Sains Malaysiana 43(8)(2014): 1157–1163

Periodontal Status and Oral Health Knowledge among a Selected Population of Malaysian Type 2 Diabetics

(Status Periodontal dan Kesedaran Kesihatan Mulut dalam Kalangan Sekumpulan Penduduk Malaysia yang Menghidap Penyakit Diabetes Jenis 2)

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ABSTRACT

*Diabetes is an important risk factor in the pathogenesis of periodontal disease. Subjects with diabetes have a greater prevalence and severity of periodontal disease compared with subjects without diabetes. This study was carried out to assess periodontal status, treatment needs and oral health awareness among a selected population of Malaysian Type 2 diabetics. Ninety four Type 2 diabetes subjects were divided into those diagnosed with periodontal disease (PD+) (CPITN≥3) and healthy/gingivitis (PD-) (CPITN≤2) groups based on the Community Periodontal Index of Treatment Needs (CPITN). Subjects were interviewed regarding socio-demographic data and oral health awareness. Their medical information was obtained from the medical records. The results showed that 55.3% subjects had (PD+) as compared with 44.7% (PD-) subjects. 18.1% subjects required advanced periodontal treatment with specialist referrals. Male diabetic subjects were more likely to have advanced periodontal disease compared to female subjects (*p*<0.05). Subjects with advanced periodontal disease were more likely to be on combination of insulin and oral drugs (*p*<0.05). (PD+) diabetic subjects were aware that they had mobile teeth (*p*<0.001) and gum disease (*p*=0.004). In conclusion, male diabetics in Malaysia and subjects on combination of insulin and oral diabetic drugs are more likely to require advanced periodontal treatment.*

Keywords: CPITN; oral health awareness; periodontal disease; periodontal treatment needs; Type 2 diabetes

ABSTRAK

*Penyakit diabetes adalah satu faktor risiko yang penting dalam patogenesis penyakit periodontal. Subjek dengan diabetes mempunyai kelaziman dan keterukan penyakit periodontal yang lebih berbanding dengan subjek tanpa penyakit diabetes. Kajian ini dijalankan untuk menilai status periodontal, keperluan rawatan periodontal dan kesedaran kesihatan mulut dalam kalangan sekumpulan penduduk Malaysia yang menghidap penyakit diabetes Jenis 2. Sembilan puluh empat subjek diabetes Jenis 2 telah dibahagikan kepada mereka yang didiagnosis dengan penyakit periodontal (PD +) (CPITN ≥ 3) dan gusi sihat/gingivitis (PD-) (CPITN ≤ 2) berdasarkan Indeks Komuniti Periodontal dan Keperluan Rawatan (CPITN). Subjek telah ditemu bual mengenai data sosio-demografik dan kesedaran kesihatan mulut. Maklumat perubatan mereka telah diperoleh daripada rekod perubatan. Hasil kajian menunjukkan bahawa 55.3% responden mempunyai (PD+) berbanding 44.7% (PD-). 18.1% subjek memerlukan rawatan periodontal lanjutan dengan rujukan pakar. Subjek diabetes lelaki lebih berkemungkinan untuk mempunyai penyakit periodontal lanjutan berbanding subjek perempuan (*p*<0.05). Subjek dengan penyakit periodontal lanjutan adalah lebih cenderung untuk mengambil gabungan ubatan insulin dan ubat-ubatan oral (*p*<0.05). Subjek diabetes (PD +) sedar bahawa mereka mempunyai gigi goyah (*p*<0.001) dan penyakit gusi (*p*=0.004). Kesimpulannya, subjek diabetes lelaki di Malaysia dan subjek yang mengambil gabungan insulin dan ubat-ubatan diabetes oral adalah lebih cenderung untuk mendapatkan rawatan periodontal lanjut.*

Kata kunci: CPITN; diabetes Jenis 2; keperluan rawatan periodontal; kesedaran kesihatan mulut; penyakit periodontal

INTRODUCTION

Type 2 diabetes is a disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. It leads to complications such as microangiopathy, retinopathy, nephropathy, microvascular disease and delayed wound healing (Kinane & Chestnutt 1997). Individuals with poorly controlled diabetes have also been found to be more susceptible to oral infections including periodontitis (Loe 1993; Moore et al. 2000). It has been reported that subjects with diabetes have a greater prevalence and severity of periodontal disease compared with subjects without diabetes (Emrich et al. 1991; Soskolne & Klinger 2001; Taylor et al. 1998) in all age groups (Emrich et al. 1991). In these subjects, diabetes also increases the progression of bone loss and attachment loss over time (Taylor et al. 1998).

