

Oral Hygiene Status and Caries Experience: A Comparative Study of Diabetic and Non- Diabetic Patients

*Matthew Asizide SEDE, *Julie Omole OMO,
**Adebola Oluyemisi EHIZELE

**Department of Restorative Dentistry, University of
Benin, Benin City, Nigeria*

***Department of Periodontics, University of Benin,
Benin City, Nigeria*

Correspondence

Dr. J. O Omo.

Department of Restorative Dentistry

University of Benin,

Benin City, Edo State.

Nigeria.

Email: julie.omo@uniben.edu

Received: 10th January, 2022

Revision: 31th January, 2022

Accepted: 4th February, 2022

ABSTRACT

Objective: To compare the oral hygiene status and caries experience among diabetic and non-diabetic patients and to determine the relationship between glycaemic control and the severity of the oral health problems among the diabetics.

Methods: The comparative cross-sectional study was carried out among diabetics and non-diabetic who were age and sex matched. Data collated include demographic characteristics, fasting blood sugar level, number of decayed, missing and filled teeth, oral hygiene status as well as the presence and extent of tooth mobility. Chi-square test was used to test for statistical significance difference between categorical variables in both groups. Comparison of the mean simplified oral hygiene index (OHI-S) score and the mean decayed teeth (D), missing teeth (M), filled teeth (F) scores in both groups was done using independent t- test. P-value<0.05 was considered statistically significant.

Results: A total of 168 patients (84 cases and 84 controls) participated in this study. The mean decayed missing and filled teeth score among cases and controls was 0.37 ± 0.51 and 0.57 ± 0.23 respectively ($P = 0.009$) while the mean Oral Hygiene Index score was 1.81 ± 0.09 among the cases and 2.18 ± 0.10 among the controls ($P = 0.039$). Majority of the cases (54.8%) and controls (65.5%) had fair oral hygiene status ($P = 0.166$) while most of the cases (52.4%) had no caries experience with a DMFT score of zero ($P = 0.032$). More persons in the control group had decayed teeth, missing teeth and mobile teeth ($P > 0.05$). Filled teeth were however seen in 16.7% of cases and 4.8% of controls ($P = 0.032$). In diabetic patients with poor glycaemic control, more decayed, missing, filled and mobile teeth were seen while periodontal disease was the major reason for tooth loss among the diabetic patients.

Conclusion: There is a difference between the oral hygiene status and caries experience in diabetic and non-diabetic patients while poor glycaemic control is directly related to the severity of the oral health problems among the diabetics.

Keywords: Diabetic patients, caries experience, oral health status.

Matthew Asizide Sede

<https://orcid.org/0000-0002-6737-8601>

Julie Omole Omo

<https://orcid.org/0000-0002-5680-6922>

Adebola Oluyemisi Ehizele

<https://orcid.org/0000-0002-9596-2020>

CLINICAL IMPLICATIONS

It is imperative to ensure diabetic patients always achieve glycaemic control to prevent dental caries, periodontal disease and subsequently tooth loss which are some of the complications associated with poor control. Also, patient should be regularly educated on the need for good oral hygiene and regular dental visits for check-ups and follow-ups to prevent or manage these complications.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder caused by absolute or relative deficiency of insulin, an anabolic hormone.¹ It is a chronic, non-communicable, systemic disease that constitutes a major international public health problem.² Diabetes is one of the major risk factors for periodontitis; especially when the disease is uncontrolled.³ Oral diseases have a complex aetiopathogenesis that can be associated with the systemic health status.⁴ Epidemiological data suggest that diabetes mellitus is a major risk factor for periodontitis. It is also well documented that periodontal tissue become more susceptible to damage with poor glycaemic control.^{5,7} Although the causal relationship between diabetes and oral health is controversial,⁸ host response to the assaults of periodontal pathogens is persistent inflammation which progresses to the destruction of periodontal ligament, the cementum and alveolar bone with the resultant tooth loss.^{9,10}

