PERIODONTAL HEALTH STATUS OF AGING DIABETES PATIENTS IN BANGKOK METROPOLITAN ADMINISTRATION HEALTH CENTER

Saruta Saengtipbovorn[1, 2, *], Surasak Taneepanichskul[1]

[1]Health Center no.54, Bangkok 10140, Thailand
[2] College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand

ABSTRACT: A cross-sectional study was conducted among 132 elderly patients with diabetes mellitus (DM) in Health Centers 54 and 59, Bangkok, Thailand from 25th November to 11th December 2013. The objective of this study was to explore the periodontal status in aging DM patients. The data was collected through oral examination by calibrated dentists to measure plaque index score, gingival index score, pocket depth, clinical attachment loss (CAL), and bleeding on probing (BOP). Face-to-face interview were conducted by trained interviewers using a structured questionnaire to characterize general characteristics and oral health behaviors. Blood samples for FPG, HbA1C, TG, HDL, and LDL were tested by nurse practitioners. Data were analyzed by using descriptive statistic and t-test. All of aging DM patients in two Bangkok Metropolitan Administration (BMA) health centers had periodontitis. Most of them had moderate periodontitis (87.9%). The average score of pocket depth (SD) was 2.48 (0.72) mm. The average score of CAL (SD) was 3.51 (1.12) mm. The average score of BOP (SD) was 36.21 (23.85)%. The average FPG and HbA1c (SD) were 148.67 (45.88) mmol/l and 7.54 (1.34)%, 17.4% of the participant controlled glycemic level. The periodontal status in the uncontrolled glycemic group tended to be worse when compared with the controlled glycemic group with no significant differences. The present study confirms the need to increase oral health care and education in aging DM patients. Coordination between diabetic clinics and dental clinics would be useful in improving periodontal health in diabetes.

Keywords: Periodontal health status, Aging, Diabetes mellitus,

INTRODUCTION

Periodontal disease is an inflammatory disease affecting the periodontium including gingivitis (the inflammation is confined to the gingiva and reversible with good oral hygiene) and periodontitis (the inflammation extends and results in tissue destruction and alveolar bone resorption). Chronic periodontitis occurs mostly in adults and its incidence increases with age. Periodontal destruction is consistent with the amount of plaque present and other local factors [1]. Periodontal disease is a complication of type 2 diabetes associated with health outcomes due to systemic inflammation. Periodontal disease and diabetes mellitus (DM) have a dual adverse relationship. DM affects periodontal health and periodontal infection also affects glycemic control. Furthermore, periodontal infection increases the risk for developing DM complications [2, 3].

DM is a chronic, systemic metabolic disorder causing morbidity and mortality due to long-term complications, which affect the important organ, for example the eyes, blood vessels, heart, kidneys, and nerves. Clinical complications of DM include retinopathy, nephropathy, neuropathy, macro-vascular disease, delayed wound healing, and periodontal disease [2].

The prevalence of DM has been increasing in the Thai population and is highest in Bangkok [4]. Of Thailand's diabetic patients, 65.9% had uncontrolled blood glucose and 59.4% with uncontrolled blood glucose had acute diabetes complication [5].

* *Correspondence to: Saruta Saengtipbovorn*
E-mail: saruta79@gmail.com

Cite this article as: Saengtipbovorn S, Taneepanichskul S. Periodontal health status of aging diabetes patients in Bangkok Metropolitan Administration Health Center. J Health Res. 2014; 28(5): 319-25.

Thailand is an aging society due to slow population [6]. The elderly are at high risk of chronic conditions including DM, arthritis, congestive heart failure, and dementia [7]. The elderly has an increase in the prevalence of DM and oral manifestations of diabetes mellitus such as periodontal disease [2, 3, 7].

From the 7th Thai National Oral Health Survey in 2012, most of the elderly population had periodontal disease; 89.0% of the population aged 60-74 and 91.8% of the population aged above 80 [8]. Many studies were undertaken to assess the oral health status in diabetic patients [9-13] or oral health status in the elderly [8]. Although this evidence suggests that DM is associated with periodontal health, there is scant information on the periodontal health of aging DM patients in Thai urban areas.