The prevalence of Type 2 diabetes has increased worldwide and in particular in the Asia-Pacific region (Cockram 2000). In the National Health Morbidity Survey of Malaysia 2006 (Ministry of Health Malaysia 2006), diabetes prevalence in Malaysian adults was reported to be 14.9%. Studies have suggested a two-way relationship

between diabetes and periodontitis, with more pronounced periodontal tissue destruction in people with diabetes (Emrich et al. 1991; Taylor et al. 1998) and also a poorer metabolic control of diabetes in subjects with periodontitis (Soskolne & Klinger 2001; Taylor 2001). Periodontal therapy consisting of mechanical treatment combined with systemic or local antimicrobial administration has been shown to improve diabetic status as indicated by a reduction in HbA1c levels (Iwamoto et al. 2001).

The Community Periodontal Index of Treatment Needs (CPITN), designed for rapid and practical assessment of level of periodontal disease as well as various periodontal treatment needs in population surveys, has been applied in several studies worldwide (Pilot & Barmes 1987) as it has been widely recommended to increase international uniformity (Petersen & Ogawa 2005). The time needed to provide periodontal care can be estimated when using this index, which is the reference index for the WHO Global Oral Data Bank. The advantage of CPITN includes simplicity, speed and reproducibility (Petersen & Ogawa 2005). In the Malaysian context, although the CPITN has been used in the national level oral health surveys (Ministry of Health Malaysia 2001), however, thus far there has not been any known study reporting on the periodontal status and treatment needs of Malaysian subjects with Type 2 diabetes.

The objectives of this study were to determine the periodontal status, treatment needs and oral health awareness of a selected population of Malaysian diabetic subjects and to investigate the relationship between periodontal status and diabetes-related factors.

METHODS

SAMPLE SUBJECTS

This cross-sectional study involved subjects from the Diabetic Clinic, University Malaya Medical Centre, whose diagnosis had been established (WHO diagnostic criteria) (World Health Organisation 1994) and were on regular follow-up for a minimum period of 1 year. Ethical clearance was obtained for this study from the Ethics Committee, Faculty of Dentistry and Faculty of Medicine, University of Malaya (DF PE0901/0018(P), MEC Ref No: 696.9).

Subjects who were edentulous were excluded. Each subject was given an information sheet explaining the nature of the study. Explanations were done verbally. Written consent was then obtained from each subject. Subjects were interviewed regarding their demographic data, lifestyle habits and level of education. Data concerning oral hygiene habits such as frequency of dental visits, brushing and interdental cleaning frequency were also noted.

The subject's HbA1c level, duration of Type 2 diabetes, type of diabetic medication and the presence of diabetic complications such as retinopathy, nephropathy, neuropathy and history of myocardial infarct or stroke were obtained from medical records. Body mass index (BMI) levels were then measured (weight (kg)/ height^2(m^2)). Subjects were categorized as normal weight (BMI level 18.5- 24.9 kg/m^2), overweight (BMI level 25- 29 kg/m^2) and obese (BMI level ≥30 kg/m^2).

Patients were also asked to fill a questionnaire on their knowledge on oral health-systemic disease relationship as well as knowledge of gum disease. The questionnaire was validated by 2 periodontists and pre-tested with a sample of 5 diabetic patients with periodontitis from the postgraduate periodontal clinic. Following this, minor amendments were made to the questions.

PERIODONTAL EXAMINATION

The subjects were examined by a single examiner using the WHO periodontal probe with a probing force of not more than 20 g. The CPITN index was used to determine their periodontal status. Briefly, the mouth of each patient was divided into sextants, and each sextant was examined only if there were 2 or more teeth present and not indicated for extraction. For each sextant all teeth (probing was done on six sites per tooth) were examined and the highest index for the sextant was recorded. The following score was used: 0, periodontal health; 1, gingival bleeding; 2, calculus detected during probing; 3, pockets of 4 to 5 mm depth and 4, pockets of more than 6 mm depth. Subjects were then categorized according to their periodontal status whereby subjects with highest scores of CPITN 3 or 4 were in the periodontitis group (PD+) while those with CPITN scores 0, 1 or 2 were in the healthy/ gingivitis group (PD-). Intra-examiner calibration, which achieved good agreement (Kappa score of 0.81), has been validated prior to commencing the study.

