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Oral Health Status in a Population of Nigerian Diabetics

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Abstract

Oral manifestations of diabetes mellitus have been documented, but the effect of glycemic control on the oral tissues has been scantily reported. The oral health status of 65 metabolically controlled adult diabetic patients attending the Diabetes Clinic of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, was prospectively assessed over six months and compared with that of 54 non-diabetic acting as controls. The mean duration of diabetes was 100.5±85.1 months. The difference in periodontal status of the patients and control, assessed using the Community Periodontal Index of Treatment Needs (CPITN), was not statistically significant ($p=0.07$). The degree of hyposalivation between the two groups was, however, statistically significant ($p<0.05$). No significant difference was observed in the altered taste, burning mouth sensation, angular cheilitis, glossitis, and stomatitis status of the two groups. We conclude that, with adequate metabolic control, the oral health status of a diabetic may not be significantly different from that of a non-diabetic except for xerostomia. A good understanding of the interactions between systemic diseases and oral health is imperative for physicians and dental practitioners. The need for early detection and closer linkages between the dental and medical professions in managing diabetic patients is emphasized.

Keywords: Diabetes, periodontal disease, xerostomia, burning mouth syndrome, oral health

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Introduction

Diabetes mellitus is a highly prevalent worldwide disorder. There is a rising prevalence particularly of type 2 diabetes mellitus. It is projected 221 million people will have diabetes by the year 2010[1]; Africa and Asia are designated as the regions with the greatest potential increases, where the current number is expected to double the number experienced today. Of particular concern is the increasing emergence in young adults and children. The rising prevalence has been closely linked with westernization, urbanization, and mechanization.[2] With improvements in treatment, more people are likely to survive for longer periods after diagnosis, thereby, further increasing the prevalence. This may consequently lead to increases in complications.

Ascertaining underlying systemic diseases from oral symptoms is a valuable tool in discovering occult systemic diseases. The correlation between oral symptoms and systemic diseases provides a means for early diagnosis of such conditions. Oral candidiasis and other opportunistic fungal infections are some of the early, non-specific signs of uncontrolled diabetes.[3] Rhinocerebral involvement causing severe tissue destruction and necrosis of the paranasal sinuses, pharynx, palate, orbit, and brain has also been reported. Systemic adverse sequelae of diabetes mellitus include increased vulnerability to bacterial infections, such as periodontal disease and wound healing alterations.

Diabetics are said to exhibit poorer oral health than non-diabetics in some oral conditions.[4] Diabetics have been found to have a higher average gingival index and higher or the same plaque index levels relative to controls.[5] Severe periodontitis is considered a risk factor for poor glycemic control[6] and duration of diabetes is a more significant factor for the severity of periodontitis in type 2 diabetics than the patient's age.[7] Severity of periodontal disease has also been shown to increase with the severity of organ complications.[8] Periodontitis is, however, rare in diabetic children and adolescents.[9] In this study few appreciable differences were seen in the oral health of well-controlled adult type 2 diabetics.[10]

Sandberg et al. found a significantly higher degree of xerostomia in type 2 diabetics than in the non-diabetic control; however, the duration of the illness or metabolic control was not related to periodontal status.[4] A Xerostomia Clinic, for example, found three cases of undiagnosed diabetes out of 39 with objective evidence of salivary hypofunction.[11] Guggenheimer et al. concluded Candida pseudohyphae and oral soft tissue manifestations of candidiasis such as median rhomboid glossitis, denture stomatitis, and angular cheilitis were more prevalent in type 1 diabetics than in controls with a significant association between the presence of Candida pseudohyphae and poor glycemic control.[12]

Gibson et al. in their management of 43 patients with previously undiagnosed type 2 diabetes found glycemic control resulted in resolution of the patients' oral symptoms.[13] Other documented oral manifestations are burning mouth syndrome, altered taste, lichen planus, and parotid enlargement.[13, 14]

Few published works exist on the oral manifestations of diabetes mellitus with almost none coming from an African centre; hence, the need for this study which is aimed at filling this gap as well as reviewing some of the oral signs and symptoms of diabetes mellitus.

Materials and Methods

Sixty-five consecutive diabetic, adult patients attending the Outpatient Diabetes Clinic of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, over a six-month period, were recruited for the present study. Fifty-four non-diabetic controls were then selected from the Medical Outpatient Clinic after matching for age and sex. The majority of these were controlled hypertensive patients. Informed consent was obtained from both the patients and the controls. A data collection sheet was filled out for each patient seeking information such as age, sex,

educational status, patterns of oral hygiene, and history of professional dental care. For all the 65 cases, the clinical and diagnostic features of the diabetes such as duration of the illness, levels of fasting blood sugar, and two hour postprandial were obtained from the clinic records.

