Lifestyle Change Plus Dental Care (LCDC) Program Improves Knowledge, Attitude, and Practice (KAP) toward Oral Health and Diabetes Mellitus among the Elderly with Type 2 Diabetes

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Background: Currently, there is an increased prevalence of diabetes mellitus among the elderly. Chronic inflammation from diabetes mellitus effects glycemic control and increases risk of diabetes complications.

Objective: To assess the effectiveness of a Lifestyle Change plus Dental Care (LCDC) program by improved knowledge, attitude, and practice (KAP) toward oral health and diabetes mellitus among the elderly with type 2 diabetes.

Material and Method: A quasi-experimental study was conducted in two Health Centers (HC 54 intervention and HC 59 control) between October 2013 and April 2014. Sixty-six diabetic patients per health center were recruited. At baseline, the intervention group attended a 20-minute lifestyle and oral health education program, individual lifestyle counseling using motivational interviewing, application of self-regulation manual, and individual oral hygiene instruction. At 3-month follow-up, the intervention group received individual lifestyle counseling and oral hygiene instruction. The intervention group received booster education every visit by viewing a 15-minute educational video. The control group received the routine program. Participants were assessed at baseline, 3-month, and 6-month follow-up for knowledge, attitude, and practice (KAP) toward oral health and diabetes mellitus. Data was analyzed by using descriptive statistic, Chi-square test, Fisher's exact test, and repeated measure ANOVA.

Results: After the 6-month follow-up, repeated measure ANOVA analysis showed that participants in the intervention group had significantly higher knowledge and attitude toward oral health and diabetes mellitus. The participants in the intervention group were more likely to exercise, modify diet, have foot examinations, always wear covered shoes, participate in self-feet screening, use dental floss, and use inter-proximal brush than the control group with statistically significant differences.

Conclusion: The combination of lifestyle change and dental care in one program improved knowledge, attitude, and practice (KAP) toward oral health and diabetes mellitus in the elderly with type 2 diabetes.

Trial registration: ClinicalTrials.in.th: TCTR20140602001.

Keywords: Lifestyle change, Dental care, KAP, Oral health, Diabetes mellitus, Aging, DM patients

Thailand is becoming an aging society[1]. The elderly population have increased in the prevalence of diabetes mellitus (DM) and oral manifestations of DM including periodontal disease[2,3].

DM is a chronic, systemic metabolic disorder[2]. The growing burden of non-communicable diseases in low and middle-income countries is one of the most important global health challenges[4]. In Thailand, DM, one of the non-communicable diseases, is an emerging public health concern. In 2009, the Thai prevalence of DM was highest in Bangkok[5]. In 2012, 65.9% of Thai's diabetes patients had uncontrolled blood glucose and 59.4% of those with uncontrolled blood glucose had glycated hemoglobin (HbA1c) >8%[6]. DM causes morbidity and mortality due to long-term complications that affect the important organs. Clinical complications of DM include retinopathy, nephropathy, neuropathy, macro-vascular disease, delayed wound healing, and periodontal disease[2].

Periodontal disease is an inflammatory disease affecting the periodontium including gingivitis and periodontitis[7]. Chronic periodontitis occurs mostly in adults and its incidence increases with age[7]. Periodontal destruction is consistent with the amount of plaque present and other local factors[7]. Periodontal disease is a complication of type 2 diabetes associated with health outcomes due to systemic inflammation.

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Periodontal disease and DM have a dual adverse relationship. DM affects periodontal health, periodontal infection, and affects glycemic control. Furthermore, periodontal infection increases the risk for developing DM complications[2,3]. From the seventh Thai National Oral Health Survey in 2012, most of the elderly population had periodontal diseases; 89.0% of the population aged 60 to 74 and 91.8% of the population aged above 80[8].

