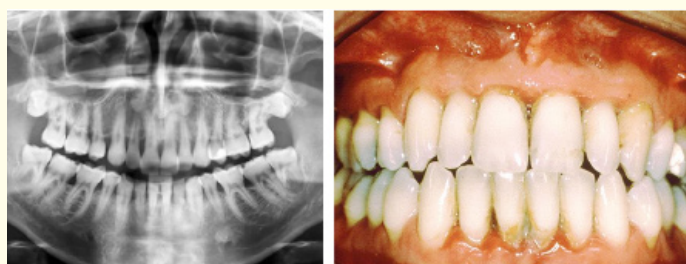
Patient selection

100 male and female patients who were diagnosed with uncontrolled D.M. and periodontal disease participated in this study. Their age ranged between 30-65 years old (Table 2). They were selected from the K.F.H., dental centre outpatients, Jeddah. Patients were grouped into four groups regarding the severity of the periodontal affection, 5 undiabetic patients for each group were used as control.

Study Design



Group I: Consisted of 13 uncontrolled diabetic patients (> 260) with chronic gingivitis, with good oral hygiene.



Group II: Consisted of 15 uncontrolled diabetic patients (> 320) with mild chronic periodontitis, with good oral hygiene.



Group III: Consisted of 30 uncontrolled diabetic patients (> 370) with moderate chronic periodontitis, with acceptable oral hygiene only.



Group IV: Consisted of 42 uncontrolled diabetic patient (> 450) with severe chronic periodontitis, with poor oral hygiene.

Clinical Parameters

All the subjects were subjected to the following:

1. Plaque index (PI) according to Silness and Loe 1964
2. Gingival index (GI) according to loe and silness 1963.
3. Clinical attachment level (CAL) according to Glavind and Loe, 1967.

Treatment scheme used:

- a. Thorough scaling to remove all calculus and plaque.
- b. Root planning and pockets evacuation.
- c. Systemic antibiotic was given for 5 days only, at the second week of treatment, to patients with uncontrolled diabetes.
- d. Oral hygiene regimen and follow up appointments were given to the patients.

Results

The results of the present study regarding the periodontal disease showed a significant difference in the mean and standard deviation of PI and CAL among patients with gingivitis and progressed towards the various levels of periodontitis. However, the difference in the mean and standard deviation of PI scores between gingivitis, mild and severe periodontitis is not significant as compared to the difference in the PI scores of moderate periodontitis (Table 1).

Mean and SD	Gingivitis	Mild	Moderate	Severe
PI – mean SD	5.8 2.68	5.3 2.71	3.6 1.7	6.7 2.12
CAL – mean SD	-	1.2 0.525	2.8 0.55	4.46 0.159
GI – mean SD	2 0.74	-	-	-

Table 1: Mean and standard deviations of various clinical parameters in relation to the severity of periodontitis.

The present study included both male and female participants. The results demonstrate that the percentage of females was greater than the males. Table 2 shows that majority of male and female participants were aged between 40-49 years of age. The least number of participants were present in the age group of 60-69.

	30-39	40-49	50-59	60-69	Total numbers of participants	Percentage
Male	14	20	4	4	42	42%
Female	15	31	11	0	58	58%
Total	30	51	5	4	100	100%

Table 2: Frequency of the sexes and their distribution according to age.

While examining the results, the study reveals that 42% of them suffered from severe chronic periodontitis which formed the majority, 30% of them suffered from moderate periodontitis and 15% from mild periodontitis. The least number of participants suffered from chronic gingivitis which accounted for only 13% (Table 3).

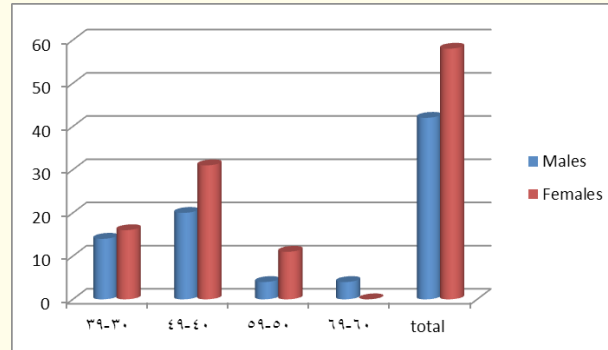


Chart 1: Depicting the distribution of sex according to age of participants.