The objective of the present study was to explore the periodontal status in aging DM patients in Bangkok Metropolitan Administration (BMA) health centers.

MATERIALS AND METHODS

This study was conducted in Health Center 54 and 59 located in Bangkok, Thailand. All of the elderly with type 2 diabetes who met the inclusion criteria and used curative services from 25th November to 11th December 2013 were interviewed. The study included patients age over 60 years, who had type 2 diabetes, both male and female and at least 16 natural teeth. The patients who had serious systemic diseases or complications, blood disease, liver damage, kidney disease, severe chronic periodontitis, communicable disorders, could not speak Thai language or did not agree to participate (5 participants: 2 participants in Health Center 54 and 3 participants in Health Center 59) were excluded. The total sample size was 132 participants (66 participants per each Health center).

The measurement tools consisted of a structured questionnaire which was divided into 3 parts including 1) general characteristics, 2) biological parameters (fasting plasma glucose (FPG), glycosylated hemoglobin (HbA1C), triglyceride (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL), and 3) oral health behaviors and utilization of dental services. Plaque index score, gingival index score, pocket depth, bleeding on probing (BOP), and clinical attachment level (CAL) [14] were used to characterize periodontal status.

Data collection was done in two stages; preparation stage and operation stage. Preparation stage consisted of 5 steps as follows: 1) Approached the director of Health Center 54 and 59 for permission to collect data. 2) Validated questionnaires by three experts, in diabetes, research methodology and dentistry. The Item-Objective Congruence Index (IOC) was 0.77. 3) A pilot study was carried out to test the reliability of the questionnaire. Another 30 diabetic patients who were receiving services in Health Center 42 were interviewed. The Cronbach's Coefficient Alpha was 0.81. 4) Standardized interviews by training the interviewers in standardized data collection. 5) Standardized dentists: two dentists were used to measure periodontal status. One dentist measured Health Center 54 and the other measured Health Center 59. Inter-examiner reliability between dentists was tested with the Cronbach's Coefficient Alpha measuring 0.85.

Operation stage consisted of 4 steps as follows: 1) Research team introduced themselves. The research assistants explained the purpose and procedures of the study to the participants who were included in the study. If they were willing to participate in the study, the participants signed informed consent before collecting data. 2) Oral examination was done by calibrated dentists. 3) Face-to-face interviews were done by trained interviewers using a structured questionnaire. 4) Testing blood samples for FPG, HbA1C, TG, HDL, and LDL were done by nurse practitioners.

The severities of periodontal disease (chronic periodontitis) were divided by used CAL (slight (1-2 mm. CAL), moderate (3-4 mm. CAL), and severe (>5 mm. CAL)) [1]. The glycemic control defined HbA1c < 6.5% as controlled glycemic level and HbA1c ≥ 6.5% as uncontrolled glycemic level [15]. Data were analyzed with SPSS statistical package version 16.0. Descriptive statistics including frequency distribution, percentage, mean and standard deviation were used to describe characteristics of diabetic patients. A T-test was used to analyze the association between influencing factors. The plaque index score, gingival index score, pocket depth, CAL, and percentage of BOP were dependent variables. The independent variable was a glycemic control. All analysis used a 95% confidence interval (CI), and a statistically significant p-value less than 0.05.

ETHICAL CONSIDERATION

Ethics approval was sought from the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University. Informed consent was signed by all participants.