There have been many studies of diabetes intervention programs and periodontal intervention programs. Diabetes education[9,10], diabetes empowerment[11], and the community-based interactive approach[12] improved knowledge and attitude toward DM. Lifestyle coaching[13] and diabetes empowerment[11] increased self-care behaviors. Oral health information from health professionals increased oral health knowledge[14]. Compliance to self-management of diabetes significantly correlated with periodontal health[15]. Periodontal intervention programs including tooth brushing instruction, oral health education, and supra-gingival scaling improved periodontal status with statistically significant differences[16-18].

The Common Risk Factor approach is an integrated approach in chronic disease prevention to overcome social inequalities[19].

Due to a dual adverse relationship between DM and periodontal disease, only a diabetes intervention program or a periodontal intervention program alone is not enough to prevent dental complications. To control DM, patients should maintain healthy lifestyles and routinely control health levels, maintain healthy eating habits, have regular physical activity, and take diabetes medicine[20]. The most important method for treating periodontal disease is intensive oral hygiene instruction including tooth brushing technique, flossing, and the use of other devices[21]. Therefore, a combined lifestyle change and periodontal care intervention by using the Common Risk Factor approach is needed to prevent dental complications.

The objective of the present study was to assess the effectiveness of the Lifestyle Change plus Dental Care (LCDC) program to improve knowledge, attitude, and practice (KAP) toward oral health and DM among the elderly with type 2 diabetes.

Material and Method

The quasi-experimental study was conducted in two health centers located in Bangkok, Thailand between October 2013 and April 2014. Health Centers 54 and 59 were selected from 68 health centers in Bangkok because these health centers serve a population with similar socio-demographic characteristics, have scheduled appointments, and have at least 500 patients in their Diabetes Clinics. The two health centers were randomly assigned to intervention (Health Center 54) and control (Health Center 59) groups. Systematic sampling was used to select 66 participants in each health center. The sample size was calculated based on a previous study[22]. The sample size required in each group in the current study was 55 with 80% power at the 5% significant level. Twenty percent was increased for refusal and attrition in each group so the total sample size in each group was 66, and overall sample size was 132 participants.

The inclusion criteria for both male and female participants were patient age over 60 years with type 2 diabetes and having at least 16 natural teeth. The patients 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, were excluded.

Training of interviewers

The interviewers were standardized by attending a 2-day training program. Two nurse practitioners were trained in Motivational Interviewing (MI) for lifestyle change and dental care including dietary counseling, physical activity, quit smoking, and oral health care, by experts in the fields. MI is a synergistic, individual-centered process to develop and strengthen motivation for change. MI is an empathic, supportive counseling style that supports the state for change[23]. Moreover, the same two nurse practitioners and two dental assistants attended a one-day training program for the education and teaching technique, by experts in education, diabetes, and oral health.

Intervention

The Lifestyle Change plus Dental Care (LCDC) program is based on a health belief model, social cognitive theory, and cognitive-behavioral theory. The LCDC program used the Common Risk Factor approach[19]. It integrated DM and periodontal disease prevention by lifestyle change and dental care using multiple professionals including doctors, nurse practitioners, dentists, and dental assistants. At baseline, 66 participants in the intervention group received a 20-minute lifestyle and oral health education program by trained nurse practitioners,

which emphasized type 2 diabetes complications, the prevention of general and oral health complications, the relationship between type 2 diabetes and oral complications, and oral health care. Then participants received individual lifestyle counseling by MI, application of self-regulation manual and selected their goal of lifestyle and oral health care change with trained nurse practitioners. The content of the lifestyle counseling and the self-regulation manual were consistent with lifestyle change and oral health education. The goals included loss of body weight, eating healthy food (fruits and vegetables), eating more high-fiber foods, eating less sugar, exercising for more than 30 minutes at least three to five times per week, quit smoking, tooth brushing after meals, and using dental floss at least one time per day. Individual oral hygiene instruction by trained dental assistants was also conducted in the dental room. The content included tooth brushing with fluoride toothpaste, using dental floss or other devices such as inter-proximal brush, cleaning dentures, and how to check oral health by themselves.

