

Original Article

Prevalence of Periodontal diseases in Type 2 Diabetes

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Periodontal disease is a less recognised, but well documented complication of diabetes mellitus. In this study we evaluated the prevalence of periodontal disease in Type 2 Diabetes Mellitus (DM). Four hundred and twelve subjects with type 2 diabetes were evaluated for periodontal status. Community Periodontal Index (CPI) modified, Simplified Oral Hygiene Index (OHI-S) and Mobility was assessed in all. The prevalence of periodontal diseases in Type 2 diabetic patients was 61.9%. Bleeding on probing was present in 90% of the subjects, pocket probing depth in 59.5% and loss of attachment in 61.9%, indicating periodontal diseases, a frequent and severe complication in type 2 diabetes. Subjects with type 2 DM have a high prevalence and severe form of periodontal disease.

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Key words : Prevalence, periodontal disease, Community periodontal index, type 2 diabetes mellitus.

Diabetes mellitus is a complex and globally evolving chronic health problem faced by the world today. The total number of people in the world with diabetes is expected to rise from 171 million in 2000 to 366 million in 2030¹. Periodontal diseases are the most common diseases that includes gingivitis or periodontitis. In periodontitis, the primary etiologic factor may be microbiologic, systemic, or physical injury. The signs and symptoms are gingival bleeding, increase in pocket probing depth, destruction of periodontal attachment (mainly, bone) and tooth loss². It is best considered as the outcome of an ongoing host-parasite interaction between pathogenic microorganism that colonized in the periodontal pocket and host tissues that resist such bacteria or their products. Inadequate antimicrobial defence strategies of the host frequently result in the loss of normal structural components such as collagen fibres of gingival and periodontal ligament and replacement of these fibres by dense infiltrates of the inflammatory mediators³.

Recently, much emphasis has been laid down to potentiate the impact of systemic disease on the oral health.

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Various systemic diseases and disorders are considered as risk factors of periodontal diseases. One such example is diabetes mellitus⁴.

As per Loe⁷, periodontal diseases are considered as the 6th complication of diabetes. Chronic, gram negative periodontal infection is currently thought to increase insulin resistance, contributing to the development of metabolic imbalance and thus destabilizes the glycemic status of the person with diabetes⁵.

In a study by Almas *et al*, at the King Saud University, College of Dentistry, evaluated 40 subjects for periodontal health, 20 in each group of healthy and diabetic subjects, with ages ranging from 20 to 70 years. It was observed that the severity of periodontal disease increased with the increase in the blood glucose level. There was a steady increase in blood glucose level with increase in Community Periodontal Index of Treatment Needs (CPITN) scores⁶. CPITN is an epidemiological screening procedure for periodontal treatment needs in populations and also, in a modified form for screening and monitoring of individuals by dental practitioners. A cross-sectional study was conducted to determine the relationship between DM and oral health status in Pima Indians from the Gila River Indian community in Arizona by Emrich *et al*. The findings of their study demonstrated that diabetes increases the risk of developing destructive periodontal disease about threefold⁷.

In this background, we have evaluated the prevalence of periodontal disease in Type 2 Diabetes Mellitus in an Indian context.

MATERIALS AND METHODS

The present study is a descriptive cross-sectional study, carried out to assess the prevalence of periodontal diseases in patients with Type 2 DM. A total of 412 consecutive adults aged between 25-75 years diagnosed with Type 2 Diabetes Mellitus attending the dedicated

AMRI Institute of Diabetes and Hormonal Disorders, Kolkata were recruited. Duration of diabetes and history of addiction was documented in all.

AMRI Institute of Diabetes and Hormonal Disorders, Kolkata was selected as the patients who visit the center belong to higher socio-economic status so as to remove the effect of chronic malnourishment on dental health and lack of knowledge about oral hygiene. It is a well-established center for treatment of diabetes patients with a dedicated team of endocrinologists, ophthalmologists, dentists and diabetic educator who work together to provide patients with advance care and management of complex endocrine disorders.

The study protocol was explained to each potential subject and written informed consent was obtained prior to the commencement of the study. Ethical clearance was obtained from the research review board committee of AMRI Institute of Diabetes and Hormonal Disorders, Kolkata.

The subjects were diagnosed to have diabetes according to American Diabetes Association criteria 2018.

