Oral health status and treatment needs among individuals with type II diabetes mellitus

Dr. Mridusmita Pathak, Dr. Swagat Mahanta

Abstract:

Background: Diabetes has emerged as a major health problem in India. The association between diabetes mellitus and periodontitis has been reported in numerous studies. It is generally accepted that the interrelationship between diabetes mellitus and periodontitis is a two-way relationship.

Aims: To assess the oral health status and treatment needs among type II diabetes mellitus patients.

Methods and Material: This present study is a cross sectional study to assess the oral health status and treatment needs among type 2 diabetic patients in Bangalore city. The total study participants were 385. A specially prepared and pre tested proforma designed for collecting all the required and relevant general information and clinical findings was used for recording the data.

Statistical analysis: Chi square test, ANOVA, and Tukey’s post hoc test.

Results: In the present study, most of the study participants, 189 (49.09%) were in the age group of 45-59 year, most of them, 187(48.57. In CPI, maximum mean number of sextants, 1.68±0.8 were affected by code 3(5mm pocket). In the association between HBA1C level and the mean number of sextants affected with CPI codes, the difference were found to be statistically significant for Code 0, code 2, code 3 and code X. In the association between duration of diabetes and the mean DMFT, when the duration of diabetes was more than 15 years, the DMFT was 3.96±2.95. the value was statistically significant.

Conclusions: To conclude, in the present study, the oral health status of the type 2 diabetic patients were poor and the treatment needs were frequent.

Key-words. Diabetes mellitus, periodontitis, CPI, DMFT.

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INTRODUCTION

Diabetes mellitus represents a heterogeneous group of metabolic disorders in which elevated blood glucose levels result in disturbance of carbohydrate, fat and protein metabolism. Generally of two types: Type I, which is insulin-dependent (IDDM) and Type II, is non insulin-dependent (NIDDM). Type I is of sudden onset in children and results from an absolute insulin deficiency, while Type II is of gradual onset in adults and is due to insulin resistance. The most common form is type 2 diabetes. Diabetes has emerged as a major health problem in India. According to International Diabetes Federation every fifth diabetic in the world would be an Indian by the year 2025. Diabetes is a major public health concern with 380 million people suffering from the disease worldwide, and about 80 % of the patients are from low and middle-income countries.

It is expected that Africa will take the lead in terms of the largest proportional increase in adults with diabetes by 2030. Prevalence of diabetes in Sudan, as in many other low-income countries, is increasing to epidemic proportions. In 2014, the prevalence of the disease in The Sudan was about 18 %, which ranks the Sudan among countries with high prevalence of diabetes in Africa and the world. It also reflects the change in life style and the urbanization movement of the population.

Chronic hyperglycemia is associated with irreversible complications such as nephropathy, retinopathy, neuropathy, cardiovascular diseases, peripheral vascular diseases, delayed healing and periodontal diseases. Diabetic patients are said to exhibit poorer oral health than normal subjects. Periodontitis is the sixth complication of diabetes, which puts Indian population at a higher risk of developing it secondary to diabetic status. The two way relation of periodontal destruction and diabetes mellitus make diabetic screening essential in periodontitis.

Chronic periodontitis is characterized by apical migration of the epithelial attachment accompanied by loss of connective tissue and alveolar bone. These changes are mediated by the interaction between pathogens and the host immune-inflammatory response. Although periodontal pathogens are considered as the initiative factor of the disease, tissue destruction in chronic periodontitis is the consequence of the host response to those pathogens. The exact mechanism by which diabetes affects periodontal tissues is not fully elucidated. An altered immune-inflammatory response to bacterial pathogens has been suggested.

The association between diabetes mellitus and periodontitis has been reported in numerous studies. It is generally accepted that the inter-relationship between diabetes mellitus and periodontitis is a two-way
relationship. Data from epidemiology studies as well as animal studies all suggest that the presence of one condition tends to increase the risk and severity of the other. It is widely accepted that diabetes mellitus is a risk factor for increased prevalence and severity of periodontitis. Conversely, periodontitis is an important factor for increased risk of diabetic complications in patients with diabetes. Epidemiological research indicates that periodontal diseases are widespread throughout the world and evidence exists to show that their extent and severity increases with age. This view of a particularly high prevalence of periodontal diseases appears to have originated from early epidemiological studies using an index system that gave weight to gingivitis and moderate periodontitis resulting from poor oral hygiene and calculus deposition.