At 3-month follow-up, participants received individual lifestyle counseling and individual oral hygiene instruction. In the first, second, fourth, and fifth month, participants received an educational booster by viewing a 15-minute educational video covering all of the above mentioned points. Furthermore, the goal of lifestyle and oral health care change was boosted by nurse practitioners.

A focus group discussion was used to develop a slide presentation for lifestyle change and oral health education, self-regulation manual, and 15-minute educational video by brain storming ideas from doctors, nurse practitioners, dentists, dental assistants, and a representative of diabetic patients. The slide presentation, self-regulation manual, and educational video were validated by an expert in education, an expert in diabetes and an expert in dentistry. A pretest of the three items was also conducted.

Control group
The routine program included seeing a doctor once a month, receiving individual diabetes education from a doctor, measuring fasting plasma glucose (FPG), and collecting diabetic medicine from a pharmacist.

Outcome measures
Participants in both groups received face-to-face interview at baseline, 3-month, and 6-month

follow-up. The single-blind technique was used. The participants did not know if they were in the intervention or the control groups.

A structured questionnaire was validated by three experts in public health. The Item-Objective Congruence Index (IOC) was 0.83. A pilot study was carried out to test the reliability of the questionnaire. The Cronbach's coefficient alpha was divided into four 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. The structured questionnaire included general characteristics, body mass index (BMI), knowledge and attitude toward oral health and DM, oral health behaviors, and practice toward DM.

Statistical analysis
The intervention and the control groups were independent variables. KAP toward oral health and DM were dependent variables.

Descriptive statistic, Chi-square test, Fisher's exact test, and t-test were used to compare the difference between the intervention and the control group at baseline and 6-month follow-up. Repeated measure ANOVA was used to compare changes in outcomes across time. The time-by-group interaction effect assessed differences in outcome changes. Post-hoc test (Bonferroni) was used to evaluate between the group's differences in outcome measures. Data was analyzed by SPSS statistical package version 16.0. All analysis used a 95% confidence interval (CI), and statistically significant p-value of less than 0.05.

Ethical consideration
Ethics approval was granted from the Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (No. 123.1/56). Prior to participation, the purpose and procedures were fully explained and all participants gave written inform consent.

Results
Study population
From 561 diabetic patients in Health Center 54 and 538 diabetic patients in Health Center 59, 185 diabetic patients in Health Center 54 and 167 diabetic patients in Health Center 59 did not meet inclusion criteria. Three hundred seventy six diabetic patients in Health Center 54 and 371 diabetic patients in Health Center 59 were randomly selected participants for the present study. Of the 132 participants who enrolled at

baseline (66 intervention and 66 control), 130 (98.5%) were eligible for follow-up at 3- and 6-month. Of those who were not eligible, one participant in the intervention group was too ill to participate (paralysis) and the other participate in the control group moved to live in another province (Fig. 1).

Baseline characteristics

Among 132 diabetic patients (66 diabetic patients per group), most of the participants in each group were female. The average age of the intervention and the control groups were 63.83 (4.51) years and 64.06 (5.53) years, respectively. There were no statistically significant differences of gender, age, educational level, BMI, health insurance, duration of having diabetes, and smoking between the intervention and the control groups ($p = 0.714$, 0.357, 0.789, 0.096, 0.466, 0.084, and 0.270, respectively) (Table 1).

Knowledge toward oral health and DM

At baseline (132 diabetic patients), there were no statistically significant differences of the average score of overall knowledge, oral health knowledge, and diabetes knowledge between the intervention and the control groups ($p = 0.893$, 0.677, and 0.698, respectively).

Repeated measure ANOVA

Among 130 diabetic patients (65 diabetic patients per group), in overall knowledge, there were statistically significant differences between the intervention and control groups ($p<0.001$), within measurements ($p<0.001$), and interaction effect between measurements depending on the group ($p<0.001$) (Table 2). The mean difference of overall knowledge between the intervention and the control groups was highest at six months (2.25) with statistically significant differences at 3- and 6-month follow-up ($p<0.001$ and <0.001, respectively) (Table 3).