- A fasting plasma glucose (FPG) level ≥ 126 mg/dL (7.0 mmol/L), or
- A 2-hour plasma glucose level ≥ 200 mg/dL (11.1 mmol/L) or
- HbA1c $\geq 6.5\%$ (48mmol/mol)

Inclusion Criteria :

- Subjects of both sexes previously diagnosed with Type 2 diabetes
- Subjects were aged between 25-75 years
- Subjects with minimum 20 permanent teeth

Exclusion Criteria :

- Subjects suffering from Type 1 Diabetes Mellitus
- Those with other chronic diseases and on medications that could influence the oral health status.
- Subjects with less than 20 permanent teeth
- Current smokers or ex-smokers for four to six month
- Unable to cooperate due to their physical or mental status.

Periodontal Assessment : The periodontal examination was based on Simplified Oral Hygiene Index (OHI-S), Community Periodontal Index (CPI) modified and mobility. All assessments were performed by 1 of 2 trained examiners using a Shepherd Hook Explorer and WHO periodontal probe to determine the parameters.

OHI-S, which includes the Debris and Calculus index were employed for assessing the oral hygiene condition of the subjects⁸. Community Periodontal Index (CPI) modified consists of the following components, which are scored separately: Gingival bleeding and periodontal pocket depth. Bleeding on Probing (BOP) helps to assess periodontal status of subjects. Bleeding after stimulation is indicative of inflammation or erosion in gingival sulcus^{9,10}. BOP is recorded as present or absent within 30

seconds after probing. Probing Pocket Depth (PPD) defined “as the distance between the gingival margin and the bottom end of the periodontal pocket”¹¹ was measured by a specially designed, lightweight CPI metallic probe with a 0.5 mm ball tip, black band between 3.5 and 5.5 mm, and rings at 8.5 and 11.5 mm from the ball tip. All teeth present in the mouth are examined for absence or presence of gingival bleeding and periodontal pockets. Loss of Attachment (LOA) is recorded. It represents the distance from Cemento-Enamel Junction (CEJ) to the bottom of periodontal pocket. For loss of attachment, only 10 teeth known as index teeth are examined for an epidemiological survey. The teeth have been identified as the best estimate of the worst periodontal condition of the mouth¹².

According to the Canadian Health Measures Survey 2007-2009, the measurement of loss of periodontal ligament attachment is considered the gold standard in reporting the prevalence of periodontal disease¹³. National Health and Nutrition Examination Survey (NHANES) determined the attachment loss and Pocket Probing depth at six sites of all teeth (excluding third molars) for the estimation of periodontal disease in the US¹⁴.

Based on the above parameters, periodontal diseases were diagnosed as having presence of bleeding on probing (BOP) or a probing pocket depth (PPD) measurement of more than 4 mm, or loss of attachment (LOA) of more than 4 mm or any combinations of these parameters.

Statistical Analysis : Descriptive statistical analysis was carried out with Statistical Package for Social Sciences Version 21.0 for windows (SPSS Inc, Chicago, IL, USA) with Microsoft Word and Excel being used to generate tables.

Results on continuous measurements are presented as mean \pm SD and results on categorical measurements are presented in percentage. Statistical significance is assessed at a level of 5%. Normality of data was tested by Kolmogorov-Smirnoff test and visually by QQ plot.

Results : Out of the total 412 participants included in the study, 235(57%) were male and 177(43%) were female. The age of the participants ranged between 25 to 78 years with a mean age of 54.17 (± 10.58) years. The mean duration of type 2 diabetes is 8.53 (± 4.78) years. The mean of the glycemic parameters, fasting blood sugar (FBS), postprandial blood sugar (PPBS) and glycated hemoglobin (HbA1c) are 153.88mg/dl (± 59.70), 216.11mg/dl (± 88.06) and 7.95% (± 2.02) respectively. These baseline features are shown in Table 1.

Among 412 participants, 157(38.1%) have mild Loss of attachment (LOA) (0-3mm), 250 (60.7%) have moderate LOA (4-5mm) and 5 (1.2%) subjects have severe LOA (6-8mm). Periodontal pocket depth was absent in 167 (40.5%) individuals. PPD was present in 245 participants, among which 238 (57.8%) had 4-5mm depth while 7(1.7%) had 6mm or more pocket depth. Two hundred and sixty-six subjects (64.56%) had poor oral hygiene, 137 (33.25%) had fair oral hygiene and only 9 (2.18%) had good oral hygiene. These

features are shown in Table 2.

