

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Status of Periodontal Diseases and Dental Caries among Type -2 Diabetic and Non-Diabetic Patients.

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ABSTRACT

Historically, dental caries and periodontal diseases have been considered as the most important global oral health burdens. Many medical conditions, particularly diabetes, predispose patients to the development of more severe and progressive forms of periodontal disease and dental caries. To assess the dentition status among type II Diabetic and Non-Diabetic patients present in and around Eluru city. The study was conducted among diabetic and non-diabetic patients attending the outpatient department of St. Joseph Dental College and Hospital, Eluru, Andhra Pradesh, India. The periodontal index scores and dental caries scores were computed according to WHO recommendations. The sample size of the study was 612 which included diabetic and non-diabetic patients. The present study revealed that, there is an increased tendency of acquiring dento alveolar infections, caries and periodontal destruction among the diabetics when compared to non-diabetics. There was significant difference in the status of dental caries and periodontitis among the study population.

Keywords: Dental caries, periodontal disease, Diabetic, Non-diabetic.

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INTRODUCTION

Dental health refers to all the aspects of health and functioning of the mouth especially the teeth and gum which in turn are linked to overall health and well-being in a number of ways. Periodontal diseases and dental caries are the major dental problems effecting people world-wide as well as in Indian community.

Historically, dental caries and periodontal diseases have been considered as the most important global oral health burdens. Among the common oral diseases, caries and periodontal diseases are the two prime oral pathologies that remain widely prevalent affecting all populations throughout their life span [1]. The prevalence of dental caries in India is about 50%–60% and is multifactorial and a social disease. The interest in understanding the link of the dental infections with various systemic diseases has been found to be significant, which could further increase the awareness and the importance of oral health that is often found to be neglected in India. It is well known that diabetes is the only common systemic disease to be so clearly linked to periodontal disease. Hence, dental diseases with respect to the systemic disease diabetes mellitus, is one of the considerable subject for the study. According to the World Health Organization, one in six diabetic's lives in India [2]. It is observed that, many medical conditions, particularly diabetes, predispose patients to the development of more severe and progressive forms of periodontal disease [3,4].

The oral problems are considered to be one of the few categories of diseases emerging as a public health problem in India, as they are significantly associated with pain, suffering, functional and esthetic problems which shows impact on quality of life at biological, psychological and social aspects [5]. It is recognized that diabetes mellitus has acquired a pandemic status in India and diabetics are at greater risk for developing periodontal diseases hence, this topic is found to be significant for the study. To assess the dentition status among type II Diabetic and Non-Diabetic patients attending St. Joseph Dental College and Hospital in Eluru city.

MATERIALS AND METHODS

The entire work was carried out at St. Joseph Dental College and Hospital, Eluru, Andhra Pradesh, India. A total of six hundred and twelve (612) patients were included in the study. The study population included both males and females with age range from 10-80 years. The dental caries status was recorded from the dentition status Decayed, Missed, Filled and all Three (DMFT) and the periodontal status was recorded by using the Community periodontal index (CPI) scores measured according to WHO oral examination procedures with the help of dental doctors attending out-patient department at St. Joseph Dental College and Hospital, Eluru. Diabetes was assessed by their random blood sugar levels.

Sampling

Individuals were randomly selected from the patients attending outpatient department. Simple probability random sampling was used, so that the sample collected

could be the representative of patient’s population and gives exact information about prevalence of the dental diseases, in that local area.

Statistical analysis

Statistical analysis was performed by the chi-square test to assess the significant association between the different parameters in the study by measuring Contingency coefficient which expresses the strength of association between two nominal variables.

RESULTS

Prevalence of diabetes mellitus among the study population

Total number of patients in the study are presented in table 1, out of 612 patients, 180 were with type-2 diabetes. The proportion of patients with diabetes mellitus increased with age group. Amongst 180 patients with diabetes mellitus, 4 patients were within 10-20 years age group, 13 in 21-30 years age group, 27 in 31-40 years age group, 40 in the 41-50 years age group, 35 in 51-60 years age group, 39 in 61-70 years age group and 22 patients in 71-80 years age group. The occurrence of diabetes mellitus among 10-20 and 21-30 years age group was significantly lower than in other age groups.