An oral examination was conducted for both patients and controls. These were conducted under natural light and with the patients sitting on an ordinary upright chair. The dental examinations were conducted by one author (EOO) using plain mouth mirrors and sickle shaped probes. The World Health Organization (WHO) periodontal probe, previously described by Emslie[15], was used for the assessment of periodontal status. The criteria used for the diagnosis of oral diseases were consistent with those recommended by the WHO.[16] For the assessment of periodontal status, the Community Periodontal Index of Treatment Needs (CPITN) was used as described by Ainamo et al.[17] and with the modifications suggested by Cutress et al.[18]

The assessment of xerostomia was based on participants' responses to a modified questionnaire employed by Navazesh et al.[19] The questions were as follows:

1. Does the amount of saliva in your mouth seem to be too little, too much, or you do not notice it?
2. Do you need to sip liquids to aid you in swallowing dry foods?
3. Does your mouth feel dry when eating a meal?

Other oral diseases were recorded as either present or absent.

All patient data were recorded anonymously, but patients in need of treatment were referred to the appropriate units of the dental hospital for management. The data were analyzed on an IBM compatible microcomputer using the SPSS statistical software. The Chi square test and Mann Whitney's U-test were used, as appropriate, to determine differences, and these were taken as significant when p is less than 0.05 ($p < 0.05$).

Results

The mean age of the patients was found to be 57.53±12.13 (range 25 to 82) years, while that of the control was 59.44±11.51 (range 25 to 82) years. The difference in mean age between the two groups was not statistically significant ($p=0.22$). The gender distribution of the patients is shown in Table 1. The mean number of teeth present was 28.92±5.69 (range 9 to 32) for the patients and 29.87±5.10 (range 2 to 32) for the controls. The mean Decayed, Missing and Filled teeth score (DMF) were 1.56±2.39 (range 0 to 8) and 0.96±1.64 (range 0 to 8) for the patients and controls, respectively. The demographic characteristics of the patients with regard to the type of diabetes is presented in Table 2. The mean fasting blood sugar was 8.14±2.94 and 5.16±1.22 for patients and control groups, respectively, while the two hour post-prandial was 10.98±4.02 and 5.97±1.57, respectively.

Table 1. Demographic characteristics of subjects.

GENDER	CASES	CONTROLS	TOTAL
Male	35	23	58
Female	30	31	61
Total	65	54	119

$X^2 = 1.50$, df = 1, p= 0.22

Table 2. Diabetic status of the subjects according to gender.

		DIABETES				TOTAL	
		IDDM		NIDDM			
		No	%	No	%	No	%
Sex	M	5	7.7	30	46.2	35	53.8
	F	6	9.2	24	36.9	30	46.2
Total		11	16.9	54	83.1	65	100.00

X^2= 0.38, df=1, p = 0.54

Table 3. Treatment needs status of the subjects.

CPITN Score	CASES		CONTROLS		TOTAL	
	No	%	No	%	No	%
Healthy gingiva (Code 0)	0	0.0	0	0.0	0	0.0
Bleeding on gentle probing (Code 1)	0	0.0	1	0.8	1	0.8
Supra/subgingival calculus (Code 2)	30	25.2	16	13.4	46	38.7
Pocket depth 3.5 to 5.5 mm (Code 3)	22	18.5	29	24.4	51	42.9
Pocket depth > 5.5 mm (Code 4)	13	10.9	8	6.7	21	17.7
Total	65	54.6	54	45.4	119	100.0

$X^2 = 5.25$, df=2, p = 0.07

* Codes 0 and 1 were excluded from the analysis because of the small number of samples in these categories.

Table 4. Distribution of hyposalivation.

	YES		NO		TOTAL	
	No	(%)	No	(%)	No	(%)
Cases	20	16.8	45	37.8	65	54.6
Controls	7	5.9	47	39.5	54	45.4
Total	27	22.7	92	77.3	119	100.0
$X^2 = 5.33$, df = 1, p = 0 .02						
Male	11	9.3	47	39.5	58	48.7
Female	16	13.4	45	37.8	61	51.3
Total	27	22.7	92	77.3	119	100.0
$X^2 = 0.56$,df = 1,p = 0.45						

Table 5. Signs and symptoms observed and reported by subjects.

SIGNS/ SYMPTOMS	CASES		CONTROL	
	No	%	No	%
Glossitis	5	5.8	5	9.3
Altered taste	4	6.2	3	5.6
Angular cheilitis	2	3.1	0	0.0
Stomatitis	2	3.1	0	0.0
Delayed healing	1	1.6	1	1.9
Burning mouth sensation	1	1.6	0	0.0

Halitosis, one of the signs of periodontal disease, was seen in 42 (64.6%) of the patients and 39 (72.2%) of the controls, while periodontal abscess was recorded in seven (10.8%) and 4 (7.4%) of the diabetics and controls, respectively. The periodontal status assessed using the CPITN is presented in Table 3. Twenty (30.8%) of the diabetics and seven (13.0%) of the controls had hyposalivation. This difference was significant ($p < 0.05$). The sex distribution of diabetics with hyposalivation is shown in Table 4. Four diabetics (6.2%) and three (5.6%) of the controls had altered sensation, while the distribution of other symptoms such as altered taste, burning mouth sensation, and signs such as angular cheilitis, glossitis, and stomatitis are shown in Table 5.