A number of factors which include the altered host immune response;¹¹ the role of cytokines;¹² as well as the implication of advanced glycation end-products¹³ have been investigated to explain the reasons for the influence of DM on the periodontium. A large number of both diagnosed and undiagnosed patients with DM are not aware of the possibility of developing periodontal diseases which ultimately result in tooth loss.¹⁴ It has been reported that people with diabetes mellitus tend to have more carious lesions and tooth loss.^{15,16} The relationship between dental caries and DM appears controversial, they however share a common risk factor (sugar consumption), if there is an understanding between the association, it could help to reduce the burden of both diseases.¹⁷ The sucrose restricted diet in DM patients have been reported to be responsible for the

low caries experience among these group of people, however, a higher caries incidence has been observed in poor control compared to those with a well-balanced disease.¹⁸ The aim of this study was therefore to compare the oral hygiene status and caries experience among diabetic and non-diabetic patients and to determine the relationship between glycaemic control and the severity of the oral health problems among the diabetics.

MATERIALS AND METHODS

This was a cross sectional study carried out in Diabetic and Dental out-patient clinics of the University of Benin Teaching Hospital. Diabetic patients with at least 6 months' history of the disease, without any other systemic disease, and those who had not used anti-inflammatory drugs and antibiotics three months before the study were included in the study. The participants in the control group were selected from the non-diabetic dental out-patient attending the prosthetic and periodontics clinics of the Hospital. They were matched in age and sex with the cases.

Data collected include demographic characteristics such as age, sex, marital, educational and socioeconomic status of the study participants. The fasting blood sugar level, the number of the decayed, missing, filled and mobile teeth, oral hygiene status, and the use of dental prosthesis were noted. For the purpose of analysis, a DMFT score of zero was considered normal, 1-3 within acceptable standard and >3 below acceptable standards. Also, a fasting blood sugar level of ≤ 125 mg/dl was considered as a good glycaemic control while levels >125 mg/dl was considered poor glycaemic control.

Data was analysed using the IBM SPSS version 21.0. Statistical analyses included frequency distributions, estimation of mean values and cross-tabulation. Chi-square test was used to test for statistical significance difference between categorical variables in both groups. Comparison of the mean simplified oral hygiene index (OHI-S) score and the mean decayed teeth (D), missing teeth (M), filled teeth (F) scores in both groups was done using independent t-test. P value < 0.05 was considered statistically significant.

RESULTS

A total of 168 participants (84 cases and 84 control) were included in this study, Females were more in both groups (70.2% of cases and 73.8% controls). Majority in both groups were in the 40 - 59 years age range, married, with tertiary level of education and in the skilled social class (Table 1). The mean decayed teeth score among cases and controls was 0.37 ± 0.51

and 0.57 ± 0.23 respectively ($P= 0.009$), the mean missing teeth score among cases and controls was 1.29 ± 0.32 and 1.93 ± 0.34 respectively ($P= 0.469$), the mean filled teeth score among cases and controls was 0.05 ± 0.04 and 0.26 ± 0.10 respectively ($P= 0.131$) while the mean oral hygiene Index score was 1.81 ± 0.09 among the cases and 2.18 ± 0.10 among the controls ($P= 0.039$) (Table 2).

Table 1: Demographic Characteristics of the study participants

Characteristics	Case n (%)	Control n (%)	P value
Age (years)			0.997
20-39	5 (6.0)	4 (4.8)	
40-59	49 (58.3)	48 (57.1)	
60-79	23 (27.4)	25 (29.8)	
80-99	7 (8.3)	7 (8.3)	
Mean $\pm$ SD	58.1 ± 12.4	56.9 ± 14.1	
Gender			0.606
Male	25 (29.8)	22 (26.2)	
Female	59 (70.2)	62 (73.8)	
Marital status			0.804
Single	4 (4.8)	5 (6.0)	
Married	69 (82.1)	70 (83.3)	
Divorced	1 (1.2)	2 (2.4)	
Widowed	10 (11.9)	7 (8.3)	
Educational level			0.128
Informal	6 (7.1)	7 (8.3)	
Primary	16 (19.0)	11 (13.1)	
Secondary	18 (21.4)	9 (10.7)	
Tertiary	44 (52.4)	57 (67.9)	
Social class			0.075
Highly skilled	3 (3.6)	8 (9.5)	
Skilled	43 (51.2)	46 (54.8)	
Semi-skilled	3 (3.6)	2 (2.4)	
Unskilled	35 (41.7)	25 (29.8)	
Unemployed	0 (0.0)	3 (3.6)	
Total	84 (100.0)	84 (100.0)	