Other oral problems related to diabetes are candidiasis, dental caries, tooth loss, gingivitis, lichen planus, neurosensory disorders (burning mouth syndrome), periodontitis, salivary dysfunction and xerostomia, and taste Impairment. Even though there is a strong evidence that supports the relationship between oral health and diabetes mellitus, oral health awareness is lacking among diabetic patients and health professionals. So, there is a need for physicians to be educated about various oral manifestation of diabetes so that they can be diagnosed early and timely referral to oral health specialist can be made. Studies have found that diabetic patient's awareness of their increased risk for oral disease is low. It was found that most of the participants were unaware of the oral health complications of diabetes mellitus and the need for preventive care. Despite the worldwide recognition of the dangers of diabetes mellitus, diabetic patients' awareness of and attitudes toward their heightened risk for oral diseases has not been fully addressed.

**SUBJECTS AND METHODS**

The present study was conducted in the hospitals and diabetic centers of Bangalore city. A convenient sampling technique was adopted to select the participants. Inclusion criteria are subjects with type II diabetes mellitus and individuals in the age group of 30-75 years. Exclusion criteria are patients with history of any systemic diseases other than type II diabetes mellitus and pregnant women. This study was systematically scheduled to spread over a period of 6 months from January 2015 to June 2015. A specially prepared and pre tested proforma designed for collecting all the required and relevant general information and clinical findings was used for recording the data. WHO 1997 proforma was used to assess the dentition status, the treatment needs along with the demographic details, extra-oral and other intraoral findings. Periodontal health status was assessed using CPI Index. While conducting the study, the study participants...
were educated about the importance oral hygiene procedures and oral health strategies.

**STATISTICAL ANALYSIS**

The data was transformed to Microsoft excel sheet for the purpose of data analysis. SPSS version 20.0 (SPSS Pty Ltd, Chicago, IL, USA) was used for statistical analysis. Data was analyzed by using descriptive statistics (frequency distribution and cross-tabulation). Frequency distributions were analysed for each variable. Chi square test, ANOVA, and Tukey’s post hoc test was employed to test significance among variables.

**RESULTS**

Demographic variables have been described in Table 1 and most of the participants 189 (49.09%) were in the age group of 45-59 years. Table 2. Among CPI scores , the maximum mean number of sextants had code 3 , with a value of 1.68±0.8, Table 3. According to the dentition status, the study participants had decayed teeth followed by missing teeth. Among the participants who had missing teeth, 265(68.83%) were found to have missing teeth any other reason, and 153 (39.74%) were found to have missing teeth as a result of caries. 27 (7.01%) study participants had filled teeth with no decay and 18 (4.68%) had filled teeth with decay. 11(2.86%) had bridge abutment, special crown or veneer/implant. 8 (2.08%) study participants had teeth affected with trauma. According to treatment needs, maximum treatment need was need for other care 204(52.99%), followed by 114(42.47%) needed extraction , 102(27.47%) and similarly 101 (26.23%) needed one surface filling and two surface filling respectively. 68 (17.66%) needed pulp care and restoration, 18 (11.66%) needed crown due to any other reason and 3 (0.78%) needed veneer or laminate. Table 4. shows the association between diabetes and oral health and the difference between the HBA1C levels and CPI codes were found to be statistically significant for Code 0, code 2, code 3 and code X. Table 5. The association between duration of diabetes and the mean DMFT shows that when the duration was less than 5 years, the mean number of DMFT was 2.28±1.08, when the duration of diabetes was 5 to 15 years, the mean DMFT was 3.41±1.92 and when the duration of diabetes was more than 15 years, the DMFT was 3.96±2.95. the value was statistically significant.

**DISCUSSION**

This cross sectional study was undertaken to assess the oral health status and treatment needs among type II diabetes mellitus patients in Bangalore city. A total of 385 type 2 diabetic patients were examined and the results were tabulated and statistically analyzed. In the present study, most of the study participants, 189 (49.09%) were in the age group of 45-59 years, followed by 133
Table 1. Distribution of the study participants according to age.