Table 1: Number and percentage of the diabetic and non- diabetic patients based on age and gender

Age group (years)	Diabetic		Non-diabetic		Total
	Males	Females	Males	Females	
10-20	0	4 (5.4)	40 (54)	30 (40.6)	74
21-30	3 (3)	10 (9)	49 (44.5)	48 (43.5)	110
31-40	16 (16)	11 (11)	36 (36)	37 (37)	100
41-50	25 (22.3)	15 (13.4)	49 (43.7)	23 (20.6)	112
51-60	21 (25)	14 (16)	36 (42)	14 (17)	85
61-70	21 (27.5)	18 (23.5)	22 (29)	15 (20)	76
71-80	12 (22)	10 (18)	19 (35)	14 (25)	55
Total	98	82	251	181	612
Grand total	180 (29)		432 (71)		
Coefficient of association between age and gender among diabetics- Contingency coefficient = 11.02102, p = 0.050965 (NS) Coefficient of association between age and gender among Non-diabetics- Contingency coefficient = 11.56441, p = 0.072422 (NS) Coefficient of association between age and condition (Diabetic& Non-diabetic) - Contingency coefficient = 65.5647, p < 0.01 (S).					

The coefficient of association between Age and Gender of the patients among the number and percentage within the group of Diabetics showed Contingency Coefficient of 11.02102 and $p = 0.050965$ which indicated that there is no significant association between the age and gender of the patient among the diabetics, the same was observed among non-diabetics with Contingency Coefficient of 11.56441 and $p = 0.072422$ but, the coefficient of association between the age and condition (Diabetic and Non-Diabetic) showed Contingency Coefficient of 65.5647 and $p < 0.01$ indicating a significant association.

Prevalence of Caries and periodontal diseases among diabetics and non-diabetics

The general prevalence of periodontal disease is approximately 65-100 per cent and dental caries is approximately 60 per cent - 65 per cent in India. Incidence of diabetic and non-diabetic patients among the study population was given in figure1. Periodontal disease observed among diabetics and non-diabetics of the study population was 97% and 92%, respectively. Prevalence of dental caries was 66.1% among diabetics and 64.5 % among non-diabetics.

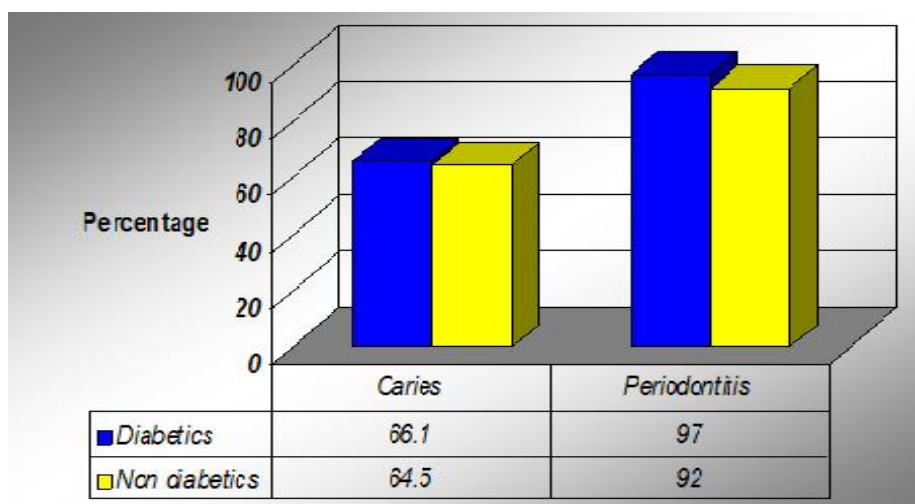


Figure: 1. Percentage prevalence of dental caries and periodontitis among diabetic and non-diabetic patients.

Occurrence of dental caries according to age and gender

The number of caries affected patients among diabetics and non-diabetics of different age groups is presented in table 2. The proportion of females with caries was 3.36% among diabetics. Within 10-20 years age group, 8.96 % males and 6.09 % females among non-diabetics had caries. In the age group of 21-30 years, 1.68 % males and 7.56 % females among diabetic and 13.62 % males and 11.11% females among non-diabetic patients were with caries. Maximum number was observed in the age group of 31-40 years with 13.44 % males and 9.24% females in diabetics and 12.54% males and 10.39% females in non-diabetics. Among 41-50 years age group, caries affected patients were 14.28% males and 5.88% females in diabetics and 10.75 % males and 5.37% females in non-diabetics. Caries prevalence further decreased in the age groups of 51-60, 61-70, and 71-80 years with 13.44%, 8.40% and 5.88% males and 5.88%, 9.24% and 1.68% females, respectively in diabetics, and 13%, 9.5%, 5.5% males and 2.50%, 2.15% and 1.43% females in non-diabetics,

respectively. Highest caries affected patients were of 41-50 years age group and least caries affected patients were non-diabetic females within 71-80 years age group.