Table 2: Comparison of the mean value of estimated parameter in both groups

Parameters	Case Mean $\pm$ SEM	Control Mean $\pm$ SEM	P value
Mean Decayed Teeth	0.37 ± 0.51	0.57 ± 0.23	0.009
Mean Missing Teeth	1.29 ± 0.32	1.93 ± 0.34	0.469
Mean Filled Teeth	0.05 ± 0.04	0.26 ± 0.10	0.131
Mean Oral Hygiene Index Score	1.81 ± 0.09	2.18 ± 0.10	0.039

Fair oral hygiene status was commonly observed ($P=0.166$) in both cases (54.8%) and controls (65.5%) patients and majority of the cases (52.4%) had no caries experience with a DMFT score of zero ($P= 0.032$) (Table 3). More persons in the control group

(58.3%) had decayed teeth ($P=0.378$), 54.4% of controls had missing teeth ($P=0.279$) and mobile teeth were more (58.8%) in the control group ($P=0.443$). Filled teeth were seen in 16.7% of cases and 4.8% of controls ($P=0.032$) (Table 4). Among the

diabetic patients with poor glycaemic control, 70% had decayed teeth ($P= 0.738$), 69.4% had missing teeth ($P= 0.296$), 100% had filled teeth ($P= 0.529$), and 85% had mobile teeth ($P= 0.252$) (Table 5). The reasons for tooth loss were caries in 50% of cases and 58.1% of control ($P=0.001$), periodontal disease in

47.2% of cases and 18.6% of control and trauma in 2.8% of cases and 23.3% of control ($P=0.001$) (Table 6). Majority of the study participants with missing teeth (92.4%) did not replace the tooth/teeth with any dental prosthesis ($P= 0.010$) (Table 7).

Table 3: Comparison of Oral Health Status of both groups.

Status	Case n (%)	Control n (%)	Total n (%)	P value
Oral Hygiene Status				0.166
Good	19 (22.6)	10(11.9)	29 (17.3)	
Fair	46 (54.8)	55 (65.5)	101 (60.1)	
Poor	19 (22.6)	19 (22.6)	38 (22.6)	
Caries Experience				0.032
DMFT score of 0 (Normal)	44 (52.4)	33 (39.3)	77 (45.8)	
DMFT score of 1-3 (within acceptable standard)	28 (33.3)	25 (29.8)	53 (31.6)	
DMFT score of >3 (below acceptable standard)	12 (14.3)	26 (30.9)	38 (22.6)	
Total	84 (100.0)	84 (100.0)	168 (100.0)	

Table 4: Comparison of oral health of participants in both groups

Variable	Case n (%)	Control n (%)	Total n (%)	P value
Decayed teeth				0.378
Presence	10 (41.7)	14 (58.3)	24 (100.0)	
Absence	74 (51.4)	70 (48.6)	144 (100.0)	
Missing teeth				0.279
Presence	36 (45.6)	43 (54.4)	79 (100.0)	
Absence	48 (53.9)	41 (46.1)	89 (100.0)	
Filled teeth				0.032
Presence	2 (16.7)	4 (4.8)	12 (100.0)	
Absence	82 (52.6)	48 (57.1)	156 (100.0)	
Mobile teeth				0.443
Presence	7 (41.2)	10 (58.8)	17 (100.0)	
Absence	77 (51.0)	48 (49.0)	151 (100.0)	
Total	84 (50.0)	84 (50.0)	164 (100.0)	

DISCUSSION

Diabetes mellitus and dental caries are common chronic diseases and needs to be addressed to prevent the imminent complications associated with them. There was a female predilection in this study which reflects the sex related differences in the risk of developing DM and women tend to present to the diabetic clinic regularly and have a higher health seeking behaviour than men.¹⁹ Similar studies^{14,20,21} have also reported female preponderance. The mean DMFT scores were higher in the control cases and this was statistically significant for the decayed teeth. The sucrose restricted diet in DM patient may

be responsible for this, as well as awareness of the importance of good oral health among the cases. The level of education has been significantly linked to knowledge²² this may have reflected in this study, as most of the participants had tertiary level of education. This observation corroborates with the study of Schmolinsky et al.²³ and contradicts other studies^{18,24} where the DMFT of the DM cases was high. Although, more than 70% of their DM population had poor control of their diabetic condition compared to 63.1% in this study. they lacked adequate knowledge and practice of good oral hygiene.

