International Academic Journal of Medical and Clinical Practice
Vol.7, No.1, 2022;
ISSN (5353 – 5523);
p –ISSN 8156 – 7532
Impact factor: 3.15

ORAL HYGIENE STATUS AND ORAL HYGIENE BEHAVIOR OF TYPE 2 DIABETES MELLITUS PATIENTS IN TWO TEACHING HOSPITALS IN NIGERIA- A COMPARATIVE STUDY

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Abstract: Background and Objective: The aim of this study was to assess the oral hygiene status and oral behaviours of Type 2 diabetes mellitus patients in two cities in Nigeria. **Methods:** A cross-sectional study of 180 patients from two Nigerian teaching hospitals' diabetes clinics, the University of Port Harcourt Teaching Hospital and the Lagos State University Teaching Hospital. Respondents' socio-demographic status, oral hygiene behaviors, and frequency of dental visits were all determined using a standardized, self-administered questionnaire. Oral hygiene level was assessed by clinical examination. Data was analyzed using SPSS software version 20.0. **Results:** One hundred and eighty individuals were included in the study, with a mean age of 54.32 ± 11.58 years. There was a female predominance. More participants were with in the fifth and sixth decades of life and 91.7% had type 2 diabetes mellitus. Assessment of dental hygiene behavior showed that 57.2% brushed teeth once daily, 83.7% never used floss and 50.5% never visited a dental clinic. The oral hygiene status of about half of the participants was fair with a mean OHI score of 2.14± 1.29. **Conclusion:** With the implementation of educational intervention, oral health literacy should improve. A positive relationship between patient perception and dental examination will aid diabetes care providers in incorporating oral health care into diabetic treatment at an early stage thereby improving quality of diabetic care.

Keywords: Diabetes, Oral hygiene practice, Oral hygiene status

Introduction

Oral hygiene is the practice of maintaining the cleanliness of the mouth, teeth, and gingiva.[1] Individuals with effective oral hygiene practices have improved oral health and overall health. [2] Poor oral hygiene practices are the primary cause of oral diseases. [3] Oral diseases are a serious public concern due to their high prevalence and effects on the individual's quality of life, [4] and well-being by causing suffering and pain and affecting the ability to eat, drink, swallow, maintain proper nutrition, and communicate. [5]

Oral diseases such as dental caries, gingivitis, periodontal diseases, bad breath, and systemic diseases such as diabetes mellitus (DM), respiratory diseases, cardiovascular diseases, and chronic kidney diseases are all linked to poor oral hygiene. [6]

Diabetes is one of the world's most prevalent non-communicable diseases. [7] There has been a consistent increase in the prevalence of DM over the last few decades. [8] The International Diabetes Federation projected a rise within the number of adults with diabetes to 55% by the year 2035. [9]

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Diabetes is a metabolic disease that causes high blood glucose called hyperglycaemia. [10] Hyperglycaemia can cause complications associated with most organ systems especially the eyes, kidneys, nerves, heart, and blood vessels. [10] Periodontal disease affects a majority of the population worldwide, with the mildest form (gingivitis) affecting 50–90% of adults while the chronic stage (periodontitis) affects 10–15% of the overall population. [11] The increased risk for periodontitis is reported to be two to three-fold higher with diabetics. [11]

Poorly controlled diabetes has an impact on periodontal health, and periodontitis has an adverse influence on blood glucose levels and exacerbates diabetic complications. Diabetes and periodontitis are linked by complicated biological mechanisms that include features of inflammation, immunological function, neutrophil activity, and cytokine biology. [12] There is also evidence that good oral health has beneficial effects on glycaemic control, with a reduction in glycated haemoglobin (HbA1c). [13]

Recognizing the bidirectional relationship between diabetes and periodontitis, as well as the possible advantages of good dental hygiene. To prevent periodontitis and preserve excellent dental health, current recommendations [14, 15] urge that people with diabetes improve their oral hygiene habits and seek frequent oral health check-ups. [16, 17]

Similarly, research indicates that improving oral health knowledge is important for improving self-oral care practices. [18] Despite the bidirectional association between diabetes and periodontitis and current recommendations, research from several countries report that diabetic patients often have low levels of oral health knowledge, awareness about the increased risk of oral diseases, and compliance with good oral health behaviours. [19, 20]

Hence, the aim of this study was to assess the oral hygiene status and behaviours of Type 2 DM patients in two Teaching Hospitals in Nigeria

Methods and Materials

A descriptive cross-sectional study conducted between August and October 2018 at two outpatient Diabetic clinics of two Teaching Hospital in two zones in Nigeria.