The coefficient of association between the Age and Gender of the patients among diabetics regarding the occurrence of dental caries within the group of Diabetics showed Contingency Coefficient of 17.4336 and $p = 0.003747$ indicating a significant association between the age and gender of the patients among the diabetics in the occurrence of dental caries while the coefficient of association between Age and Gender of the patients among Non-Diabetics regarding the occurrence of dental caries with Contingency Coefficient of 5.89355 and $p = 0.43522$ indicated that there is no significant association between the age and gender of the patients among the non-diabetics in the occurrence of dental caries. The coefficient of association between Age and condition (Diabetic & Non-diabetic) of the patient regarding the occurrence of dental caries with Contingency Coefficient of 38.64033 and $p < 0.01$ indicated that there is significant association between the age and condition (Diabetic & Non diabetic) of the patient in the occurrence of dental caries.

Table 2: Occurrence of dental caries in diabetic and non-diabetic patients based on age and gender

Sl. No.	Age group (Years)	Diabetics		Non-diabetics		Total Number (caries)
		Male	Female	Male	Female	
1	10-20	-	4 (3.36)	25 (8.96)	17 (6.09)	46
2	21-30	2 (1.68)	9 (7.56)	38 (13.62)	31 (11.11)	80
3	31-40	16 (13.44)	11 (9.24)	35 (12.54)	29 (10.39)	91
4	41-28	17 (14.27)	7 (5.88)	30 (10.75)	15 (5.37)	69
5	51-60	16 (13.44)	7 (5.88)	22 (7.88)	7 (2.50)	52
6	61-70	10 (8.40)	11 (9.24)	11 (3.94)	6 (2.15)	38
7	71-80	7 (5.88)	2 (1.68)	9 (3.22)	4 (1.43)	22
Total		68	51	170	109	398
Grand total		119		279		
<p>The coefficient of association between Age of the patient and Gender regarding the occurrence of dental caries within the group of Diabetics- Contingency Coefficient = 17.4336, $p = 0.003747$ (S).</p> <p>The coefficient of association between Age of the patient and Gender regarding the occurrence of dental caries within the group of non- Diabetics- - Contingency Coefficient = 5.89355, $p = 0.43522$ (NS).</p> <p>The coefficient of association between Age of the patient and condition(diabetic / non-diabetic) patient regarding the occurrence of dental caries – Contingency Coefficient = 38.64033, $p < 0.01$ (S)</p>						

Periodontal assessment in the study

Tables 2, 3 and 4 represent the periodontal assessment in diabetic and non-diabetic patients done by using CPI score. Percentage of patients with periodontitis in diabetic and

non-diabetic patients was represented in figure 2. CPI code of 0 (healthy individuals) among diabetics was 7.4% and 18.3% among non-diabetics which shows the high prevalence of periodontal disease among the diabetic population.

Table 3: Periodontal assessment of diabetics in different age groups according to community periodontal index

Age group (years)	Healthy 0		Bleeding 1		Calculus 2		Pocket (4-5mm) 3		Pocket (> 6 mm) 4	
	M	F	M	F	M	F	M	F	M	F
10-20	2	2	0	0	0	0	0	0	0	0
21-30	2	2	1	7	0	0	0	0	0	0
31-40	3	2	8	10	0	0	0	0	0	0
41-50	0	0	9	11	16	4	0	0	0	0
51-60	0	0	7	6	8	4	6	4	0	0
61-70	0	0	0	0	8	6	7	7	6	5
71-80	0	0	0	0	4	4	4	4	4	2
Total	7	6	25	34	36	18	17	15	10	7
Grand total	13		59		54		32		17	

M=Males, F=Females

Table 4: Periodontal assessment of non- diabetics in different age groups according to community periodontal index