About 371 (90%) participants had a tendency of gingival bleeding on probing (BOP) while only 41(10%) did not have positive BOP. Two hundred and forty-five (59.5%) subjects reported with no mobility of teeth while 167(40.5%) subjects had mobile teeth at the periodontal examination. These features are shown in Table 3.

Based on the above parameters, the prevalence of periodontal diseases in Type 2 diabetic patients is 61.9%.

DISCUSSION

Sheridan *et al*, found that prevalence and severity of periodontal diseases increases with advancing age¹⁵. These findings could be due to deterioration of immune function and tissue integrity in older age that may increase the vulnerability to periodontal diseases. The present study also demonstrated that, there is a high prevalence of periodontal diseases in the elderly population.

Emrich et al stated that the duration of diabetes was strongly correlated to both prevalence and severity of periodontal diseases⁷. The present study also demonstrated that the prevalence rate of periodontitis is high in association with longer the duration, and poorer the control of diabetes mellitus.

Casarin RC et al, compared, subgingival plaque samples obtained from 71 type 2 diabetic patients with samples from healthy individuals. *P. gingivalis*, which is the main causative organism of periodontal destruction, was present in greater concentration in Type 2 diabetic patients. This study demonstrated that subjects with type 2 diabetes suffer from periodontal infection to a great extent¹⁶.

In the present study, a significant majority of

Parameters	Mean ± SD
Age (Years)	54.17±10.587
Duration of DM	8.53±4.78
Number of teeth present	28.89±2.42
Fasting Blood Sugar (FBS, mg%)	153.88±59.701
Post Prandial (PPBG mg%)	216.11±88.063
HbA1c(%)	7.95±2.027

participants (266 out of 412) (64.56%) had poor oral hygiene with mean HbA1c of 7.95%. This finding may suggest that patients diagnosed with type 2 diabetes and having sub-optimal or poor glycemic control may have greater tendency of accumulations of plaque and calculus leading to more pronounced

periodontal inflammation compared to healthy individuals.

In this study, the index used for assessing the periodontal status of the population was modified CPI index. It is an ideal index for epidemiological studies because it uses accepted clinical criteria, full mouth scoring and a simple recording procedure, which allows rapid assessment of individuals for periodontal conditions related to treatment needs¹⁷.

In periodontal diseases, gingival bleeding is one of the signs of acute gingival conditions. In this study, 90% of subjects with Type 2 DM have bleeding on probing. A 5-year follow-up study by Costa et al, demonstrated that periodontal tissue destruction is associated with poor glycemic control (HbA1c ≥6.5%)¹⁸.

Similarly, the present study suggests that type 2 diabetes is associated with a high prevalence of periodontitis.

Thus, there is a high prevalence rate of periodontal diseases in Type 2 diabetic patients. An increase in the periodontal parameters is associated with high values of indices of glycemic control.

Conclusion :

Abnormal increase in the periodontal parameters is related with poor glycemic control. The present study also demonstrated an increased prevalence of periodontal diseases in subjects with Type 2 Diabetes Mellitus. It is necessary to maintain oral hygiene regularly and educate the patients to ensure there is change of lifestyle modifications and attitude so that they can go for regular dental check-ups for glycemic control and reduce the incidence of periodontal diseases in Type 2 Diabetes Mellitus.

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(Continued on page 35)

Table 2 — Periodontal Examination findings of the participants (n=412)

Parameters	Number of subjects	Percent (%)
Loss of Attachment :		
0-3 mm	157	38.1
4-5 mm	250	60.7
6-8 mm	5	1.2
Pocket Depth :		
No pocket	167	40.5
4-5 mm	238	57.8
6 mm or more	7	1.7
OHIS :		
Good	9	2.18
Fair	137	33.25
Poor	266	64.56
PPD (Overall)	245	59.5
Periodontal Disease (Overall)	255	61.9

Table 3 — Other Periodontal Examination findings of the participants (n=412)

Parameters	Nil	Yes	Total
Mobility	245 (59.5%)	167 (40.5%)	412
Bleeding on probing	41 (10%)	371 (90%)	412

(Continued from page 32)

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