

KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) TOWARD ORAL HEALTH AND DIABETES MELLITUS AMONG THE ELDERLY WITH TYPE 2 DIABETES, BANGKOK, THAILAND

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ABSTRACT: A cross-sectional study was conducted among 132 diabetic patients in Health Center 54 and 59 in the area of Thung-Khru District, Bangkok to explore knowledge, attitude, and practice (KAP) toward oral health and diabetes mellitus among the elderly with type 2 diabetes. Eligible criteria included patient age over 60 years, type 2 diabetes, both male and female, and at least 16 natural teeth. The data was collected from 25th November to 11th December 2013 by face-to-face interview using a structured questionnaire. Descriptive statistic, chi-square, and Fisher Exact test were used to analyze the data. 17.4% of all participants had been controlled glycemic level. More than half of participants in the controlled and uncontrolled groups had moderate score of overall knowledge (52.2% and 67.9%, respectively). Most of participants in the controlled and uncontrolled groups (82.6% and 70.6%, respectively) had neutral attitude of overall score of attitude. There were no significant difference of knowledge, attitude, and practice (KAP) toward diabetes mellitus and oral health with glycemic control at p-value < 0.05. The present study indicated the need to increase KAP by combine general and oral health to controlled glycemic level.

Keywords: Knowledge Attitude and Practice, Oral health, Diabetes mellitus, Type 2 Diabetes, Elderly, Thailand

INTRODUCTION

Thailand is an aging society due to slow population growth and the number of new births continues to dwindle [1]. The elderly are at high risk of chronic conditions include diabetes mellitus (DM), arthritis, congestive heart failure, and dementia [2]. The prevalence of DM and oral manifestations of DM including periodontal disease also increase in the elderly [3, 4].

Prevalence of DM has been increasing in the Thai population and is highest in Bangkok [5]. 65.9% of Thai's diabetic patient had uncontrolled blood glucose and 59.4% of uncontrolled blood glucose had acute diabetes complication [6].

DM is a chronic, systemic metabolic disorder cause morbidity and mortality due to long-term

complications, which affect the important organs, for example the eyes, blood vessels, heart, kidneys, and nerves [3]. Clinical complications of DM include retinopathy, nephropathy, neuropathy, macro-vascular disease, delay wound healing, and periodontal disease. Periodontal disease is the sixth complication of DM [4].

Periodontal disease and DM have a bidirectional relationship. DM affects on periodontal health and periodontal infection also affect glycemic control furthermore periodontal infection also increases the risk for developing diabetes complications [3]. 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 [7].

Many factors associated with glycemic control

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in type 2 diabetes included obesity, diet, physical activity, family history of diabetes, duration of diabetes, smoking, high blood pressure, low-density lipoprotein (LDL), and sleep duration [3,6,8-14]. There were many studies explored knowledge, attitude, and practice (KAP) in type 2 diabetes patients in the aspect of general health or oral health [15-18]. However, there were lack of a study, which combined oral health and general health to explore knowledge, attitude, and practice (KAP) in the elderly with type 2 diabetes.

The objective of the present study was to explore knowledge, attitude, and practice (KAP) of oral health and DM among the elderly with type 2 diabetes in Thung-Khru District, Bangkok, Thailand.

MATERIAL AND METHOD

A cross-sectional study was conducted in Health center 54 and Health center 59, which is responsible all of the area of Thung-Khru District, Bangkok, Thailand. The elderly with type 2 diabetes who used curative services from 25th November to 11th December 2013 were interviewed. The total sample size was 132 participants (66 participants per each Health center). Eligible criteria included patient age over 60 years, type 2 diabetes, both male and female, and at least 16 natural teeth. The patient who had serious systemic diseases or complications, blood disease, liver damage, kidney disease, severe chronic periodontitis, communicable disorder, could not speak Thai language, or did not agree to participate was excluded.

The measurement tools consist of structured questionnaire which was divided into 7 parts including 1) general characteristics, 2) biological parameters (fasting plasma glucose (FPG), glycated hemoglobin (HbA1c), triglyceride (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL), 3) knowledge, 4) attitude, and 5) practice toward oral health and DM, 6) oral health behaviors, and 7) utilization of dental services.

Data collection was done in two stages; preparation stage and operation stage. Preparation stage consisted of 4 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 public health. The three experts consisted of expert in diabetes, research methodology, and dental health. The Item-Objective Congruence Index (IOC) was 0.83. 3) A pilot study was carried out to test the reliability of the questionnaire. The Cronbach's Coefficient

Alpha was divided into 4 parts; knowledge toward oral health and DM: 0.84, attitude toward oral health and DM: 0.87, oral health behaviors: 0.77, and practice toward DM: 0.89. 4) Standardized interviews by training the interviewers in standardized data collection.