STATISTICAL ANALYSIS

Statistical analysis was done using the SPSS version 12.0 package. Significance testing was done with an α value of 0.05. Crosstabulation was done to compare the significant differences between PD+ and PD- diabetic subjects with respect to socio-demographic characteristics, diabetes-related factors, oral hygiene practice and oral health knowledge. Stepwise logistic regression analysis was then used to ascertain predictors of advanced periodontal disease (CPITN=4).

RESULTS & DISCUSSION

A total of 94 subjects comprising 42 males (44.7%) and 52 females (55.3%) were examined in this study (Table 1). Their age ranged from 35-65 years, with the majority comprising subjects in the 55 to 65 year range. The ethnic distribution of the patients was 42.6% Malays, 35.1% Indians and 22.3% Chinese. Only 6.4% subjects were smokers while 14.9% were former smokers and 78.7% had never smoked. A total of 77.7% subjects were either

TABLE 1. Comparison of socio-demographic characteristics, diabetic related factors and oral hygiene habits between diabetic subjects with periodontitis (CPITN≥3) and healthy/ gingivitis subjects (CPITN≤2)

	Total *n*(%)	CPITN ≥ 3		CPITN ≤ 2		*p*-value
		n	%	*n*	%	
Gender						
Male	42(44.7)	26	61.9	16	38.1	0.248
Female	52(55.3)	26	50.0	26	50.0	
Age						
35 to 44	8(8.5)	5	62.5	3	37.5	
45 to 54	32(34.0)	13	40.6	19	59.4	0.120
55 to 65	54(57.4)	34	63.0	20	37.0	
Ethnicity						
Malay	40(42.6)	21	52.5	19	47.5	
Chinese	21(22.3)	11	52.4	10	47.6	0.723
Indian	33(35.1)	20	60.6	13	39.4	
Smoking						
Smoker	6(6.4)	5	83.3	1	16.7	
Former Smoker	14(14.9)	10	71.4	4	28.6	0.121
Never Smoked	74(78.7)	37	50.0	37	50.0	
Education						
Primary	17(18.1)	12	70.6	5	29.4	
Secondary	53(56.4)	28	52.8	25	47.2	0.366
Tertiary	24(25.5)	12	50.0	12	50.0	
BMI						
Normal	21(22.3)	9	42.9	12	57.1	
Overweight	40(42.6)	27	67.5	13	32.5	0.144
Obese	33(35.1)	16	48.5	17	51.5	
HbA1c						
<7	24(25.5)	10	41.7	14	58.3	
7-8.5	29(30.8)	19	65.5	10	34.5	0.162
>8.5	41(43.6)	19	46.3	22	53.7	
T2D Complications						
Yes	39(41.5)	23	59.0	16	41.0	0.548
No	55(58.5)	29	52.7	26	47.3	
T2D Duration						
<7 years	22(23.4)	12	54.5	10	45.5	
7-12 years	27(28.7)	14	51.9	13	48.1	0.884
>12 years	45(47.9)	26	57.8	19	42.2	
Medication						
Insulin & Oral	50(53.2)	28	56.0	22	44.0	
Insulin Only	10(10.6)	8	80.0	2	20.0	0.182
Oral Only	34(36.2)	16	47.1	18	52.9	
Oral Hygiene habits						
Dental Visit						
Regular	28(29.8)	13	46.4	15	53.6	0.259
Irregular	66(70.2)	39	59.1	27	40.9	
Brushing						
1x day	18(19.1)	10	55.6	8	44.4	
2x day	63(67)	35	55.6	28	44.4	0.993
>2x day	13(13.8)	7	53.8	6	46.2	
Inter Dental hygiene						
Yes	36(38.3)	21	58.3	15	41.7	0.643
No	58(61.7)	31	53.4	27	46.6	

overweight or obese. Approximately half the subjects had been diagnosed with Type 2 diabetes for the duration of more than 12 years.

Among these diabetic subjects, 55.3% were in the PD+ group as compared with 44.7% subjects who were PD- (Table 1). There was no significant difference between the two groups in terms of age, sex, ethnicity, smoking status and educational level. Similar results have been reported with regards to the association between periodontal status among diabetics and factors such as age and educational level (Jansson et al. 2006). However Bakshandeh et al. (2007) demonstrated that diabetics with lower educational levels were more likely to be diagnosed with periodontal disease. In this study, although the number of subjects with primary level education having PD+ were more than that from the PD- group, this finding was not statistically significant.