The Lagos State University Teaching Hospital (LASUTH) in Lagos, South West zone in Nigeria and the University of Port Harcourt Teaching Hospital (UPTH) in South-South zone of Nigeria. Institutional ethical approval was obtained.

The inclusion criteria were type 1 or type 2 diabetes patients aged 18years and above, permanent residents in the study locations and diagnosed for diabetes at least 1 year previously who are willing to participate in the study. Exclusion criteria were physically or mentally challenged patients, those on xerostomia causing drugs and conditions (anti-hypertensives, anti-depressants, diuretics and radiation therapy), those with chronic systemic diseases such as asthma & epilepsy, those below 18 years of age and those who refused to participate in the study.

Interpreters were utilized where possible for participants with limited English, and family members who were fluent in English were also asked to provide assistance to complete the questionnaire

Sample size

The minimum sample size was determined using the following formula:

$N = Z^2 p q/d^2$ [21]

Where d = degree of accuracy desired, set at 0.05

p = the proportion in the target population estimated to have a particular characteristic,

p = 3.3% (0.33) based on a previous report of good oral hygiene status. [22]

Z = standard normal deviation, set at 1.96 which corresponds to 95% confidence level.

$q = 1 - p$

N = (1.96)2 (0.033) (0.967)/(0.05)2 = 49+5 of none responsive =54

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Finally, 180 patients were selected from these two centers in equal proportions, i.e., 90 from Lagos and 90 from Port Harcourt.

Participants were interviewed using a self-administered - structured questionnaire. Questions included sociodemographic and oral hygiene practice of the participants. Sociodemographic questions included age, sex, marital status, education level, type and duration of diabetes.

Oral hygiene behaviours questions included frequency of cleaning teeth per day; types of cleaning aids used; materials used to clean teeth; types of toothpaste used; types of tooth brushing technique used and dental visits.

After data collection, dental examinations were conducted using a standard mouth mirror and probe with adequate lighting

Oral hygiene status was assessed using OHI-S index. [23] The index is one of the most commonly used indices for assessing oral hygiene status. The OHI-S is a composite index that scores debris and calculus deposition on selected teeth. The six surfaces examined for the OHI-S were selected from four posterior and two anterior teeth. These are:

1. The buccal surfaces of the Upper right and left first permanent molars
2. The lingual surfaces of the lower right and left first permanent molars
3. The labial surfaces of the Upper right and lower left permanent central incisors.

Criteria for scoring oral debris:

0 = No debris or stain present

1 = Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered.

2 = Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surfaces.

3 = Soft debris covering more than two thirds of the exposed tooth surface.

Criteria for scoring calculus

0 = No calculus present

1 = Supragingival calculus covering not more than third of the exposed tooth surface.

2 = Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surfaces or presence of individual flecks ofsubgingival calculus around the cervical portion of the tooth.

3 = Supragingival calculus covering more than two thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

Calculating the index:

After recording the debris and calculus scores for the patient, the index values were then calculated. This was achieved by totaling the debris scores and dividing by the number of surfaces examined.

The average score is known as the Simplified Debris Index (DI-S).

This same method is used to obtain the Simplified Calculus Index (CI-S).

The (DI-S) and (CI-S) are added to obtain the Simplified Oral Hygiene Index (OHI-S). That is DI-S+CI-S=OHI-S. The OHI-S scores range from 0 to 6 and are categorized as good (score 0.0 to 1.2), fair (score 1.3 to 3.0) and poor (score 3.1 to 6.0).

Data was entered in to SPSS software version 20.0 for statistical analysis. Descriptive statistics (frequency distribution & cross tabulation) were generated and the level of significance was set at $p < 0.05$.

RESULTS.

Table 1 Demographic and clinical data of the participants.