Table 5: Effect of glycaemic control on oral health of diabetic patients

Variable	Glycaemic control		Total	P value
	Good n (%)	Poor n (%)		
Decayed teeth				0.738
Presence	3 (30.0)	7 (70.0)	10 (100.0)	
Absence	28 (37.8)	46 (62.2)	74 (100.0)	
Missing teeth				0.296
Presence	11 (30.6)	25 (69.4)	36 (100.0)	
Absence	20 (41.7)	28 (58.3)	48 (100.0)	
Filled teeth				0.529
Presence	0 (0.0)	2 (100.0)	2 (100.0)	
Absence	31 (37.8)	51 (62.2)	82 (100.0)	
Mobile teeth				0.252
Presence	1 (14.3)	6 (85.7)	7 (100.0)	
Absence	30 (39.0)	47 (61.0)	77 (100.0)	
Total	31 (36.9)	53 (63.1)	84 (100.0)	

Table 6: Reasons for tooth loss among participants in both groups

Reasons	Case n (%)	Control n (%)	Total n (%)	P value
Caries	18 (50.0)	25 (58.1)	43 (54.4)	0.001
Periodontal diseases	17 (47.2)	8 (18.6)	25 (31.6)	
Trauma	1 (2.8)	10 (23.3)	11 (14.0)	
Total	36 (100.0)	43 (100.0)	79 (100.0)	

Table 7: Pattern of use of dental prosthesis among study participants with missing teeth

Missing teeth	Denture use		Total n (%)	P value
	Yes n (%)	No n (%)		
Presence	6 (7.6)	73 (92.4)	79 (100.0)	0.010
Absence	0 (0.0)	89 (100.0)	89 (100.0)	
Total	6 (3.6)	162 (96.4)	168 (100.0)	

In this study, fair oral hygiene status was observed in a majority of cases (54.8%) and controls (65.5%) patients. This could be attributed to the level of education of the studied population. This report is at variance with that of another study;¹⁸ where the studied patients lacked knowledge of oral health complications associated with their disease and may not have kept to the basic oral hygiene practices. Therefore, diabetic patients should be educated on the tenets of good oral hygiene to assuage the complications that follow negligence.

This study indicates that in diabetic patients with poor glycaemic control, 70% had decayed teeth, 69.4% had missing teeth, 100% had filled teeth, and 85% had mobile teeth. Good glycaemic control improves first phase insulin response to meal challenge in diabetic patients,²⁵ and tend to reduce the burden of the disease and delay complications.²⁶

The glycaemic control in these patients was poor and may have been the reason why there was accentuation of the parameters above.

The reasons for tooth loss as revealed in this study showed that dental caries and trauma were more responsible for missing tooth/teeth in the control participants than the cases, while periodontal disease was more responsible for missing tooth/teeth among the diabetic patients. Diabetes is one of the major risk factors for periodontitis; especially when uncontrolled.³ This is because host response to the assaults of periodontal pathogens is persistent inflammation which progresses to the destruction of periodontal ligament, the cementum and alveolar bone with the resultant tooth loss.^{9,10} The result of this study corroborates the findings of other studies.^{20,27,28} Hence, diabetic patients with poor metabolic control should be seen more often in

the dental clinic to help maintain periodontal health and reduce complications.

It was observed in this study that the unmet prosthetic need of the study participants was high (92.4%). The implication of this is they may not be aware of the impact of missing tooth on oral health and the various options available for prosthetic replacement of missing teeth. It is imperative for patients to be intimated about the tenets of preventing tooth loss and if unavoidable, the importance of rehabilitation and the various options available.

CONCLUSION

There is a difference between the oral hygiene status and caries experience of diabetic and non-diabetic patients while the degree of glycaemic control is directly related to the severity of oral health problems among the diabetics.

Financial Sponsorship

No external source of funding

Conflict of Interest-

None declared

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