Age group (years)	Healthy 0		Bleeding 1		Calculus 2		Pocket (4-5mm) 3		Pocket (> 6 mm) 4	
	M	F	M	F	M	F	M	F	M	F
10-20	20	11	20	18	0	0	0	0	0	0
21-30	19	18	28	25	0	0	0	0	0	0
31-40	2	3	12	11	10	11	8	8	0	0
41-50	0	0	17	9	17	7	7	7	0	0
51-60	0	0	11	4	11	4	7	2	2	2
61-70	0	0	0	0	8	5	7	4	5	5
71-80	0	0	0	0	7	5	7	5	5	4
Total	41	32	88	67	53	32	36	26	12	11
Grand total	73		155		85		62		23	
<p>The coefficient of association between Age of the patient and condition (Diabetic & Non-diabetic) of the patient regarding the Periodontal assessment-</p> <p>Contingency Coefficient=18.29843432, p = 0.01 (S)</p>										

M=Males, F=Females

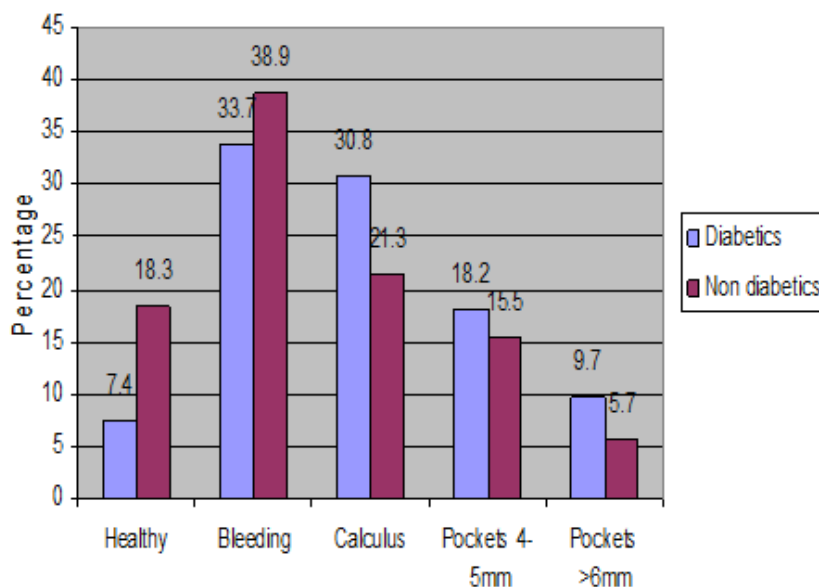


Figure 2: C P I score of diabetic and non- diabetic patients

CPI score 1 was 33.7% in diabetics and 38.9% in non-diabetics. Patients with CPI score of 2 were 30.8% in diabetics and 21.3 % in non-diabetics. CPI score of 3 was 18.2% in diabetics and 15.5% in non-diabetics and CPI score of 4 was 9.7% in diabetics and 5.7% in non-diabetic patients. The most prevalent CPI score was 1 (gingival bleeding) in both diabetics and non-diabetics which chiefly reflects poor oral hygiene among the study population. Females were less affected than males.

The coefficient of association between Age of the patient and condition (Diabetic and Non-diabetic) regarding the Periodontal assessment with Contingency Coefficient of 18.29843432 and $p < 0.01$ showed that there is a significant association between the age and condition (Diabetic & Non-diabetic) of the patient.

DISCUSSION

Diabetes mellitus and dental diseases

The actual rise in the prevalence of diabetes in India began from 80's. Present study, which was conducted in Andhra Pradesh of south India found higher incidence among diabetes mellitus which is in agreement with the survey done by Amrita Diabetes and Endocrine Population Survey (ADEPS) that reported the highest prevalence of diabetes in India. Earlier in a survey, the prevalence of known diabetes in Eluru of rural Andhra Pradesh was 1.5 % [6]. In a recent study very high prevalence of 13.2 % of diabetes was reported in rural population of Andhra Pradesh [7]. All these studies thus support the higher prevalence of diabetes among the study population.

The present study revealed that, there is an increased tendency of acquiring dento alveolar infections and periodontal destruction along with increase in number of bacteria among the diabetics when compared to non-diabetics. The National Health and Nutrition Examination Survey III found that the individuals with poorly controlled type 2 diabetes

mellitus had significantly higher prevalence of severe periodontitis than those without diabetes after observing for age, education, smoking and amount of calculus. Furthermore, some more studies [8,9] reported that diabetic patients are more likely to loose teeth than non-diabetic patients.