Variables	Hospital

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	UPTH N (%)	LASUTH N (%)	Total N (%)	p value
Age				
<21-30	3 (60.0)	2 (40.0)	5 (2.8)	0.052
31-40	3 (42.9)	4 (57.1)	7 (3.9)	
41-50	21 (75.0)	7 (25.0)	28 (15.6)	
51-60	28 (52.8)	25 (47.2)	53 (29.4)	
61-70	21 (42.0)	29 (58.0)	50 (27.8)	
>71	14 (37.8)	23 (62.2)	37 (20.6)	
Sex				
M	32 (55.2)	26 (44.8)	58 (32.2)	0.339
F	58 (47.5)	64 (52.5)	122 (67.8)	
Education Level				
None	5 (55.6)	4 (44.4)	9 (5.0)	0.544
Primary	19(42.2)	26(57.8)	45 (25.0)	
Secondary	25 (48.1)	27 (51.9)	52 (28.9)	
Tertiary	41 (55.4)	33 (44.6)	74 (41.1)	
Occupation				
Self-employed	43 (49.4)	44 (50.6)	87 (48.3)	0.026*
Civil servants	29 (64.4)	16 (35.6)	45 (25.0)	
Retired	15 (34.1)	29 (65.9)	44 (24.4)	
Farmer	3 (75.0)	1 (25.0)	4 (2.2)	
Type of DM				0.418
Type 1	6 (40.0)	9 (60.0)	15 (8.3)	
Type 2	84(50.9)	81(49.1)	165(91.7)	
OHI S score				
Good (0.0-1.2)	30 (54.5)	25 (45.5)	55 (30.6)	0.326
Fair (1.3-3.0)	45 (51.7)	42 (48.3)	87 (48.3)	
Poor (3.1-6.0)	15 (39.5)	23 (60.5)	38 (21.1)	

DM **Diabetes Mellitus

One hundred and eighty participants were recruited for this study. Majority of participants from UPTH and LASUTH were in their sixth and seventh decade of life respectively. The sample's mean age was 59.57 ± 12.82; mean age of participants in UPTH and LASUTH were 57.02 ± 12.6years and 62.12 ± 12.59 years respectively. More female respondents participated in the study; constituting 122(67.8%) of the studied sample with 58 (47.5%) and 64 (52.5%) from UPTH and LASUTH respectively. About 74 (41.1%) of the participants had tertiary level education. In relation to type of diabetes, most of the participants 165 (91.7%) had type 2 diabetes. [Table 1]

Table 2. Participants' dental care practice

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Variable	Hospital			
	UPTH n(%)	LASUTH n(%)	Total n(%)	p-value
Cleaning Tools				
Tooth brush	66 (48.2)	71 (51.8)	137(76.1)	0.579
Chewing stick	4 (66.7)	2 (33.3)	6 (3.3)	
Both	20 (54.1)	17 (45.9)	37 (20.6)	
Dentifrice				
Fluoridated Paste	72 (45.9)	85 (54.1)	157 (87.7)	0.006*
Herbal	17 (81.0)	4 (19.0)	21 (11.7)	
Charcoal	1 (100)	0 (0.0)	1(0.6)	
Frequency of tooth brushing				
Once	45 (43.7)	58 (56.3)	103 (57.2)	0.034*
Twice	41 (56.2)	32 (43.8)	73 (40.6)	
Others	4 (100)	0 (0.0)	4 (2.2)	
Type of Brush Bristle				
Soft	31 (48.4)	33 (51.6)	64 (35.6)	0.948
Medium	43 (50.6)	42 (49.4)	85 (47.2)	
Hard	16 (51.6)	15 (48.4)	31 (17.2)	
Brushing Technique				
Horizontal	23 (41.8)	32 (58.2)	55 (30.6)	0.340
Vertical	16 (45.7)	19 (54.3)	35 (19.4)	
Both	48 (56.5)	37 (43.5)	85 (47.2)	
Roll	3 (60.0)	2 (40.0)	5 (2.8)	
Interdental Cleaning				0.389
Yes	70(51.9)	65 (48.1)	135 (75.0)	
No	20 (44.4)	25 (55.6)	45 (25.0)	
Interdental cleaning Tool				
Floss	13 (72.2)	5 (27.8)	18 (13.3)	0.020*
Toothpick	53 (46.9)	60 (53.1)	113 (83.7)	
Interdental	4(100)	0(0.0)	4(3.0)	
Dental visits				
Yes	42(49.4)	43 (50.6)	85 (47.2)	0.881
No	48 (50.5)	47 (49.5)	95 (52.8)	
Last Dental visits				
<1 year	18 (62.1)	11 (37.9)	29 (34.1)	0.241
2-5year	10 (41.7)	14 (58.3)	24 (28.2)	
>5years	14 (43.8)	18 (56.2)	32 (37.6)	