For oral health knowledge, there were statistically significant differences between the intervention and control groups ($p<0.001$) within measurements ($p<0.001$), and interaction effect between measurements depending on the group ($p = 0.002$) (Table 2). The mean difference of oral health knowledge between the intervention and the control groups was highest at three months (1.14) with statistically significant differences at 3- and 6-month follow-up ($p<0.001$ and <0.001, respectively) (Table 3).
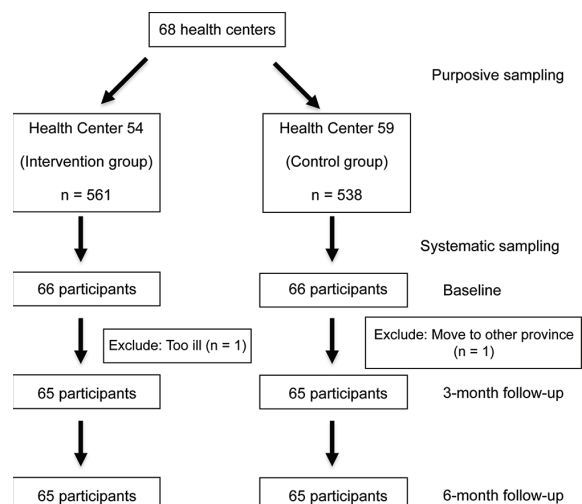

Fig. 1 Study population of diabetic patients.

Regarding diabetes knowledge, there were statistically significant differences between the intervention and control groups ($p<0.001$) within measurements ($p<0.001$), and interaction effect between measurements depending on the group ($p = 0.002$) (Table 2). The mean difference of diabetic knowledge between the intervention and the control groups was highest at six months (1.30) with statistically significant differences at 3- and 6-month follow-up $p<0.001$ and <0.001, respectively (Table 3).

Attitude toward oral health and DM

At baseline (132 diabetic patients), there were no statistically significant differences of the average score of overall attitude, oral health attitude, and diabetes attitude between the intervention and the control groups ($p = 0.057$, 0.202, and 0.244, respectively).

Repeated measure ANOVA

Among 130 diabetic patients (65 diabetic patients per group), in respect to overall attitude, there were statistically significant differences between the intervention and control groups ($p<0.001$), within measurements ($p = 0.002$), and interaction effect between measurements depending on the group ($p<0.001$) (Table 2). The mean difference of overall attitude between the intervention and the control groups was highest at six months (6.64) with statistically significant differences at 3- and 6-month follow-up ($p<0.001$ and <0.001, respectively) (Table 3).

With regard to oral health attitude, there were statistically significant differences between

Table 1. Baseline characteristics (n = 130)

Variables	Intervention group (n = 65) (%)	Control group (n = 65) (%)	*p*-value
Gender			
Male	22 (33.8)	24 (36.9)	0.714
Female	43 (66.2)	41 (63.1)	
Age			
60-69 years	55 (84.6)	54 (83.1)	0.357
70-79 years	10 (15.4)	9 (13.8)	
≥80 years	0 (0.0)	2 (3.1)	
Educational level			
Illiteracy	2 (3.1)	3 (4.6)	0.789
Primary school	52 (80.0)	47 (72.3)	
Secondary school	8 (12.3)	9 (13.8)	
Vocational school	2 (3.1)	3 (4.6)	
Bachelor degree	1 (1.5)	3 (4.6)	
BMI (kg/m^2)			
Mean ± SD	25.35±3.57	26.65±4.39	0.096
Min-max	17.95-34.60	18.93-36.50	
Health insurance			
Universal coverage	54 (83.1)	59 (90.8)	0.466
Universal coverage (other)	3 (4.6)	1 (1.5)	
Government/state enterprise officer	7 (10.8)	5 (7.7)	
No insurance	1 (1.5)	0 (0.0)	
Duration of being diabetes (years)			
Mean ± SD	6.82±5.18	8.51±6.20	0.084
Min-max	1-20	1-25	
Smoking			
Never	57 (87.7)	57 (87.7)	0.270
Ever	7 (10.8)	4 (6.2)	
Current smoker	1 (1.5)	4 (6.2)	

