

Original Article:

Influence of Type 2 Diabetes mellitus on periodontal conditions in a population of Dhaka City

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Abstract

Background: Periodontal disease is a destructive type of oro-dental disease because of potential damage to the dentition resulting early loss of teeth. Patients suffering from both diabetes mellitus and periodontal disease present the challenge of managing two chronic diseases as each of which may influence the other. **Purpose:** The aim of this study was to find out the influence of periodontal disease in patients with type 2 diabetes mellitus in a population of Dhaka City. **Methods:** The clinical study carried out in a reputed dental clinic of Dhaka, Uttara; consist of 132 type 2 diabetic patients as cases and 30 non-diabetic persons as controls. The cases include two age groups: one of which was considered as middle age group (40–55yrs, both male and female) while the other age group consisting participants both sexes of 56-70yrs, were considered as elderly group. The middle age group was again divided into two categories, group A consisting of 22 patients on non-drug therapy but on regular physical exercise, restricted diet and other directions as per physician, while patients from group B were on oral drug therapy (oral hypoglycemic tablets). Thirty (30) non-diabetic persons belonging to both sexes and aged between 40–55yrs (n=15) and 56–70 yrs (n=15) respectively were selected as controls. Clinical exam was performed by a trained periodontologist and Plaque Index (PI) and Gingival Index (GI) were determined according to the preset criteria. The periodontal pocket depth (PPD), Clinical attachment loss (CAL) and severity of periodontitis (mild, moderate, severe) were recorded among the two groups of NIDDM cases and the healthy controls. **Results:** An increase in the periodontal destruction (CAL) was apparent in type 2 diabetic patients compared to the non-diabetic controls. Drug dependent middle age group (both male-female) demonstrated more disease prevalence than the same age group of non-drug dependent NIDDMs. All the elderly patients under oral drug therapies had high prevalence of periodontal disease of variable severity. Non-diabetic controls presented with 13.3% and 33.3% disease prevalence in 40-55 yrs and 56-70 yrs age groups respectively. **Conclusion:** Periodontal disease is more prevalent in patients with Type 2 diabetes mellitus and particularly patients on oral hypoglycemic agents had more periodontal tissue break down. It was also apparent from the findings of the study that periodontal destruction is more prevalent in ageing subjects suffering from NIDDM.

Key words: Periodontal diseases, Type-2 diabetes,

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Introduction

Periodontal diseases are infections of the gums and supporting structures of the teeth. An increase in periodontal pocket depth and attachment loss, regression of junctional epithelium in an apical direction along with bone loss at the alveolar crest level is common manifestations of periodontal disease. Although uncommon among the young adults, the incidence of periodontal disease increases with

advancing age¹⁻³. Adult type of periodontitis usually begins after 4th decade of life with multiple systemic and local factors playing their decisive roles in its etiology.

Gingivitis and periodontitis, two most common types of periodontal disease, are as ancient as human history goes. Human skulls from ancient civilizations show evidence of periodontal bony destruction⁴.

Both diabetes mellitus (DM) and periodontal diseases are chronic disorders that have a major impact on the health and well-being of millions individuals worldwide⁵. Periodontal disease is the second main cause of oral cavity disorders affecting the population due to its high prevalence⁶. Therefore, if the presence of periodontal diseases plays any role in overall systemic health, the public health impact may be substantial³. Evidence consistently reveals that diabetes is a risk factor for increased prevalence of gingivitis and periodontitis⁷. Diabetes results in changes function of immune cells including neutrophils, monocytes, and macrophages. Neutrophil adherence, chemotaxis, and phagocytosis often are impaired^{8,9}.

Defects in this first line of defense against periodontal pathogens can facilitate bacterial persistence in the periodontal pocket and significantly increase periodontal destruction. In a 2008 review of evidence published since year 2000, Taylor and Borgnakkel¹⁰ validated previously reported conclusions that diabetes is associated with increased occurrence and progression of periodontitis and, further, that periodontal infection is associated with poorer glycemic control in individuals with diabetes.

This study was carried out to find out the intensity of periodontal diseases in diabetic patients and compare the results with non-diabetic controls. As this study was conducted using a number of laboratory confirmed diabetic patients, the influence of NIDDM on periodontal status of the participants were also discussed in detail.