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>Frequency (n)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-44</td>
<td>133</td>
<td>34.55</td>
</tr>
<tr>
<td>45-59</td>
<td>189</td>
<td>49.09</td>
</tr>
<tr>
<td>60-75</td>
<td>63</td>
<td>16.36</td>
</tr>
<tr>
<td>Total (N)</td>
<td>385</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Distribution according to CPI Index scores

<table>
<thead>
<tr>
<th>CPI codes</th>
<th>Mean number of sextants affected with CODE 0</th>
<th>Mean number of sextants affected with CODE 1</th>
<th>Mean number of sextants affected with CODE 2</th>
<th>Mean number of sextants affected with CODE 3</th>
<th>Mean number of sextants affected with CODE 4</th>
<th>Mean number of sextants affected with CODE X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean No. of sextants affected ±SD</td>
<td>0.96±0.45</td>
<td>0.99±0.9</td>
<td>1.53±0.5</td>
<td>1.68±0.8</td>
<td>0.73±0.8</td>
<td>0.04±0.2</td>
</tr>
</tbody>
</table>
Table 3. Distribution according to Dentition status and Treatment Needs Index.

<table>
<thead>
<tr>
<th>Dentition status</th>
<th>Frequency (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status 0=sound</td>
<td>0</td>
</tr>
<tr>
<td>Status 1=decayed</td>
<td>385(100)</td>
</tr>
<tr>
<td>Status 2=filled with decay</td>
<td>18(4.68)</td>
</tr>
<tr>
<td>Status 3=filled with no decay</td>
<td>27(7.01)</td>
</tr>
<tr>
<td>Status 4=missing as a result of caries</td>
<td>153(39.74)</td>
</tr>
<tr>
<td>Status 5=missing, any other reason</td>
<td>265(68.83)</td>
</tr>
<tr>
<td>Status 6=fissujre sealant</td>
<td>0</td>
</tr>
<tr>
<td>Status 7=bridge abutment, special crown or veneer/implant</td>
<td>11(2.86)</td>
</tr>
<tr>
<td>Status 8=unerupted tooth</td>
<td>0</td>
</tr>
<tr>
<td>Status T= trauma</td>
<td>8(2.08)</td>
</tr>
</tbody>
</table>
### Table 4. Association between the mean number of sextants affected and HBA1C

<table>
<thead>
<tr>
<th>HBA1C LEVEL</th>
<th>CPI CODES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CODE 0</td>
</tr>
<tr>
<td>HBA1C LEVEL &lt;8%</td>
<td>0.96±0.50</td>
</tr>
<tr>
<td>HBA1C LEVEL &gt;8%</td>
<td>0.97±0.36</td>
</tr>
<tr>
<td>P VALUE</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

(34.55%) and 63 (16.36%) were in the age group of 30-44 years and 60-75 years respectively. In a study done by Eun-Kyong et al, most of the participants, 40 (32%) were in the age group of 60 to 69 years followed by 28 (22.4%) in the age group of
50 to 59 years, 25 (20%) in 40 to 49 years, 22 (17.6%) above 70 years and 10 (8%) in 30 to 39 years. DM and periodontitis are common multigenic and multifactorial chronic disease with higher incidence at an increased age. Both these conditions negatively affect periodontal health, thus affecting the quality of life. In our study, CPI was used for the assessment of periodontal health status. Similar to our study, CPI was used for the assessment of periodontal health status in the studies done by SM Aporva et al., Bacic et al., Emrich et al., Tervenon and Oliver, Cerda et al., Mortan et al., Novanes Junior et al., Soskolne, Grossi and Genco, Almas et al., Campus et al. and Mealey and Oates.

In the present study, maximum mean number of sextants, 1.68 ± 0.8 were affected by code 3 (5mm pocket), followed by, 1.53 ± 0.5 mean number of sextants, were affected by code 2 (calculus), 0.99 ± 0.9 mean number of sextants were affected by code 1 (bleeding), 0.98 ± 0.45 were mean number of healthy sextants with code 0 (healthy), 0.73 ± 0.8 mean number of sextants were affected by code 4 (6mm or more pocket) and 0.04 ± 0.2 were mean number of excluded sextants with code X (excluded). Whereas in a study done by Manjunath P et al, 2.46 ± 2.31 mean number of sextants were affected by code 4, followed by 1.84 ± 1.83 mean number of sextants were affected by code 3, 1.84 ± 1.83 mean number of sextants were affected by code 2, which was higher than the present study. However in the same study done by Manjunath P et al, 0.316 ± 0.78 mean number of sextants were affected by code 1, 0.24 ± 0.77 the mean number of excluded sextants, code X and 0.004 mean number of healthy sextants were present, which was lower than the present study. In a study by Anoop Kumar et al, the mean number of sextants affected by code 3 were 2.31 ± 0.98 which was higher than the present study, whereas, the mean number of sextants affected by code 4 were 0.50 ± 0.55, which was lower than the present study. However, in a study done by Rathy R, the mean number of sextants were affected mostly with code 2 (2.46 ± 0.5) which was higher than the present study, followed by 3, 0.64 ± 0.22, code 1 (0.43 ± 0.99) and code X (0.21 ± 0.32) which was lower than the present study.