BMI = body mass index
p-value by Chi-square test or t-test

the intervention and control groups (*p*<0.001) within measurements (*p*<0.001), and interaction effect between measurements depending on the group (*p*<0.001) (Table 2). The mean difference of oral health attitude between the intervention and the control groups was highest at three months (3.27) with statistically significant differences at 3- and 6-month follow-up (*p*<0.001 and <0.001, respectively) (Table 3).

Regarding diabetes attitude, there were statistically significant differences between the intervention and control groups (*p*<0.001) and interaction effect between measurements depending on the group (*p*<0.001) (Table 2). The mean difference of diabetes attitude between the intervention and the control groups was highest at six months (3.48) with statistically significant differences at 3- and 6-month follow-up (*p*<0.001 and <0.001, respectively) (Table 3).

Practice toward oral health and DM
Practice toward oral health

Every participant (100%) in both the intervention and the control groups reported regular cleaning their oral cavity by tooth brushing at baseline and 6-month follow-up (Table 4).

At baseline (132 diabetic patients), there were no statistically significant differences in the use of mouth rinse, salt solution, dental floss, toothpick, inter-proximal brush, and having had dental treatment between the intervention and the control groups (*p* = 0.856, 0.291, 0.804, 0.722, 0.176, and 0.148, respectively).

Among 130 diabetic patients (65 diabetic patients per group), after 6-month follow-up, the participants in the intervention group were more likely to use mouth rinse, salt solution, dental floss, and inter-proximal brush. However, only dental floss

Table 2. Repeated measure ANOVA of knowledge and attitude toward oral health and DM (n = 130)

Source of variation	SS	df	MS	F	*p*-value
Overall knowledge					
Between subjects					
Intervention	227.550	1	227.550	39.237	<0.001
Within group (error) (between group error)	742.324	128	5.799		
Within subjects					
Time	147.191	1.783	82.531	28.559	<0.001
Intervention x time	92.078	1.783	51.628	17.866	<0.001
Intervention x within group (error) (within subject error)	659.697	228.285			
Oral health knowledge					
Between subjects					
Intervention	54.656	1	54.656	20.679	<0.001
Within group (error) (between group error)	338.318	128	2.643		
Within subjects					
Time	42.774	1.707	25.059	17.998	<0.001
Intervention x time	17.021	1.707	9.971	7.162	0.002
Intervention x within group (error) (within subject error)	304.205	218.487	1.392		
Diabetes knowledge					
Between subjects					
Intervention	57.462	1	57.462	45.351	<0.001
Within group (error) (between group error)	162.183	128	1.267		
Within subjects					
Time	29.911	2	14.956	21.046	<0.001
Intervention x time	33.440	2	16.720	23.529	<0.001
Intervention x within group (error) (within subject error)	181.921	256	0.711		
Overall attitude					
Between subjects					
Intervention	2,427.510	1	2,427.510	74.089	<0.001
Within group (error) (between group error)	4,193.887	128	32.765		
Within subjects					
Time	265.390	1.841	144.142	6.578	0.002
Intervention x time	450.559	1.841	244.714	11.168	<0.001
Intervention x within group (error) (within subject error)	5,164.051	235.669	21.912		
Oral health attitude					
Between subjects					
Intervention	559.203	1	559.203	45.536	<0.001
Within group (error) (between group error)	1,571.897	128	12.280		
Within subjects					
Time	107.092	1.889	56.680	8.646	<0.001
Intervention x time	131.421	1.889	59.556	10.610	<0.001
Intervention x within group (error) (within subject error)	1,585.487	241.844	6.556		
Diabetes attitude					
Between subjects					
Intervention	537.856	1	537.856	76.418	<0.001
Within group (error) (between group error)	900.913	128	7.038		
Within subjects					
Time	11.554	2	5.777	1.322	0.268
Intervention x time	168.036	2	84.018	19.231	<0.001
Intervention x within group (error) (within subject error)	1,118.410	256	4.369		