Our study did not demonstrate any relationship between diabetes-related factors such as HbA1c levels, BMI levels, diabetic complications and duration of Type 2 diabetes with the presence of periodontal disease (Table 1). In this study, HbA1c levels were categorized as HbA1c <7%, 7-8.5% and >8.5% based on the protocol given by the American Diabetes Association whereby HbA1c recommendation for microvascular disease prevention should be <7% (American Diabetes Association 2007). Similar findings for HbA1c levels have been demonstrated in a study by Karikoski et al. (2002). The finding in this study is however in contrast to that reported in studies where individuals with severe periodontitis demonstrated significantly higher HbA1c levels (Bakshandeh et al. 2007; Jansson et al. 2006). In these studies, different categorisation methods have been used for good diabetic control and therefore the results from this study could not be directly compared with these earlier data.

Similar findings have been reported for BMI (Jansson et al. 2006), duration of diabetes (Bakshandeh et al. 2007), diabetic complications (Jansson et al. 2006, Karikoski et al. 2002) and its association with periodontitis in diabetics. Our findings are however in contrast to Thorstensson et al. (1996) where it was demonstrated that complications such as renal disease, cardiovascular complications and retinopathy were associated with severe periodontitis.

When the periodontal treatment needs of subjects diagnosed with advanced periodontal disease was considered, the groups were then reclassified to include those with advanced periodontal disease (CPITN=4; where there is a presence of pockets ≥6 mm) as compared with those without advanced periodontal disease (CPITN≤3) (Table 2). Seventeen subjects (18.1%) had advanced periodontal disease requiring complex periodontal treatment. The prevalence of advanced periodontal disease in this group was much higher than that reported in the general Malaysian population where 5.5% of the subjects had pockets 6 mm or more (Ministry of Health Malaysia 2001). Numerous studies have demonstrated that individuals with diabetes tend to have higher prevalence and more severe forms of periodontitis than non-diabetics (Emrich et al. 1991; Jansson et al. 2006). In this study, the diabetic patients were three times more likely to require advanced periodontal treatment as compared to that reported for the general Malaysian population.

Male subjects (28.6%) were more likely to have advanced periodontal disease compared to female subjects ($p<0.05$) (Table 2). Paulender et al. (2004) described similar gender differences between diabetic subjects with and without periodontitis. Men have been shown to exhibit worse periodontal health than women and this difference has been documented in different populations (Albandar 2002). It has been traditionally thought to be a reflection of better oral hygiene practices (Christensen et al. 2003; Hugoson et al. 1989) and/or more utilization of oral health care services among women (Dunlop et al. 2002).

Diabetic subjects with advanced periodontal disease were more likely to be taking both oral anti-diabetic drugs and insulin ($p<0.05$). This combination of oral anti-diabetic drugs and insulin is prescribed to patients who need adequate control of their glycaemic condition following secondary failure to their oral anti-diabetic drug regime (Scheen et al. 1993). This finding is in contrast to that by Jansson et al. (2006) where there was no difference in the diabetic medication between periodontally diseased and healthy diabetics.

Stepwise logistic regression analysis was used to find predictors of advanced periodontal disease. Gender was seen to be a significant predictor (OR = 3.37, 95% CI = (1.07, 10.68)). Thus the males were 3.37 times more likely to have advanced periodontal disease as compared with the females.

When comparisons were made between oral health knowledge of PD+ and PD- diabetic subjects (Table 3), 87.5% subjects who agreed that they had mobile teeth ($p<0.001$) and 70.2% of diabetic subjects who were aware of their gum disease ($p=0.004$) were PD+ (CPITN≥3). However, out of the 52 diabetic subjects who had PD+, only 14 (26.9%) subjects believed that diabetes had some influence on their oral health status. Various other studies (Jansson et al. 2006; Moore et al. 2000) corroborate with this finding. Over the years, there has been increased evidence showing the bi-directional relationship between diabetes and periodontal disease (Taylor et al. 1998). However, based on the findings in this study, this information has only been disseminated to a small proportion of these subjects.