In the current study, all the study participants, 385 (100%) had decayed teeth, 265 (68.83%) participants were found to have missing teeth due to any other reason, and 153 (39.74%) participants were found to have missing teeth as a result of caries. The findings of the present study are in line with the studies done by Bacic et al., Albrecht et al., Kawamura et al., Almas et al., Campus et al. and Jansson et al.

In the study by Anoop et al, 74% participants had missing teeth and 64% participants had decayed teeth, which was less than the present study. The reason for high caries might be due to less salivary flow among the
diabetics. Also, as diabetic patients have higher risk of tooth loss due to periodontitis. Hence, missing teeth is a common finding among the diabetics.

In our study, 312 (81%) participants had prosthetic needs and 73 (19%) participants did not have any prosthetic need. Among the study participants, who had prosthetic needs, 167 (53.52%) participants needed multi unit prosthesis followed by 115 (36%) participants had combination of one unit prosthesis and or Multi unit prosthesis and 30 (10.48%) participants needed one unit prosthesis.

Life threatening conditions were absent among all the study participants in the current study. Among the study participants, 282 (72.99%) participants had no pain or infection present whereas, 103 (27.01%) participants had pain or infection present. No previous studies with respect to this parameter, hence comparison cannot be made. In this study, with respect to the association between the HBA1C level and the mean number of sextants affected with CPI codes, the following observations were made.

When the HBA1C level was less than 8%, the mean number of sextants affected by code 0 were 0.96±0.50, code 1 were 0.83±0.90, code 2 were 1.44±0.50, code 3 were 1.45±0.71, code 4 were 0.67±0.86 and code X were 0.03±0.16. When the HBA1C level was more than 8%, the mean number of sextants affected by code 0 were 0.97±0.36, code 1 were 1.21±0.87, code 2 were 1.63±0.48, code 3 were 1.84±0.83, code 4 were 0.91±0.84 and code X were 0.06±0.23. The difference between the HBA1C levels and CPI codes were found to be statistically significant for Code 0, code 2, code 3 and code X. Hence, it was seen that poorer the control of diabetes, the number of the sextants affected with the periodontal disease were more. Similar results were found in the studies conducted by Rajhans et al. and Cerda et al. Karjalainen and Knuuttila had suggested that hyperglycemia impairs overall cell function. It also decreases polymorphnuclear cell chemotaxis, phagocytosis, and intracellular killing of microflora. Xerostomia among diabetics leads to higher number of decayed teeth. The oxygen carrying ability of HbA1C would be impaired, thereby decreasing tissue oxygenation. Hyperglycemia induces blood flow abnormalities like reduced erythrocyte deformability, increased blood viscosity, and increased platelet aggregation, which further enhances tissue hypoxia. Collectively all the above factors will promote periodontal destruction. In our study when the mean number of DMFT was associated with the duration of diabetes and HBA1C level, it was noticed that the mean DMFT value was more when the duration of diabetes was more and the control of diabetes was poor. In a study by Jones et al, Takheim et al, similar results were found. Contrary to our study, in a study conducted by Evanthia Lalla et al, the mean
number of DMFT was identical in both the groups when the duration and HBA1C level were associated. The lower intake of refined carbohydrates, especially sucrose, and high protein content of the diet make the dietary habits of diabetic subjects clearly less cariogenic than among non-diabetics. This finding, therefore, raises the question as to why adult diabetics develop as many new carious lesions as their healthy counterparts in spite of the restricted diet.

**CONCLUSION**

To conclude, in the present study, the oral health status of the type 2 diabetic patients were poor and the treatment needs were frequent.

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