Operation stage consisted of 3 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) Face-to-face interviews were done by trained interviewers using a structured questionnaire. 3) Testing blood samples for fasting plasma glucose (FPG), glycated hemoglobin (HbA1c), triglyceride (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL) was done by laboratory technicians.

Data was analyzed by SPSS statistical package version 16.0. Knowledge, attitude, and practice (KAP) toward oral health and DM, general characteristics, biological parameters, oral health behaviors, utilization of dental services were independent variables. The dependent variable was glycemic control defined HbA1c < 6.5% as controlled glycemic level and HbA1c ≥ 6.5% as uncontrolled glycemic level [19]. The total score of knowledge was 10 points and divided to knowledge toward oral health 5 points and knowledge toward DM 5 points. The total score of attitude was 50 points and divided to attitude toward oral health 25 points and attitude toward DM 25 points. The mean and standard deviation of knowledge was used to categorize the score to good, fair, and poor knowledge. Good knowledge was defined as the score ≥ mean + SD. Fair knowledge was defined as the score between mean - SD and mean + SD. Poor knowledge was defined as the score ≤ mean - SD. Furthermore, the mean and standard deviation of attitude was also used to categorize the score to positive, neutral, and negative attitude. Positive attitude was defined as the score ≥ mean + SD. Neutral attitude was defined as the score between mean - SD and mean + SD. Negative attitude was defined as the score ≤ mean - SD. Descriptive statistic including frequency distribution, percentage, mean and standard deviation were used to describe characteristics of diabetic patient. Chi-square and Fisher Exact test were used to analyze the association between influencing factors. All analysis used a 95% confidence interval (CI), and a statistically significant p-value less than 0.05.

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 \pm SD	63.95 \pm 5.03	
BMI (kg./m²)		
Mean \pm SD	25.81 \pm 4.47	
Income (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 \pm SD	7.64 \pm 5.73	
Smoking		
Never	115	87.1
Ever	11	8.3
Current smoker	6	4.6

Ethical consideration

Ethics approval was sought from the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (No.123.1/56). Informed consent was signed by all participants.

RESULTS**General characteristics**

Among 132 diabetic patients, more than half of

them were female (66.4). The average age (SD) was 63.95 (5.03) years old. 37.1% had income less than 1,500 baht per month. 76.5% finished primary school. 45.5% had family history of diabetes. The average duration of diabetes (SD) was 7.64 (5.73) years. 87.1% never smoke. 17.4% (n=23) controlled glycemic level (HbA1c < 6.5). (The details were demonstrated in Table 1). The average BMI (SD) was 25.81 (4.47) kg./m². The average FPG, HbA1c, TG, HDL, and LDL (SD) were

Table 2 Relationship between knowledge toward oral health & DM and glycemic control by Chi-square test ($p < 0.05$) (N=132)

Variables	Glycemic control		χ^2	p-value
	Controlled (%) (HbA1c<6.5) (N=23)	Uncontrolled (%) (HbA1c≥6.5) (N=109)		
Score of overall knowledge				
High (≥ 9.42)	6 (26.1)	19 (17.4)	2.066	0.356
Moderate (4.81-9.41)	12 (52.2)	74 (67.9)		
Low (≤ 4.80)	5 (21.7)	16 (14.7)		
Score of knowledge toward oral health				
High (≥ 4.65)	11 (47.8)	53 (48.6)	3.267	0.195
Moderate (2.54-4.64)	3 (13.1)	30 (27.5)		
Low (≤ 2.53)	9 (39.1)	26 (23.9)		
Score of knowledge toward DM				
High (≥ 4.57)	7 (30.4)	24 (22.0)	1.208	0.547
Moderate (2.54-4.56)	14 (60.9)	68 (62.4)		
Low (≤ 2.53)	2 (8.7)	17 (15.6)		

Table 3 Relationship between attitude toward oral health & DM and glycemic control by Chi-square test ($p < 0.05$) (N=132)