Sheiham (1991) has advocated that one of the strategies for the prevention of periodontal disease is the identification of high-risk groups for periodontitis. Early detection of active disease and identification of subjects and groups who are more likely to develop destructive periodontal diseases in the future are important elements of any dental care system (Bakshandeh et al. 2007). The higher level of advanced periodontal disease in this group of diabetic Malaysian subjects as compared with the general Malaysian population reinforces the need to establish a comprehensive oral health care programme for these diabetic patients. More cooperation is needed between those involved in general health and dental care

TABLE 2. Comparison of socio-demographic characteristics, diabetic related factors and oral hygiene habits of diabetic subjects with advanced periodontal disease with the rest of the subjects

	CPITN = 4		CPITN ≤ 3		*p*-value
	n	%	*n*	%	
Gender					
Male	12	28.6	30	71.4	*0.018
Female	5	9.6	47	90.4	
Age					
35 to 44	0	0.0	8	100.0	0.374
45 to 54	6	18.8	26	81.3	
55 to 65	11	20.4	43	79.6	
Ethnicity					
Malay	7	17.5	33	82.5	0.894
Chinese	3	14.3	18	85.7	
Indian	7	19.4	26	80.6	
Smoking					
Smoker	2	33.3	4	66.7	0.287
Former Smoker	4	28.6	10	71.4	
Never Smoked	11	14.9	63	85.1	
Education					
Primary	3	17.6	14	82.4	0.099
Secondary	13	24.5	40	75.5	
Tertiary	1	4.2	23	95.8	
BMI					
Normal	3	14.3	18	85.7	0.520
Overweight	6	15.0	34	85.0	
Obese	8	24.2	25	75.8	
HbA1c					
<7	4	12.1	29	87.9	0.508
7-8.5	5	23.8	16	76.2	
>8.5	8	20.0	32	80.0	
T2D Complications					
Yes	7	17.9	32	82.1	0.977
No	10	18.2	45	81.8	
T2D Duration					
<7 years	4	18.2	18	81.8	0.191
7-12 years	2	7.4	25	92.6	
>12 years	11	24.4	34	75.6	
T2D Medication					
Insulin & Oral	8	16.0	42	84.0	*0.019
Insulin Only	5	50.0	5	50.0	
Oral Only	4	11.8	30	88.2	
Oral Hygiene habits					
Dental Visit					
Regular	5	17.9	23	82.1	0.970
Irregular	12	18.2	54	81.8	
Brushing					
1x day	3	16.7	15	83.3	0.439
2x day	10	15.9	53	84.1	
>2x day	4	30.8	9	69.2	
Inter Dental hygiene					
Yes	5	13.9	31	86.1	0.405
No	12	20.7	46	79.3	

TABLE 3. Comparison of oral health knowledge between diabetic subjects with periodontitis (CPITN≥3) and healthy/ gingivitis subjects (CPITN≤2)

	CPITN ≥ 3		CPITN ≤ 2		p-value
	n	%	*n*	%	
Does diabetes have relationship with oral health status?					
Yes	14	26.9	15	35.7	0.359
No	38	73.1	27	64.3	
Do you know what gum disease is?					
Yes	28	53.8	27	64.3	0.307
No	24	46.2	15	35.7	
Do you have bleeding gum?					
Yes	19	36.5	19	45.2	0.393
No	33	63.5	23	54.8	
Do you know what causes gum disease?					
Yes	25	48.1	14	33.3	0.149
No	27	51.9	28	66.7	
Do you have mobile teeth?					
Yes	28	53.8	4	9.5	<0.001*
No	24	46.2	38	90.5	
Do you think you have gum disease?					
Yes	33	63.5	14	54.8	0.004*
No	19	36.5	28	45.2	
Rate your overall oral health status?					
Poor	12	23.1	7	16.7	0.372
Fair	27	51.9	19	45.2	
Good	13	25	16	38.1	
Do you think that your oral health will be better if you do not have diabetes?					
Yes	19	36.5	19	45.2	0.393
No	33	63.5	23	54.8	

of diabetics, with emphasis on increasing the understanding of the relationship between diabetes and oral health, in particular periodontal disease. A future study of a larger Malaysian diabetic population will be needed to substantiate the findings from the present study.

CONCLUSION

Male diabetics in Malaysia and subjects on combination of insulin and oral diabetic drugs are more likely to require advanced periodontal treatment. Although diabetic subjects with periodontal disease were aware of the presence of mobile teeth and gum disease, further emphasis should be given to the dissemination of knowledge about diabetic-oral health inter-relationship.

ACKNOWLEDGEMENTS

This study was supported by the University of Malaya Research Grant (RG066/09HTM).

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Received: 8 March 2013
Accepted: 17 October 2013