SS = sum of squares; df = degrees of freedom; MS = mean squares; F = F-test; DM = diabetes mellitus

and inter-proximal brush had statistically significant differences (*p*<0.001 and 0.004, respectively). The participants in the intervention group were less likely to use toothpicks with no statistically significant difference (*p* = 0.482). Furthermore, the participants in the intervention group were more likely to have had dental treatment in the previous six months with no statistically significant difference (*p* = 0.110) (Table 4).

Table 3. Pairwise comparisons of the different measurements of knowledge and attitude toward oral health and DM (n = 130)

Variables	Intervention group (n = 66)	Control group (n = 66)	Mean difference	p-value
Overall knowledge				
Baseline	7.19±2.36	7.04±2.27	0.15±0.41	0.705
3rd month	9.48±0.70	7.29±2.23	2.19±0.29*	<0.001
6th month	9.58±0.62	7.33±2.31	2.25±0.30*	<0.001
Oral health knowledge				
Baseline	3.68±1.73	3.51±1.60	0.17±0.29	0.564
3rd month	4.77±0.52	3.63±1.36	1.14±0.18*	<0.001
6th month	4.83±0.52	3.89±1.44	0.94±0.19*	<0.001
Diabetes knowledge				
Baseline	3.53±1.09	3.58±0.97	0.05±0.18	0.799
3rd month	4.70±0.28	3.66±1.17	1.04±0.15*	<0.001
6th month	4.74±0.23	3.44±1.32	1.30±0.17*	<0.001
Overall attitude				
Baseline	43.75±4.42	41.80±6.57	1.95±0.98	0.050
3rd month	47.82±3.41	41.45±5.27	6.37±0.78*	<0.001
6th month	47.72±3.88	41.08±5.39	6.64±0.82*	<0.001
Oral health attitude				
Baseline	21.54±2.95	20.78±3.15	0.76±0.54	0.161
3rd month	23.85±1.81	20.58±3.18	3.27±0.45*	<0.001
6th month	23.91±2.26	20.74±3.51	3.17±0.52*	<0.001
Diabetes attitude				
Baseline	22.25±2.32	21.74±2.57	0.51±0.43	0.239
3rd month	23.92±1.81	20.86±2.62	3.06±0.40*	<0.001
6th month	23.82±1.84	20.34±2.46	3.48±0.38*	<0.001

Based on estimated marginal means
* The mean difference is significant at the 0.05 level

Practice toward DM

At baseline (132 diabetic patients), there were no statistically significant differences in exercise, tested weight, diet modification, forgetting to take any prescribed drugs, eye examination, foot examination, always wearing covered shoes, and self-feet screening between the intervention and the control groups (p = 0.310, 0.397, 0.518,.0384, 0.394, 0.170, 0.282, and 0.337, respectively).

Among 130 diabetic patients (65 diabetic patients per group), after 6-month follow-up, the percentage of participants who exercised more than five times/week in the intervention group (26.2%) was more than the control group (16.9%). Moreover, the participants who never exercise in the intervention group (12.3%) were less than the control group (38.5%). Exercise had a statistically significant difference between the intervention and the control groups (p = 0.016). The percentage of participants in the intervention group (92.3%) who modified diet was higher than the control group (78.5%) with a statistically significant difference (p = 0.025). The percentage of participants in the intervention group who received foot examination, always wore covered shoes, and participated in self feet screening were higher than the control group with statistically significant differences (p<0.001, <0.001, 0.001) (Table 4).

Discussion

The present study showed the combination of lifestyle change and dental care in one program, improved KAP toward oral health and DM, which was sustained for six months.