Table 1 Distribution of general characteristic (N=132)

Variables	N	%
Gender		
Male	47	35.6
Female	85	64.4
Age (years)		
60-69	111	84.1
70-79	19	14.4
>80	2	1.5
Mean ± SD	63.95 ± 5.03	
BMI (kg./m^2)		
Mean ± SD	25.81 ± 4.47	
Income/month (baht)		
0-1,500	49	37.1
1,501-3,000	14	10.6
3,001-5,000	14	10.6
5,001-10,000	36	27.3
>10,000	19	14.4
Educational level		
Illiteracy	5	3.8
Primary school	101	76.5
Secondary school	17	12.9
Vocational school	5	3.8
Bachelor degree	4	3.0
Living arrangement		
Alone	8	6.1
With family	124	93.9
Occupation		
Agriculture	7	5.3
Employee	16	12.1
Retired	4	3.0
Merchant	31	23.5
Private business	7	5.3
No occupation	64	48.5
Other	3	2.3
Health insurance		
Universal coverage	119	90.2
Government	12	9.0
Other	1	0.8
Family history of diabetes		
Yes	60	45.5
No	72	54.5
Duration of diabetes (years)		
Mean ± SD	7.64 ± 5.73	
Smoking		
Never	115	87.1
Ever	11	8.3
Current smoker	6	4.6

RESULTS

General characteristics

Patient's characteristics are shown in Table 1. Among 132 diabetic patients, more than half of them were female (66.4%). The average age (SD) was 63.95 (5.03) years. In regard to income, 37.1% had income less than 1,500 baht per month. Regarding education level, 76.5% had finished primary school. Those who had had family history of diabetes, totaled 45.5%. The average duration of diabetes (SD) was 7.64 (5.73) years and 87.1% of participants had never smoked.

Biomedical outcomes

The average FPG, HbA1c, TG, HDL, and LDL (SD) were 148.67 (45.88) mmol/l, 7.54 (1.34)%, 139.43 (54.86) mmol/l, 51.30 (13.71) mmol/l, and 104.99 (30.54) mmol/l, respectively. The average BMI (SD) was 25.81 (4.47) kg./m^2 and 17.4%

Table 2 Periodontal status (N=132)

Variables	N	%
Plaque index (PI) score (mm.)		
mean (SD)	0.62 (0.41)	
Gingival index (GI) score (mm.)		
mean (SD)	0.71 (0.44)	
Pocket depth (PD) (mm.)		
mean (SD)	2.48 (0.72)	
Clinical attachment loss (CAL) (mm.)		
mean (SD)	3.51 (1.12)	
Slight	4	3.0
Moderate	116	87.9
Severe	12	9.1
Bleeding on probing (BOP) (%)		
mean (SD)	36.21 (23.85)	

Table 3 Distribution of oral health behaviors and utilization of dental services

Variables	N	%
Oral health behavior (N=132)		
Tooth brushing	132	100.0
Mouth rinse	47	35.6
Salt solution	56	42.4
Dental floss	19	14.4
Tooth pick	80	60.6
Interproximal brush	24	18.2
Frequency of tooth brushing (N=132)		
Once a day	10	7.6
Two times per day	107	81.0
Three times per day	14	10.6
More than three times per day	1	0.8
Have had dental treatment (N=132)		
Less than 6 months	44	33.3
6-12 months	22	16.7
More than 1 year, but less than 2 years	24	18.2
More than 2 years, but less than 5 years	18	13.6
More than 5 years	12	9.1
Never received dental service	12	9.1
Type of treatment received last time (N=120)		
Extraction	57	47.5
Filling	22	18.3
Scaling	18	15.0
Other: dental substitution, oral examination	23	19.2
Reason to have had dental treatment (N=120)		
Routine	18	15.0
Emergency	102	85.0

(n=23) controlled glycemic level (HbA1c < 6.5). The normal values of FPG, HbA1c, TG, HDL, and LDL are < 126 mg/dl, ≥ 6.5%, < 150 mg/dl, < 40 mg/dl (men) and < 50 mg/dl (women), and <130 mg/dl [15,16].

Periodontal status

Measurements of periodontal status are shown in Table 2**.** The average plaque index score and gingival index score (SD) were 0.62 (0.41) mm. and 0.71 (0.44) mm., respectively. The average score of pocket depth (SD) was 2.48 (0.72) mm. The average score of CAL (SD) was 3.51 (1.12) mm. The percentage of BOP (SD) was 36.21 (23.85)%. The normal values of plaque index score, gingival index score, pocket depth, CAL, and percentage of BOP are 0.00 mm., 0.00 mm., < 4.00 mm., < 1.00 mm., and 0.00%, respectively [1,14]. In regard to the severity of periodontal disease, most of the participants (87.9%) had moderate periodontitis.