Variables	Glycemic control		χ^2	p-value
	Controlled (%) (HbA1c<6.5) (N=23)	Uncontrolled (%) (HbA1c≥6.5) (N=109)		
Score of overall attitude				
Positive (≥ 48.43)	3 (13.0)	16 (14.7)	1.983	0.371
Neutral (37.18-48.42)	19 (82.6)	77 (70.6)		
Negative (≤ 37.17)	1 (4.4)	16 (14.7)		
Score of attitude toward oral health				
Positive (≥ 24.19)	7 (30.4)	33 (30.3)	0.540	0.763
Neutral (18.08-24.18)	13 (56.5)	55 (50.5)		
Negative (≤ 18.07)	3 (13.1)	21 (19.2)		
Score of attitude toward DM				
Positive (≥ 24.50)	2 (8.7)	27 (24.8)	4.456	0.108
Neutral (19.59-24.49)	15 (65.2)	68 (62.4)		
Negative (≤ 19.58)	6 (26.1)	14 (12.8)		

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. There were no statistically significant differences of general characteristics and biological parameters between the controlled and uncontrolled groups at p -value < 0.05.

Knowledge toward oral health and DM

The average score of overall knowledge (SD) was 7.11 (2.31). The average score of knowledge toward oral health (SD) was 3.59 (1.06) and average score of knowledge toward DM (SD) was 3.55 (1.02). More than half of participants in the controlled and uncontrolled groups (52.2% and 67.9%, respectively) had moderate score of overall knowledge. 47.8% and 48.6% of the controlled and uncontrolled group had high score of knowledge toward oral health. More than half of participants in participants in the controlled and uncontrolled groups (65.2% and 62.4%, respectively) had neutral score of attitude toward DM. There were no

the controlled and uncontrolled groups (60.9% and 62.4%, respectively) had moderate score of knowledge toward DM. There were no statistically significant differences of all knowledge toward oral health and DM between the controlled and uncontrolled groups at p -value < 0.05 (Table 2).

Attitude toward oral health and DM

The average score of overall attitude (SD) was 42.80 (5.63). The average score of attitude toward oral health (SD) was 21.13 (3.06) and average score of attitude toward DM (SD) was 22.04 (2.46). Most of participants in the controlled and uncontrolled groups (82.6% and 70.6%, respectively) had neutral attitude of overall attitude. More than half of participants in the controlled and uncontrolled groups (56.5% and 50.5%, respectively) had neutral score of attitude toward oral health. Furthermore, more than half of statistically significant differences of all attitudes toward oral health and DM between the controlled and uncontrolled groups at p -value < 0.05 (Table 3).

Table 4 Distribution of practice toward oral health and DM

Variables	N	%
Practice toward oral health		
<i>Oral health behavior (N=132)</i>		
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
<i>Frequency of tooth brushing (N=132)</i>		
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
<i>Have had dental treatment last time (N=132)</i>		
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
<i>Received treatment last time (N=120)</i>		
Extraction	57	47.5
Filling	22	18.3
Scaling	18	15.0
Other: dental substitution, oral examination	23	19.2
<i>Reason to have had dental treatment (N=120)</i>		
Routine	18	15.0
Emergency	102	85.0
Practice toward DM		
<i>Exercise (N=132)</i>		
More than 5 times per week	18	13.6
2-5 times per week	64	48.5
1 time per week	7	5.3
2-3 times per month	2	1.5
Never exercise	41	31.1
<i>Measured weight in last month (N=132)</i>		
More than once	37	28.0
One time	94	71.2
Never	1	0.8
<i>Modified diet as doctor's advice (N=132)</i>		
Ever forget to take drugs prescribed (N=132)	67	50.8
Ever received eye examination in past year (N=132)	104	78.8
Ever received foot examination in past year (N=132)	15	11.4
Always wear covered shoes when outdoors (N=132)	50	37.9
<i>Screening of feet (N=132)</i>		
Everyday	77	58.3
Sometimes	20	15.2
Rarely/never	35	26.5

Practice toward oral health and diabetes mellitus***Practice toward oral health***

Among 132 diabetic patients, every diabetic patient (100%) 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 participants have had dental treatment in the

previous 6 months. 47.5% received extraction last time. 85.0% of diabetic patients who had used dental services (n=120) have had dental treatment for emergency (The details were demonstrated in Table 4). There were no statistically significant differences of the practice toward oral health between controlled and uncontrolled groups at p -value < 0.05 (Table 5).