Previous research papers that studied knowledge and attitude toward oral health and DM in type 2 diabetes have found the scores of knowledge and attitude in diabetic patients were low to moderate[24-27]. Repeated measure ANOVA analysis in the present study showed that knowledge and attitude toward oral health and DM increased after the intervention. These results showed the effectiveness

Table 4. Practice toward oral health and DM (n = 130)

Variables	Intervention group (n = 65) (%)	Control group (n = 65) (%)	*p*-value
Practice toward oral health			
Tooth brushing (yes)	65 (100.0)	65 (100.0)	-
Mouth rinse (yes)	32 (49.2)	30 (46.2)	0.725
Salt solution (yes)	30 (46.2)	21 (32.3)	0.106
Dental floss (yes)	48 (73.8)	11 (16.9)	<0.001
Tooth pick (yes)	32 (49.2)	36 (55.4)	0.482
Inter-proximal brush (yes)	26 (40.0)	11 (16.9)	0.004
Have had dental treatment, previous 6 months (yes)	21 (32.3)	13 (20.0)	0.110
Practice toward DM			
Exercise			
>5 times/week	17 (26.2)	11 (16.9)	0.016
2-5 times/week	25 (38.5)	16 (24.6)	
1 time/week	10 (15.4)	9 (13.8)	
2-3 times/month	5 (7.6)	4 (6.2)	
Never	8 (12.3)	25 (38.5)	
Tested weight			
>1 time/month	13 (20.0)	17 (26.2)	0.409
1 time/month	52 (80.0)	48 (73.8)	
Diet modification (yes)	60 (92.3)	51 (78.5)	0.025
Forgot to take any drugs prescribed (yes)	25 (38.5)	27 (41.5)	0.590
Eye examination, last year (yes)	54 (83.1)	49 (75.4)	0.280
Foot examination, last year (yes)	61 (93.8)	18 (27.7)	<0.001
Always wear covered shoes (yes)	40 (61.5)	17 (26.2)	<0.001
Self feet screening			
Everyday	52 (80.0)	34 (52.3)	0.001
Sometimes	13 (20.0)	22 (33.8)	
Rarely/never	0 (0.0)	9 (13.8)	

of the LCDC program to increase and maintain knowledge and attitude in the elderly with DM for 6-months. This is consistent with a previous study that found that diabetic patients, who received oral health information related to diabetes by health professionals, knowledge scored 2.9 times higher, compared to participants who did not receive that information[14]. Inoue et al, 2013, who studied the impact of communicative and critical health literacy in type 2 diabetes patients in primary care in Japan, found clear patient-physician communication associated with an understanding of diabetes care and self-efficacy[28]. Pereira et al, 2012, found significantly increased knowledge toward diabetes after educational intervention that was maintained for 6-month follow-up[10]. Hartayu et al, 2012, also found improved knowledge and attitude toward self-care in type 2 diabetes patients after implementing the community-based interactive approach[12]. Bayat et al, 2013, found that education based on the health belief model in type 2 diabetes patients increased perceived susceptibility, perceived intensity, perceived benefits,

perceived barriers, and self-efficacy to 6-month follow-up[29].

The present study found the participants in the intervention group more likely to exercise, modify diet, have foot examinations, always wear covered shoes, and participate in self-feet screening than the participants in the control group. This is inconsistent with a previous research paper, which studied a structured group diabetes education program of six hours, which was delivered in the community, with follow-up for three years. The research found no statistically significant difference of physical activity[30]. The difference between the results of the current study and the abovementioned study is because the abovementioned study used group education, did not use educational boosters, and used long-term follow-up. However, the present study used a mix of individual and group education, which was boosted every month and used short-term follow-up. The results of the present study are consistent with a previous study, which found the improvements in eating control and step counts after receiving meal preparation

training[31]. Yet another previous study found the association between the knowledge of preventive behaviors regarding foot ulcers and actual preventive behaviors[32] to be consistent with the present study, which found the participants in the intervention group increased their knowledge score and improved their foot behaviors after receiving the LCDC program.

The results of the present study show knowledge and attitude toward oral health and DM in the elderly with type 2 diabetes translated to practice in both oral health and DM. This was consistent with Rise et al, 2013, who found that knowledge was essential for making lifestyle change following education[33].