Methods

This clinical study was carried out from January 2014 to December 2015. A total of 132 patients with type 2 diabetes mellitus and 30 non-

diabetic controls were included. These type 2 diabetic patients include two age groups, one group 40-55 years (both male-female) considered as middle group and another one 56-70 yrs (both male-female) as old age group. First group was divided into two sub-groups one of which consist of 22 patients who were non-drug, lifestyle maintenance therapy (subgroup A) while another sub-group of 22 patients were on oral hypoglycemic drug therapy (subgroup B). The Second age group participants were 56-70 yrs and consist of 22 male and 24 female patients on oral drug therapy. Thirty (n=30) non diabetic persons, 15 each from 40-55 yrs and 56-70 years age group respectively were selected as controls.

The patients were attending the “New Oral-Dental” clinic, a reputed dental clinic located in Uttara, Dhaka. The participants mostly represented middle to high income members of the society. All the cases for this study were laboratory confirmed diabetics without insulin having >20 remaining teeth. Edentulous patients were not included in this study. A questionnaire about general health and dental care habits was used in combination with the intra-oral examination. Informed consent was obtained from each participant beforehand explaining the purpose and nature of the study.

Diabetes mellitus was diagnosed by diabetecian having HbA1C ≥ 7 . Regarding controlling the diabetes, the middle age who were not taking medicine for their condition, informed us that they were very much sincere about routine medical checkup, physical exercise and restricted diet as prescribed by their respective physicians. The oral health examinations were carried out in the “New Oral-Dental” clinic using mouth mirrors, tweezers and ideal periodontal probes calibrated in millimeters with blunt rounded tips to measure periodontal pocket depth (PPD) and clinical attachment loss (CAL). Only one experienced examiner measured the same clinical parameters throughout the study period. All the patients were considered being almost equal in oral health status by using Gingival Index (GI) and Plaque Index (PI).

Periodontal pocket depth (PPD) was calculated as the distances in millimeters from the gingival

margin to the base of gingival crevice. Clinical attachment loss (CAL) was measured as the distance in mm from cement-enamel junction to the crevice bottom. All clinical measurements were made on 4 sites per tooth (mesial, buccal, distal and lingual/palatal) on all existing teeth except third molars. Periodontitis was considered among patients who had 2 or more teeth with significant clinical attachment loss each of which had a mean CAL score > 1 mm. The mean CAL score of an individual tooth was calculated from adding the pocket depths at 4 sites and then dividing the number by 4. The mean CAL score of a participant was calculated by adding the mean score of the affected teeth divided by the number of affected teeth. Thus the chronic form of periodontal diseases were assessed and categorized depending on the degree of CAL by “AAP international workshop for classification periodontal diseases 1999”⁵.

Results

Table 1: Clinical Attachment loss and periodontal breakdown in Type-2 diabetes mellitus (NIDDM) male patients (n=64)

Age Groups	Mild Periodontitis (CAL upto 2mm)	Moderate Periodontitis (CAL 2.1 -4 mm)	Severe periodontitis (CAL> 4 mm)
Middle age Group (40-55 years)	36% 65%	18.1% 10%	X X
Subgroup A * Subgroup B ** Elderly age Group (56-70 years)	31.8%	45.4%	27.2%

(n=22)

Subgroup A * Non- drug therapy (n=22), Subgroup B ** Oral drug therapy (n=20)

Table 1 shows that 54.1% non- drug therapy (Gr-A) males in the 40-55 age group had mild to moderate periodontitis, while 75% pt who were on oral hypoglycemic agents (gr-B) suffered from similar

condition. Severe form of periodontitis (CAL >4mm) was absent in this both subgroups. All the members (n=22) of elderly group (56-70 yrs age) suffered from variable degrees of periodontal breakdown with 27.2% had severe form of periodontitis (CAL>4mm)

Table 2: Clinical Attachment loss and periodontal breakdown in Type-2 diabetes mellitus (NIDDM) female patients (n=68)

Age Group	Mild Periodontitis (CAL upto 2mm)	Moderate Periodontitis (CAL 2.1 -4 mm)	Severe Periodontitis (CAL> 4 mm)
Middle age Group (40-55 years)	31.8% 45.4%	18.1% 22.7%	X X
Subgroup A * Subgroup B ** Elderly age Group (56-70 years)	45.8%	20.4%	33.3%

(n=24)

Subgroup A * Non- drug therapy (n=22), Subgroup B ** Oral drug therapy (n=22)