The higher prevalence and severity of periodontal disease in patients with diabetes is due to reduced PMN chemotaxis, phagocytic defects, and depressed humoral response. Moreover, it is known that in a hyperglycemic environment, numerous proteins undergo glycosylation to form advanced glycation end-products (AGE) which are important in the pathogenesis of diabetes complications that may also contribute to tissue changes within the periodontium [10]. This association can also be explained due to the persistent hyperglycemia leading to exaggerated immuno-inflammatory response to the periodontal pathogenic bacteria leading to more rapid and severe periodontal tissue destruction as explained by Southerland *et al.* [11] and Nishimura *et al.* [12]

Age

Age was also found as one of the important factor in the present study, with high number of patients with diabetes mellitus from 31-40 years age group to 61-70 years age group which was in agreement with the National Diabetes Statistics [13]. This high prevalence could be due to the altered immune inflammatory responses and high release of AGEs and also as age advances diabetics are found to be more susceptible to all infections, including the periodontium [14]. Least percentage of patients was observed in the age groups of 10-20 years, 21-30 years and in the 71-80 years of older age group. Least number in the older age group could be due to the absence or loss of teeth in that age group.

Prevalence of dental caries

Highest number of males with caries was observed when compared to females as observed in a study carried out by Sharda and Srinath [15] on periodontal and caries status of Professional students in India.

The findings of the present study indicated that the diabetic population was more prone caries than non-diabetics by 2 % increase which was in accordance with Jones *et al.* [16] who opined that diabetic patients are more caries prone than the general population. In a study conducted by Albrecht *et al.* [17] also reported the similar result. This higher susceptibility among diabetics might be due to the leakage of glucose from blood into the oral cavity [18] From the result of this study, it was found that the caries prevalence is slightly high in diabetic patients than non-diabetics as that of Karjalainen *et al.* [19] who reported significantly high DFS (decayed, filled surfaces) indices in poorly controlled diabetic children and adolescents.

The results of the present study showed that the patients with caries were more and their number increased up to 30-40 years age group both in diabetic and non-diabetic patients and later on decreased. The development of dental caries in these age groups may be because of the high sugar consumption among the children and teenagers. Maximum percentage of patients were observed in the age group of 31-40 years with 22.6 % in

diabetics and 22.9 % in non-diabetics. Caries percentage was found to be more among diabetics from 31-80 years, when compared to non-diabetic patients. Increased dental caries prevalence in adults with diabetes mellitus could also be due to xerostomia along with increase in salivary glucose. Thus, it can be implied that hyperglycemic state has shown a positive association with dental caries.

Prevalence of periodontitis

The result thus showed the higher prevalence of periodontitis among diabetics as evidenced earlier from various studies. Numerous studies, review articles and meta-analyses indicated a mutual influence between periodontitis and diabetes mellitus [20]. In another study, Mealey [21] cited numerous studies which indicated that the presence and severity of gum disease can increase the risk of poor glycemic control leading to diabetes.

Several other epidemiological studies reported that periodontal impairment is significantly more frequent and severe in patients with type- 2 diabetes mellitus [22-24]. In the present study, the severity of periodontal diseases was also found to be high among diabetics when compared to non-diabetics. CPI score of 0 (healthy individuals) among diabetics was 7.4 % and 18.3 % among non-diabetics shows the high prevalence of periodontal disease among the diabetic population. CPI scores of 2, 3 and 4 were found to be more in diabetics when compared to non-diabetics. Similar findings were observed in other studies with CPI 3 conducted in Italy [8, 25] and similar findings with CPI score 4 were observed in studies carried out in Yugoslavia [26,27].

Hence, the result of this study was in concurrence with other studies indicating that diabetes mellitus is associated with periodontal disease and periodontal destruction which is significantly more frequent and severe in patients with diabetes mellitus. The most prevalent CPI score was 2 (gingival bleeding) in both diabetics and non-diabetics which chiefly reflects poor oral hygiene among the study population.

CONCLUSION

In conclusion, the results indicate that there was difference in the status of oral health among diabetics and non-diabetics. There was a significant association between the age and gender of the patients among the diabetics in the occurrence of dental caries while the coefficient of association between Age and Gender of the patients among Non-Diabetics regarding the occurrence of dental caries indicated that there is no significant association. Significant association was observed between the age and condition (Diabetic & Non diabetic) of the patient in the occurrence of dental caries. The coefficient of association between Age of the patient and condition (Diabetic and Non-diabetic) regarding the Periodontal assessment showed that there is a significant association. It is observed that there is scarcity of data regarding oral health and diabetes in India hence, to acquire improved dental and oral health of Indian population, additional studies are further needed.

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