Discussion

Fifty-four of the 65 diabetics (83.1%) had non-insulin dependent diabetes mellitus (NIDDM), which is corroborated by previous studies that insulin dependent diabetes mellitus (IDDM) is less frequent in Africans[20] and NIDDM accounts for about 97% of all cases of diabetes.[1] There is a worldwide increase in incidence and prevalence of diabetes mellitus, which is almost accounted for by NIDDM. This has been attributed to westernization, urbanization, and mechanization with a risk resulting from a combination of genetic predisposition and lifestyle change.[2]

This study showed a significant difference in hyposalivation between cases and controls.

Hyposalivation was present in 20 (30.8%) of the cases as opposed to 68.6% documented by Quirino et al.[21] and seven of the controls (13.0%). Hyposalivation is said to be a very common symptom of the disease and has been linked with dysfunction of the parenchyma of the major salivary glands and with polyuria. The substitution of the functioning tissue by adipose tissue has been suggested to quantitatively and qualitatively modify saliva production, facilitating hyposalivation and burning mouth symptoms.[13, 22] Some studies have failed to show any difference between controls and diabetic patients examined for prevalence of complaints of dry mouth.[23] The results of Chavez et al.[24] suggests older adults with poorly controlled diabetes may have impaired salivary flow in comparison with subjects with better-controlled diabetes and non-diabetic patients, yet they may not have concomitant xerostomia complaints.

Parotid gland enlargement is another symptom documented to be common in diabetes mellitus, but this study did not record any case of parotid gland enlargement. The association of diabetes and soft tissue pathologies earlier reported by Guggenheimer et al. was not revealed in the present study.[12]

Diabetic patients are prone to bacterial, viral, and fungal infections; the oral cavity and gingiva are no exception. Therefore, acute infections in the oral cavity require specific and aggressive management as infections in any other part of the body. Pyoinflammatory processes in diabetics whether controlled or not usually run an uncommonly malignant course.[25] Purulent infections are conducive to decompensation of diabetes mellitus resulting in derangement of body defenses. Meser found a more pronounced reduction of immunity indices in patients with NIDDM and the severity of purulent infections to be largely dependent on immune disorders.[26] Postoperative wound healing is also delayed due to impairment of all types of metabolism and development of endogenous intoxication, which depresses the protein-generating function of the liver.[25] Persistent poor glycemic control has been shown to be associated with the incidence and progression of diabetes-related complications, but no strong association between controlled diabetes and increased susceptibility to infection has been proved.[27] Alterations in the flow and composition of saliva have also been suggested to predispose the diabetic patient to oral infection[28], but the alterations may improve as the diabetes gets controlled.[29] This possibly explains the reason why no single case of chronic osteomyelitis was seen despite the long mean duration of the disease in the diabetics 100.5±85.1 months.

A number of surveys have suggested the association of diabetes mellitus with severe periodontal destruction[23, 30] increases the risk of developing destructive periodontal disease about threefold.[30] The reason for this is not certain, although the possibility of abnormal polymorphonuclear leucocyte function is known presumably because they compromise host defense mechanisms; other factors may be angiopathy, altered microbial flora, and abnormal collagen metabolism.[31] Increased periodontitis has been linked with alterations in salivary flow and composition in that alterations reduce the factors that promote healing within the oral cavity.[32] The fact the pathogenesis is likely to be multifactorial was also documented by Wilton et al.[33] There is increasing evidence the relationship may be bi-directional.[34] Exacerbation of some systemic diseases such as diabetes, respiratory disease, vascular disease, and preterm low-birth weight have been linked with oral diseases.[35] More recent studies show the diabetic patient experiences greater loss of periodontal attachment than the non-diabetic with similar levels of plaque control when metabolic control is poor[36], but with good metabolic control and oral hygiene, the incidence of loss of periodontal attachment is not more than in the average population.[37] Our results are similar to those of Pinducciu et al.[37] as halitosis, one of the major signs of periodontal disease, was seen in 42 (64.6%) cases and 37 (72.2%) of the controls, which shows there is little or no

difference between the normal population and the controlled diabetics. The prevalence of overt periodontal disease (CPITN code 4) also does not significantly differ between the diabetic and non-diabetic patients (20% versus 15%).

Conclusion

The findings have disclosed that diabetics, if controlled, can maintain healthy oral conditions. Due to the occasional asymptomatic nature of diabetes, the dental surgeon, irrespective of the specialty, has a significant role to play in the early diagnosis and should refer patients with findings suggestive of diabetes mellitus to the physician for screening and expert management. Complications are reduced by good medical control. In Nigeria, like other developing countries, the dental profession has not contributed significantly to team management of the diabetic patient. However, the recent findings on bi-directional interactions between oral and systemic diseases make it imperative for the dentist to be closely involved with the management of these patients. Since the disease is bi-directional, dentists should help patients reduce oral bacteria through in-office care, diet counseling, and home care instruction. A comprehensive oral examination that identifies potential symptomatic disease should lead to a referral to a physician by the dentist.

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