Table 5 Relationship between practice toward oral health and glycemic control by Chi-square and Fisher Exact test (p<0.05)

Variables	Glycemic control		χ^2	p-value
	Controlled (%) (HbA1c<6.5) (N=23)	Uncontrolled (%) (HbA1c≥6.5) (N=109)		
Oral health behavior (N=132)				
Tooth brushing				
Yes	23 (100.0)	109 (100.0)	-	-
No	0 (0.0)	0 (0.0)		
Mouth rinse				
Yes	10 (43.5)	37 (33.9)	0.753	0.386
No	13 (56.5)	72 (66.1)		
Salt solution				
Yes	10 (43.5)	46 (42.2)	0.013	0.910
No	13 (56.5)	63 (57.8)		
Dental floss				
Yes	4 (17.4)	15 (13.8)	0.203	0.652
No	19 (82.6)	94 (86.2)		
Tooth pick				
Yes	13 (56.5)	67 (61.5)	0.195	0.659
No	10 (43.5)	42 (38.5)		
Interproximal brush				
Yes	6 (26.1)	18 (16.5)	1.170	0.279
No	17 (73.9)	91 (83.5)		
Frequency of tooth brushing (N=132)				
≤ 2 times per day	15 (65.2)	62 (56.9)	0.543	0.461
> 3 times per day	8 (34.8)	47 (43.1)		
Have had dental treatment last time (N=132)				
Less than 6 months	8 (34.8)	36 (33.1)		
6-12 months	3 (13.0)	19 (17.4)		
More than 1 year, but less than 2 years	4 (17.4)	20 (18.3)	2.861	0.721
More than 2 years, but less than 5 years	2 (8.7)	16 (14.7)		
More than 5 years	4 (17.4)	8 (7.3)		
Never received dental service	2 (8.7)	10 (9.2)		
Received treatment last time (N=120)				
Extraction	7 (33.3)	50 (50.5)		
Filling	7 (33.3)	15 (15.2)	5.316	0.256
Scaling	2 (9.5)	16 (16.1)		
Other: dental substitution, oral examination	5 (23.9)	18 (18.2)		
Reason to have had dental treatment (N=120)				
Routine	4 (19.1)	14 (14.1)	0.327	0.567
Emergency	17 (80.9)	85 (85.9)		

Practice toward DM

Among 132 diabetic patients, 48.5% exercised 2-5 times/week. 31.1% never exercised. 71.2% measured their weight 1 time/month. 72.7% modified diet as doctor's advice. 50.8% of all participants ever forgot to take drug prescribed. 78.8% tested eye and 11.4% tested foot in the past year. 37.9% always wear shoes when outdoor. 58.3% screened their feet every day (The details were demonstrated in Table 4). There were no statistically significant differences of the practice toward DM between the controlled and uncontrolled groups at *p-value* < 0.05 (Table 6).

DISCUSSION

About 17.4% of the elderly with type 2 diabetes had been controlled glycemic level which less than the previous study from the National Health Security Office (NHSO) and Roi-et province, Thailand [6, 9]. The present study had lower proportion of controlled glycemic level because using different cut point, HbA1c < 6.5% as controlled glycemic level, whereas the previous study used HbA1c < 7.0% as controlled glycemic level.

More than half of the participants had moderate score of overall knowledge and

Table 6 Relationship between practice toward DM and glycemic control by Chi-square and Fisher Exact test ($p < 0.05$) (N=132)

Variables	Glycemic control		χ^2	p-value
	Controlled (%) (HbA1c<6.5) (N=23)	Uncontrolled (%) (HbA1c \geq 6.5) (N=109)		
Practice toward diabetes mellitus				
Exercise				
More than 5 times per week	7 (30.4)	11 (10.1)	8.181	0.147
2-5 times per week	10 (43.5)	54 (49.5)		
1 time per week	0 (0.0)	7 (6.4)		
2-3 times per month	0 (0.0)	2 (1.8)		
Never exercise	6 (26.1)	35 (32.2)		
Measured weight in last month				
More than once	5 (21.7)	32 (29.4)	0.799	0.671
One time	18 (78.3)	76 (69.7)		
Never	0 (0.0)	1 (0.9)		
Modified diet as doctor's advice				
Yes	15 (65.2)	81 (74.3)	0.840	0.657
No	6 (26.1)	20 (18.4)		
Never received	2 (8.7)	8 (7.3)		
Ever forget to take drugs prescribed				
Yes	9 (39.1)	58 (53.2)	1.507	0.220
No	14 (60.9)	51 (46.8)		
Ever received eye examination in past year				
Yes	19 (82.6)	85 (78.0)	0.243	0.622
No	4 (17.4)	24 (22.0)		
Ever received foot examination in past year				
Yes	3 (13.0)	12 (11.0)	0.078	0.780
No	20 (87.0)	97 (89.0)		
Always wear covered shoes when outdoors				
Yes	11 (47.8)	39 (35.8)	1.171	0.279
No	12 (52.2)	70 (64.2)		
Screening of feet				
Everyday	16 (69.6)	61 (56.0)	1.608	0.447
Sometimes	2 (8.7)	18 (16.5)		
Rarely/never	5 (21.7)	30 (27.5)		