Severity	Frequency	Percentage
Severe	42	42%
Moderate	30	30%
Mild	15	15%
Gingivitis	13	13%
Total	100	100%

Table 3: Distribution of participants according to severity of periodontal disease.

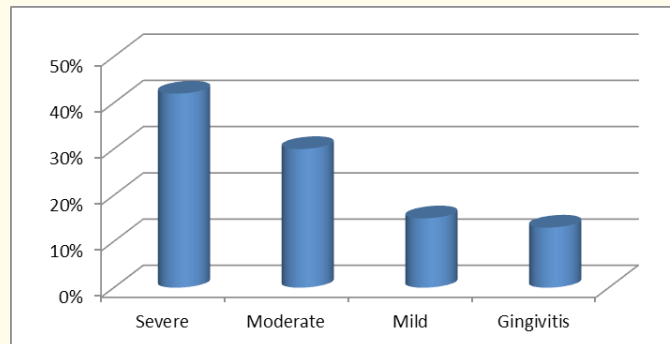


Chart 2: Depicting distribution of participants according to severity of periodontal disease.

The results of this study regarding the oral inflammations due to periodontal diseases, caused from uncontrolled DM, revealed less response to treatment than that of controlled patients in the same groups for one week treatment.

While the results of this study, regarding the bidirectional link between DM and oral inflammation due to periodontal diseases caused from uncontrolled DM, were unbelievable within the second week of treatment after the 5 days of antibiotic intake (Table 4).

Discussion

The present study was conducted to evaluate the severity of periodontal disease among diabetes mellitus (DM), and the bidirectional link regarding the effect of periodontal inflammation on controlling DM, in Saudi Arabia. A vast amount of literature establishes the correlation of DM with periodontal disease. The mechanism by which DM affects the periodontium is similar to the pathogenesis

of the micro and macro vascular complications of diabetes mellitus such as cardiopathy, neuropathy and retinopathy [6]. Formation of advanced glycosylation end products are a critical link in many complications of DM, and their deleterious effects also appear in periodontal tissues [7]. The epidemiological links between type 2 DM and periodontal disease are compelling and have been extensively reviewed [8]. Some of the earliest studies were conducted on Pima Indians, a population in the USA with a high incidence of DM Type 2 [9]. Since then, numerous studies have been conducted in relation to DM Type 2 and periodontal disease.

Groups	Bld Sugar Level Before	Bld Sugar Level After
GI: Chronic Gingivitis	> 260	< 160
GII: Mild Chronic Periodontitis	> 320	< 170
GIII: Moderate Chronic Periodontitis	> 370	< 180
GIV: Severe Chronic Periodontitis	> 450	< 200

Table 4: Difference in blood sugar level before and after treatment for different groups.

In the current study, results of the clinical parameters revealed that the majority of the female participants in the study were aged between 30 and 49 years while the male participants were aged between 40 and 49 years. The results of the current study pointed out that the majority of DM Type 2 participants included in this study demonstrated severe chronic periodontitis while moderate periodontitis was encountered in 30% of the participants. A very few participants also demonstrated mild chronic periodontitis (15%). The lowest incidence observed was of plaque induced chronic gingivitis (13%). These findings suggest that females are affected earlier and at a younger age by DM Type 2 than males. Schlossman, *et al.* [10] evaluated a group of 2878 Pima Indians and compared the severity of periodontal disease among diabetic and non-diabetic individuals [10]. Their study revealed that severity of periodontal disease was higher in subjects with diabetes than non-diabetic subjects. This is supported by a similar study conducted by Apoorva, *et al.* [6] on the local population in Bangalore, India; their study concluded that prevalence and extent of periodontal disease was more severe in diabetic patients. The risk factors like glycated haemoglobin, duration of diabetes, fasting blood sugar, personal and oral hygiene habits showed a positive correlation with periodontal destruction whereas mode of anti-diabetic therapy showed a negative correlation according to the multiple regression model [11]. In contrast, Khader, *et al.* [12] concluded that diabetic patients had a significantly higher severity but the same extent of periodontal disease than non-diabetics [12].