Oral health behaviors

Oral health behaviors are summarized in

Table 4 Relationship between glycemic control (HbA1C) and periodontal status (N=132)

Variables	Glycemic control		*t*	*p-value*
	Controlled (HbA1c<6.5) (N=23) mean (SD)	Uncontrolled (HbA1c≥6.5) (N=109) mean (SD)		
Plaque index score (mm.)	0.52 (0.40)	0.64 (0.42)	-1.210	0.229
Gingival index score (mm.)	0.73 (0.50)	0.71 (0.44)	0.274	0.785
Pocket depth (mm.)	2.20 (0.53)	2.41 (0.71)	-1.349	0.180
Clinical attachment loss (CAL) (mm.)	3.15 (0.88)	3.59 (1.15)	-1.741	0.084
Bleeding on probing (BOP) (%)	32.16 (17.40)	37.06 (24.99)	-0.895	0.373

Table 3. Among 132 diabetic patients, all cleaned their oral cavity by tooth brushing; 81.0% were brushing teeth two times/day, more than half of them (60.6%) used toothpicks, 14.4% used dental floss, 33.3% of all participants had dental treatment in the previous 6 months, 47.5% received extractions at the last treatment and 85.0% of diabetic patients who had used dental service (n=120), have had dental treatment for emergency.

Relationships between glycemic control and periodontal status

Relationships between glycemic control and periodontal status are given in Table 4. The uncontrolled glycemic level group had higher plaque index score, pocket depth, CAL, and BOP than the controlled glycemic level group. The uncontrolled group had lower gingival index score than the controlled group. There were no statistically significant differences in periodontal status between the controlled and the uncontrolled glycemic level groups.

DISCUSSION

Following the classification of the American Academy of Periodontal disease (AAP) 1999 [1], all of the aging DM patients in two BMA health centers had periodontitis ranging from slight to severe, due to the destruction of periodontal tissue. Most of them had moderate periodontitis (87.9%).

The average pocket depth and CAL (SD) of the present study (2.48 (0.72) and 3.51 (1.12) mm., respectively) were quite similar to a previous study in Germany which studied the influence of diabetes to periodontal progression in type 1 and 2 diabetic patients (2.40 (0.60) and 2.40 (1.60), respectively) [17]. However, a previous study in Thailand [18] found type 2 diabetic patients had higher pocket depth and CAL than the present study. The higher pocket depth and CAL recorded in the previous study included only uncontrolled diabetic patients.

There were no statistically significant differences between the controlled and the uncontrolled glycemic level with periodontal status in the present study. However, the present study found uncontrolled diabetes had higher pocket depth and CAL than controlled diabetes. This is consistent with the previous study that found no significant correlation between periodontal status and HbA1c [19]. However, another previous study in the USA found a higher prevalence of periodontitis in poorly-controlled type 2 diabetes than well controlled type 2 diabetes [10]. Furthermore, a previous study in East Germany found uncontrolled type 2 diabetes experienced greater pocket depth with a significant difference [17].

In the present study, the plaque index score and BOP were higher in the uncontrolled diabetes group, which is consistent with previous studies that found dental plaque is the major contributing factor for the progression of periodontitis and HbA1c level [9, 19].

The average of FPG (148.67 (45.88) mmol/l) and HbA1c (7.54 (1.34) %) of aging DM patients were more than the controlled level [15] and only 17.4% controlled glycemic level, which is less than the previous studies in Korea, Lithuania, and the USA [9, 10, 19]. However, the previous study in China found only 12.5% of their participants controlled diabetes [11]. The difference of controlled diabetes is due to the new diagnostic criteria 2013 [15], which decreased the level of HbA1c from <7 to <6.5 for controlled diabetes. The previous studies in Korea, Lithuania, and the USA used the previous guidelines (HbA1c<7 for controlled diabetes) whereas, the previous study in China and the present study used the new guidelines (HbA1c<6.5 for controlled diabetes).