knowledge toward DM inconsistent with Promphithakkul, 2010 studied in 14 Health centers, Bangkok, Thailand found 59.5% of the elderly with diabetes had high level of diabetes knowledge [20] whereas Eknithiser et al. [17] found the lack of knowledge toward diabetes mellitus in Roi-et province, Thailand. Almost half of the participants had high knowledge toward oral health inconsistent with the previous study which found diabetic patients had moderate knowledge of oral health and DM [16]. However, Ismaeil et al. [15] found the deficient of knowledge toward oral health and DM. The result of the present study showed more than half of the participants had neutral attitude toward oral health and DM consistent with the previous study [16].

Knowledge and attitude toward DM was not significant difference with glycemic control inconsistent with the previous study in Roi-et

province, Thailand, United Arab Emirates, and Western Nepal found patient's knowledge and attitude were associated with self practice which influenced to glycemic control [17, 21, 22].

The present study found no association between practice toward oral health and DM with glycemic control. Inconsistent with the previous study which found oral health especially periodontal health was associated with glycemic control in type 2 diabetes [4, 23-25]. Weinspach et al., [26] found 90% of type 2 diabetes had periodontal disease and diabetic patient with periodontitis had significant higher BMI than without periodontitis. Poorly - controlled type 2 diabetes (HbA1c \geq 7%) had more prevalence of periodontal disease progression than well - controlled type 2 diabetes (HbA1c < 7%) [27].

The present study found no association between practice toward DM and glycemic control

inconsistent with the previous study which found dietary habit and physical activity were associated with glycemic control [9, 11, 17].

The result from the present study showed that knowledge, attitude, and practice (KAP) toward DM and oral health in the uncontrolled glycemic group tended to be worse when compared with controlled glycemic group with no significant differences which is inconsistent with the previous studies [9, 11, 15-17, 20-27]. The difference was due to the different cut point of HbA1c level [6, 9]. Moreover, most of participants were female, early aging, and the low number of participants in controlled glycemic group might cause no significant differences between groups.

The present study combined DM and oral health for knowledge, attitude, and practice in the elderly with type 2 diabetes in the primary care unit in Thai's urban area which was different from a previous study in Thailand which studied only the knowledge of DM in Thai's resident age more than 15 years [28]. Whereas, the other research paper studied only knowledge, attitude, and practice toward oral health in diabetic patients [15] and Eknithiser et al. [17] studied knowledge, attitude, and practice toward DM. Although Moghadam et al. [16] studied knowledge, attitude, and practice toward DM and oral health. Yet, they studied all of age groups not in the elderly.

The result from the present study reaffirms the need to increase knowledge and attitude of oral health and DM in the elderly with type 2 diabetes. Oral health care and education should be a part of diabetic treatment. Consistent with the policy from 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 [29].

LIMITATION

The results of the present study did not representative the entire elderly with type 2 diabetes due to the cross-sectional design, lacked of randomization and the study was done only in two health centers which in urban area (Thung-Khru District). Willingness to participate and in the present study might cause selection bias. The use of participant report to estimate practice toward DM and oral health behaviors are subject to some degree of measurement error.

RECOMMENDATION

The results from the present study showed no association between knowledge, attitude, and

practice (KAP) toward oral health and DM and glycemic control among the elderly with type 2 diabetes. However, most of participants had moderate knowledge and neutral attitude of oral health and DM. It indicates a compelling need for specific strategies for health promotion and disease prevention activities, which combine general and oral health. Intervention programs might be design to make the elderly with type 2 diabetes increase knowledge and attitude of oral health and DM and realized the important of glycemic control. It is essential to increase the involvement of other health professionals to overcome the barriers. The coordination between diabetic clinic and dental clinic is useful to improve the controlled of glycemic level.

CONCLUSION

Most of participants had moderate knowledge and neutral attitude of oral health and DM. Knowledge, attitude, and practice (KAP) toward oral health and DM were not associated with glycemic control among the elderly with type 2 diabetes in Thung-Khru District, Bangkok, Thailand.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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