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More than half 103 (57.2%) of the participants brushed their teeth once daily with an overwhelming majority 157 (87.7%) using fluoride toothpaste. However, while 58 (56.3%) of the participants who brushed once daily came from LASUTH. more than half [41(56.2%)] of those who brushed twice daily came from UPTH. Almost half of the participants 85(47.2%) used medium bristle brush and brushed their teeth using both the horizontal and vertical brushing techniques; more of the participants that used horizontal technique alone came from LASUTH. Three-quarter of the participants claimed they clean interdentally, only 18(13.3%) used dental flossing, majority 113(83.7%) used toothpicks. About half 95 (52.8%); of the participants had never visited the dentists; 48(50.0%) from UPTH and 47(49.5%) from LASUTH. [Table 2]

Fig 1. Oral hygiene status of participants

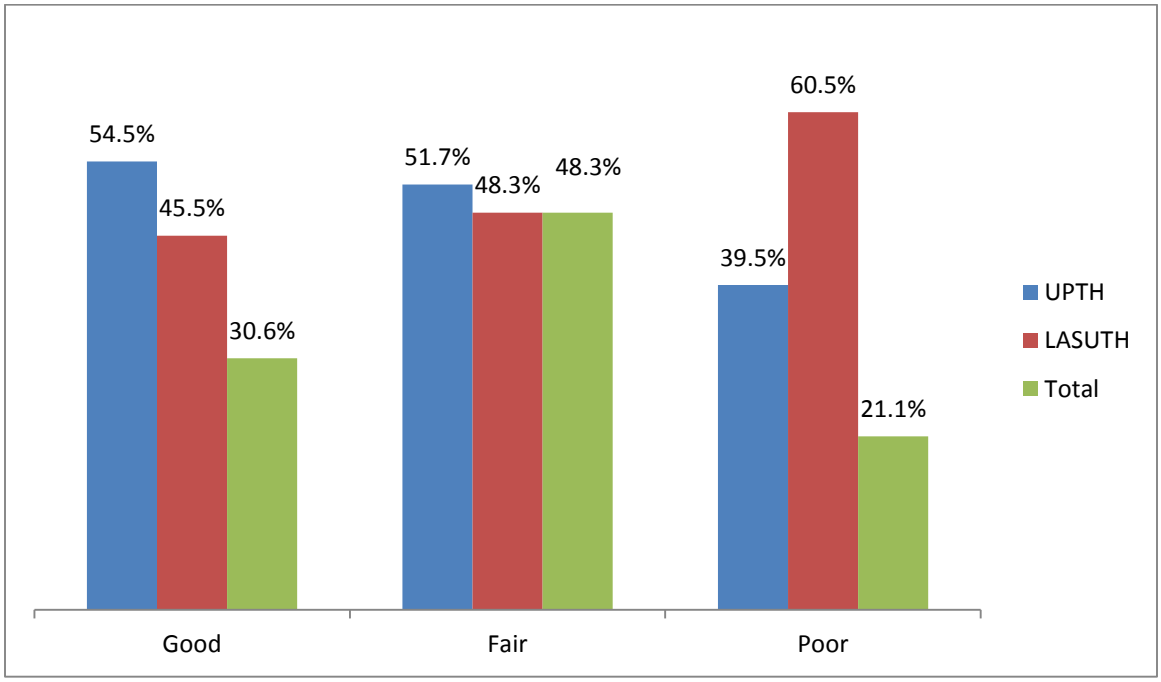

Figure 1 shows participants oral hygiene status. More of the participants with good and fair oral hygiene status came from UPTH while more of the participants with poor oral hygiene came from LASUTH.

Table 3. Mean OHI-S score of the participants with Age and Sex.