In the present study, every aging DM patients cleaned their oral cavity by tooth brushing. However, only 14.4% used dental floss. Only one third (33.3%) of all participants had had dental treatment in the previous 6 months. The percentage of utilization of dental services in the aging DM patients was less than the previous Thai study which addresses the utilization of dental services in diabetic patients in Roi et provience, Thailand

(53.9%) [13]. In regard to the utilization of dental services in the elderly, the utilization of dental services of the present study was also less than the previous study in Bangkok [20]. However the 7th Thai Oral Health Survey found the percentage of utilization of dental services in the elderly (34.2%) quite similar to the present study [21]. The low percentage of using dental floss, low percentage of utilization of dental services, and visiting dentist only for emergency, lead to periodontal disease. This is consistent with the previous study which found that brushing with fluoride toothpaste twice a day, flossing regularly or using other devices for example inter-proximal brush, visiting dentists routinely for check-up and professional cleaning and not smoking were the way to maintain healthy gingiva [22]. Moreover, another previous study found intensive oral hygiene instructions including teaching tooth brushing, flossing, and others devices were among the most important to treat periodontal disease [23].

The results from the present study reaffirm the need to increase oral health care and education in aging type 2 diabetes patients. Oral health care and education should be a part of diabetic treatment. This would support the policy of the Bureau of Dental Health, Ministry of Public Health, Thailand which formulated "Thailand Oral Health Goal 2020" to minimize the impact of oral diseases on health and psychosocial wellbeing [24].

LIMITATION

The results of the present study did not represent the entire group of the aging DM patients in Bangkok due to the cross-sectional design, lack of randomization and the small number of centers in which the study was conducted. Furthermore, the uses of participant reports to estimate oral health behaviors are subject to uncertainty.

RECOMMENDATION

The results of the present study found all of aging DM patients in two BMA health centers had periodontitis. Most of them had moderate periodontitis (87.9%). The periodontal status in the uncontrolled diabetes tended to be worse when compared with the controlled diabetes with no significant differences. It indicates a need for specific strategies for oral health care and education, which should be designed to make the aging DM patients increase knowledge and attitude of oral health care and realize the important of good periodontal health. It is important to increase the involvement of other health professionals to overcome the barriers. Coordination between diabetic clinics and dental clinics would be useful in improving periodontal health in diabetes.

CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest.

ACKNOWLEDGEMENTS

The study has been completed successfully with excellent support from Dr. Alessio Panza, Dr. Tewarit Somkotra, Prof. Sirikul Isaranurak, and Dr. Sathirakorn Pongpanich.

The study has been supported from the Higher Education Research Promotion and National Research University Project of Thailand, Office of the Higher Education Commission (No.AS1148A-56) and the Ratchadaphiseksomphot Endowment Fund of Chulalongkorn University (RES560530243-AS).