Table 2 shows that 49.9% non- drug therapy (Gr-A) females in the 40-55 age group had mild to moderate periodontitis, while 68.1% pt who were on oral hypoglycemic agents (Gr-B) suffered from similar conditions. Severe form of periodontitis (CAL >4mm) was absent in this both subgroups. All the members (n=24) of elderly group (56-70 yrs age) suffered from variable degrees of periodontal breakdown with 33.3% suffering from severe form of periodontitis (CAL>4mm)

Table 3: Periodontal disease status among the non-diabetic controls (n=30)

Age group	GI (mean)	PPD (mean)	CAL	Periodontal disease status
40-55 years n=15	0.53 (<1)	0.41 (<1)	0.4	13.3% mild periodontitis
56-70 years n=15	0.5 (<1)	0.7 (<1)	0.81	20% mild 13.3% moderate

Table 3 demonstrates mean GI, PPD and CAL to be less than 1 among the non-diabetic controls. About thirteen percent (13.1%) had mild periodontitis in 40-55 age yrs age group, while among the elderly (56-70 yrs age group), 20% suffered from mild periodontitis while 13.3% suffered from severe periodontitis.

Discussion

The results showed a significant increase in the disease progression in diabetic patients than in non-diabetic patients (Table 1, 2 & 3). The middle aged (40-55 years) drug dependent both male-female demonstrated more disease prevalence than the non-drug dependent same aged group patients (Table 1 & 2). Destructive effects of diabetes mellitus along with aging process were markedly seen in the elderly (56-70 years) group of drug dependent patients compared with non-diabetic controls. Severe form of periodontitis (CAL >4mm) was found in elderly age group, with slightly higher prevalence in female of this age group (male 27.2% and female 33.3%). All the members of elderly age group were on oral drug therapy. The non-diabetic controls demonstrated GI, PPD and CAL scores less than one (<1) (Table 3), which indicated very little periodontal breakdown in general but 13.3% mild periodontitis and 33.3% mild to moderate periodontitis were recorded in middle age and elderly patients respectively.

Among non-drug therapy middle age patients, 54.5% male and 49.9% female were suffering from periodontal disease (Table 1 & 2). On the other 75% male and 68.1% female patients who were receiving oral drug therapy for diabetes control suffered from the variable degrees of periodontal disease. It is noteworthy that higher

incidence of periodontal breakdown were seen in middle age oral drug recipients than in non-drug recipients.

The overall result of this study demonstrated a trend of increased periodontal breakdown in patients suffering from type 2 diabetes mellitus. Here one question may arise that why drug receiving middle aged group patients apparently had more disease prevalence than non-drug receivers? In this study, the non-drug dependent subjects claimed to maintain their diabetes by regular medical checkup following physical exercise, relatively stress free life and other regularities. It can be assumed that to make glycemic control, one must have regular physical activities, diet restriction and stress free life along with drug therapy. On the other hand, it could be assumed that, drug dependent subjects who showed relatively higher disease prevalence, might not be sincere about their diabetes control thinking in the mind that only drugs could cure the disease. Studies have showed that in combating periodontal disease progression, treatment protocol for diabetes should be accomplished by combined drug and physical therapies (11-13).

Diabetes mellitus induced changes in the capillary basement membrane may have an inhibitory effects on the transport of oxygen white blood cells, immune factors and waste products, all of which could affect tissue repair and regeneration. There is a decreased function of PMNs resulting reduced phagocytosis, impaired adhesion and chemotactic response. An alteration in the constituents and change in flow of gingival crevicular fluid (GCF) has been shown to be associated with diabetes mellitus (14).

The presence of periodontal disease in the diabetic subjects suggests that diabetes mellitus and periodontal disease have definitely a strong link between them. Diabetes mellitus increases the risk of periodontitis particularly if poorly controlled. Periodontal treatment has been associated with improvement in glycemic control, though more research is required to investigate this further. Oral health, including periodontal health, is a fundamentally important component of general health and particularly so in diabetes.

Conclusion

The present study showed an increased risk of periodontal damage in NIDDM pts particularly if poorly controlled. This study also revealed more intense periodontal among the drug dependent middle age group compared to non-drug dependent ones. This study also shows an apparent association between ageing process and increased prevalence of periodontitis compared to same healthy population, which needs to be statistically verified. Controlling diabetes by maintenance of life regularities along with proper hypoglycemic drugs could play a role in preservation of periodontal tissues. Further detailed research on this issue is recommended.

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