Variables	Oral hygiene Score Hospital			
	UPTH	LASUTH	Total	P
Age				
<21-30	1.33 ± 0.58	2.50 ± 0.71	1.80 ± 0.84	0.133

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p –ISSN 8156 – 7532
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31-40	1.66 ± 0.58	1.75 ± 0.50	1.71 ± 0.49	0.833
41-50	1.66 ± 0.66	1.86 ± 0.69	1.71 ± 0.66	0.498
51-60	2.07 ± 0.66	1.98 ± 0.79	2.02 ± 0.72	0.653
61-70	1.76 ± 0.83	2.03 ± 0.82	1.92 ± 0.83	0.279
>71	1.86 ± 0.53	1.96 ± 0.64	1.92 ± 0.59	0.607
Sex				
M	1.94 ± 0.62	2.08 ± 0.74	2.31 ± 1.38	0.436
F	1.77 ± 0.73	1.94 ± 0.73	2.06 ± 1.24	0.174
Total	**1.83 ± 0.69**	**1.98 ± 0.73**	**1.90 ± 0.71**	0.158

The mean OHI-S score of the participants with Age and Sex was lower in participants from UPTH than those from LASUTH The difference between the means of two groups were no statistically significant. [Table 3]

DISCUSSION

In terms of their oral self‑care, 57.2% of the participants brushed their teeth once daily while 40.6% brushed twice daily and most (87.7%) reported using fluoridated toothpaste. This is in contrast to the reports of Poudel et al., [10] where most of the diabetic patients brushed twice daily (67.7%) and 24.6% brushed once daily but similar to studies done by Nazari et al., [20] and Mohammadi et al., [24] who reported that 33.3% and 22.7% of diabetics brushed twice daily respectively. In all of these studies mentioned above, the care practices of diabetic patients toward oral health were inadequate.

Another important finding of the study was that 75% of the participants claimed that they use other aids to maintain their oral hygiene, out of which only 13.3% of the respondents indicated the use of dental floss, while 3.0 % reported using interdental brushes. However, the practice of interdental cleaning with the use of floss or interdental brush appeared to be least important for the patients, as (83.7%) reported that they did not use a floss or interdental brush.

The lower compliance on the oral self-care among the participants is consistent with the reports by previous studies. [20, 25, 26] This proves that there is the need to emphasize the importance of interdental cleaning among the populace. The decreased or lack of use of other aids for maintenance of oral hygiene may be due to financial difficulties or lack of knowledge of the availability of these various aids. [27] Daily self‑care of regular brushing in addition to interdental cleaning is very important for the prevention and treatment of various oral diseases, [27] as it may reduce plaque or gingivitis, or both. Hence, diabetic patients should be informed and encouraged for establishing a healthy oral hygiene and the importance of regular flossing so as to prevent the occurrence of oral diseases including gingivitis and periodontitis.

Thirty ‑four percent of the subjects in this study reported having a dental visit within the past 1 year. About 62.7% reported seeing a dentist in the last 12 months. [10] This implies that oral health behavior of such patients can be further improved by continuous motivation by the dental health care providers.

The low frequency of dental visits among the participants could be due to the priority given to other health issues that patients with diabetes are often dealing with such as, depression and diabetes complications. [10]

About 30.6% of the participants brushed their teeth using traditional horizontal method. The technique is relatively simple to learn and apply, but prone to causing gingival injuries if excessive force is used. [29] Only 19.4% of the participants in the present study used the recommended

vertical brushing method. The combination of horizontal scrub and vertical strokes was the more commonly used brushing technique

It was also observed that 82.8% of the participants used soft and medium textured toothbrushes at home. The textures of toothbrushes recommended for use are the soft to medium textured to avoid injuries to the gingival tissue. [29]

Similar to 30.6% of the participants with good oral hygiene as reported in this current study, Singh et al..[30] reported 20.5% but in contract only 3.3% of diabetics had good oral hygiene from the report of Sabinus, et al. [22]

Similar to the present study, Sabinus et al., [22] and Singh et al., [30] also reported that highest proportion of participants presented with fair oral hygiene.

The limitation of this study is that the data are self-reported and hence subject to recall and

social desirability bias, that is, a respondent could report what he or she believes even if it was not done or occurred such as reporting a dental visit that is believed to occur annually, but that did not occur. [31]

Despite these limitations this study has provided a valuable insight into this under researched area in Nigeria

Conclusion

Clinical examination of oral health status ranked most of our patients as good to fair state. The oral hygiene practice was below that expected to maintain a good dental health

To achieve optimal diabetic care, periodontal care should be incorporated into the management of diabetic patients.

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