REFERENCES

1. Wiebe CB, Putnins EE. The Periodontal disease classification system of the American Academy of Periodontology-An Update. J Can Dent Assoc. 2000; 66(11): 594-7.
2. Albert D, Ward A, Allweiss P, Graves DT, Knowler WC, Kunzel C, et al. Diabetes and oral disease: implications for health professionals. Ann N Y Acad Sci. 2012; 1255: 1-15.
3. Lamster IB, Lalla E, Borgnakke WS, Taaylor GW. The relationship between oral health and diabetes mellitus. JADA. 2008; 139: 19-24S.
4. Ekpalakorn W, Porapakkham Y, Taneepanichskul S, Pakchareun H, Sathernnopakaew V, Thaikae K. The fourth Thai national health examination survey 2008-2009. Nonthaburi: The graphic publisher; 2009.
5. Rungsin R. An assessment on quality of care among patients diagnosed with type 2 diabetes and hypertension visiting hospitals of Ministry of Public Health and Bangkok Metropolitan Administration in Thailand, 2012. Bangkok: National Health Security Office; 2012.
6. National Statistical Office [NSO]. Report of the 2007 survey of the older person in Thailand. Bureau of Socio-Economic and Opinion 1, National Statistical Office, Thailand. Bangkok: NSO; 2007.
7. Scully C. The influence of systemic diseases on oral health care in older adults. JADA. 2007; 138: 7-14.
8. The Seventh Thai National Oral Health Survey 2012. [cited 2013 June 18]. Available from: http://dental.anamai.moph.go.th/oralhealth/PR/E-ook/Survey/survey7th.pdf
9. Kim EK, Lee SG, Choi YH, Won KC, Merchant AT, Lee HK. Association between diabetes-related factors and clinical periodontal parameters in type-2 diabetes mellitus. BMC Oral Health. 2013; 13: 64.
10. Bandyopadhyay D, Marlow NM, Fernandes JK, and Leite RS. Periodontal disease progression and glycemic control among Gullah African Americans with Type-2 diabetes. J Clin Periodontol. 2010; 37(6): 501-9.

11. Xiao-hui G, Li Y, Qing-qing L, Li S, Zi-lin S, Fang Z, et al. A nationwide survey of diabetes education, self-management and glycemic control in patients with type 2 diabetes in China. Chin Med J. 2012; 125(23): 4175-80.
12. Demmer RT, Desvarieux M, Holtfreter B, Jacobs DR, Wallaschofski H, Nauck M, et al. Periodontal status and A1C change: longitudinal results from the study of health in Pomerania (SHIP). Diabetes Care. 2010; 33(5): 1037-43.
13. Srisaphum N. Oral health status in diabetes patients at Changhan district, Roi-Et province, Thailand. [Master's Thesis]. Bangkok: Collage of Public Health Sciences, Chulalongkorn University; 2009.
14. Indices Used for Periodontal Disease Assessment. [cited 2013 June 30]. Available from: http://www.codental.uobaghdad.edu.iq/uploads/lectures/3rd%20class%20community%20dentistry/3%20PDD%20Indices.pdf.
15. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2014 Jan: 37(Suppl. 1): S81-90. Doi:10.2337/dc14-S081.
16. American Heart Association. "What your cholesterol mean". [cited 2013 June 30]. Available from: http://www.heart.org/HEARTORG/Conditions/Cholesterol/AboutCholesterol/What-Your-Cholesterol-Levels-Mean_UCM_305562_Article.jsp.
17. Demmer RT, Holtfreter B, Desvarieux M, Jacobs DR, Kerner W, Nauck M, et al. The influence of type 1 and type 2 diabetes on periodontal disease progression. Diabetes Care. 2012; 35: 2036-42.
18. Promsudthi A, Pimapansri S, Deerochanawong C, Kanchanavasita W. The effect of periodontal therapy on uncontrolled type 2 diabetes mellitus in older subjects. Oral Disease. 2005; 11: 293-8.
19. Pranckeviciene A, Siudikiene J, Ostrauskas R, Machiulskine. Severity of periodontal disease in adult patients with diabetes mellitus in relation to the type of diabetes. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2014; 158.
20. Saengtipbovorn S, Taneepanichskul S, Pongpanich S, Boonyamanond L. Factors associated with utilization of dental services by the elderly patients in the Health center no.54, Bangkok, Thailand. J Health Res. 2012; 26(4): 199-204.
21. The 7th Thai National Oral Health Survey 2012. [cited 2014 January 30]. Available from: http://dental.anamai.moph.go.th/survey7.pdf
22. Periodontal (Gum) disease: causes, symptoms, and treatments. [cited 2013 June 30]. Available from: http://www.nidcr.nih.gov/OralHealth/Topics/GumDiseases/PeriodontalGumDisease.htm
23. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients. Diabetes Care. 2010; 33: 421-427.
24. Yongvanichakorn B. Formulating Thailand Goals for Oral Health 2020. Thailand Journal of Dental Public Health. 2009; 14: 38-48.