Not only does diabetes increase the risk for severe periodontitis, but severe periodontal disease itself increases the severity of diabetes mellitus and complicates metabolic control. In a study conducted in 1998, a dual pathway of tissue destruction and a subsequent two way relationship between diabetes mellitus and periodontal destruction was hypothesized. This proposed dual pathway of tissue destruction suggests that control of chronic periodontal infection is essential for achieving long-term control of diabetes mellitus [13]. This two way relationship is further proved by Kiran, *et al.* [14] study which concluded that non-surgical periodontal treatment is associated with improved glycemic control in type 2 patients and can be undertaken along with the standard measures for diabetic patient care [14]. In a study conducted in 2005 it was established that periodontal disease is a strong predictor of mortality from ischemic heart disease and diabetic nephropathy in Pima Indians with type 2 diabetes [15].

Several studies were conducted within Saudi Arabia to reflect upon the relationship between diabetes mellitus and periodontal disease. Khalid, *et al.* [16] conducted a study which indicated that diabetic subjects have to be encouraged to improve their oral hygiene practices and control of blood glucose levels should be emphasized [16]. He determined the effect of oral hygiene instructions on periodontal disease among type 2 male diabetic Saudi subjects. The results indicated that there was more than a 47% reduction in the overall percentage of plaque scores. The study concluded that oral hygiene instructions (a standardized regimen) have an effect on FBGL, GCF, CPITN and PII. Awartani (2009) conducted a study which concluded that there was a significant association of the loss of attachment level (3-4 mm) with PD in poorly controlled diabetic patients, as compared to better-controlled patients. Poor-control diabetics (Group II) exhibited an increased percentage of calculus and greater risk for periodontitis [7].

Finally the present study provides strong evidence that periodontal disease and DM Type 2 in Saudi Arabia have a strong inter-relationship with bidirectional link, and that periodontal disease is present in an aggravated state in patients with DM Type 2. Also, this study provides that systemic antibiotic is a must in the way of perfect treatment for both periodontal condition and DM blood Level.

Recommendations

Major effort should be directed towards preventing periodontal disease in patients with DM. More emphasis should be made on patient education and collaboration must be established between the endocrinologist/internist, the dental hygienist and the periodontist. Diabetic patients with poor metabolic control should be referred to the hygienist for oral consultation. The dental hygienist must detect any periodontal disease, determine its severity and administer the necessary care. High risk patients must be identified and put on regular follow up visits, especially if periodontal disease has already started to manifest itself. Patients with well controlled DM who have good oral hygiene should be on regular periodontal maintenance. Dentists should discuss with their patients the bidirectional relationship between diabetes and periodontal health, using the evidence as a basis for discussion.

Conclusions

Diabetes mellitus is a disease of which the general public and practicing dentists and dental hygienists should be aware. On the basis of the available data, we can conclude that practicing dentists and dental hygienists can have a significant, positive effect on the oral and general health of patients with diabetes mellitus. Dentists should discuss with their patients the relationships between diabetes and periodontal health, using the evidence as a basis for discussion. Diabetes is associated with an increased risk of developing inflammatory periodontal diseases. Research reveals numerous biologically plausible mechanisms through which these interactions occur.

While some evidence suggests that patients with diabetes who have periodontitis are at greater risk of developing poor glycemic control and that periodontal treatment aimed at reducing oral inflammation also may improve glycemic control. Inflammation is a common link between periodontal diseases and diabetes. A number of recent studies have highlighted the give-and-take relationship between diabetes and oral health. Periodontal disease worsens diabetes when bacteria released into the blood stream contribute to inflammation. With uncontrolled diabetes patients the treatment of periodontitis by oral hygiene regimen is not enough, but systemic antibiotic is a must.

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