The major strength of the present study was a high response rate (98.5%). The limitations of the present study were lack of random assignment due to the quasi-experimental design, selection bias from the willingness to participate, and it was not representative of the entire elderly population with type 2 diabetes because of the small number of centers involved in this study. However, the LCDC program had the effectiveness and acceptability to be adapted into routine work of the staff, which could be implemented to other health centers. The single-blind technique might cause measurement bias. Furthermore, the use of participant's reports to evaluate practice toward DM and oral health behaviors were subject to some degree of measurement error.

Future studies need to incorporate a longer follow-up period to generate understanding of intervention effects, adherence, and sustainability over time, by randomized controlled trial. Application of the LCDC program and measurement tools in the other groups of population to create a standardize program for all of the elderly with type 2 diabetes also needed.

Conclusion

The results of the present study showed the effectiveness of the LCDC program by improving KAP toward oral health and DM, which was sustained for six months.

What is already known on this topic?

The elderly have been increased in the prevalence of DM and oral manifestations of DM including periodontal disease. Diabetes intervention programs improve KAP toward DM, and periodontal intervention program improved periodontal status. However, periodontal diseases and DM have a dual adverse relationship, so only diabetes or periodontal intervention programs are not enough to prevent dental complications.

What this study adds?

A LCDC program that combined lifestyle change and periodontal care by using the Common Risk Factor approach improved KAP toward oral health and DM in the elderly with type 2 diabetes, which was sustained for six months.

Potential conflicts of interest

None.

References

1. National Statistical Office (NSO). Report of the 2007 survey of the older person in Thailand. Bangkok, Thailand: Bureau of Socio-Economic and Opinion 1, NSO; 2007.
2. Albert DA, 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, Taylor GW. The relationship between oral health and diabetes mellitus. J Am Dent Assoc 2008; 139 (Suppl): 19S-24S.
4. World Health Organization (WHO). Global status report on noncommunicable diseases 2010: Description of the global burden of NCDs, their risk factors and determinants. Geneva: WHO; 2011.
5. National Health Examination Survey Office (NHESO). The fourth Thai national health examination survey 2008-2009. Bangkok: NHESO; 2009.
6. 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.

7. Wiebe CB, Putnins EE. The periodontal disease classification system of the American Academy of Periodontology—an update. J Can Dent Assoc 2000; 66: 594-7.

8. Bureau of Dental Health, Ministry of Public Health, Thailand. The Seventh Thai national oral health survey [Internet]. 2012 [cited 2013 Jun 18]. Available from: http://dental.anamai.moph.go.th/oralhealth/PR/E-book/Survey/survey7th.pdf2013.

9. Guo XH, Yuan L, Lou QQ, Shen L, Sun ZL, Zhao F, et al. A nationwide survey of diabetes education, self-management and glycemic control in patients with type 2 diabetes in China. Chin Med J (Engl) 2012; 125: 4175-80.

10. Pereira DA, Costa NM, Sousa AL, Jardim PC, Zanini CR. The effect of educational intervention on the disease knowledge of diabetes mellitus patients. Rev Lat Am Enfermagem 2012; 20: 478-85.

11. Hernandez-Tejada MA, Campbell JA, Walker RJ, Smalls BL, Davis KS, Egede LE. Diabetes empowerment, medication adherence and self-care behaviors in adults with type 2 diabetes. Diabetes Technol Ther 2012; 14: 630-4.

12. Hartayu TS, Mi MI, Suryawati S. Improving of type 2 diabetic patients' knowledge, attitude and practice towards diabetes self-care by implementing Community-Based Interactive Approach-diabetes mellitus strategy. BMC Res Notes 2012; 5: 315.

13. Venditti EM, Wylie-Rosett J, Delahanty LM, Mele L, Hoskin MA, Edelstein SL. Short and long-term lifestyle coaching approaches used to address diverse participant barriers to weight loss and physical activity adherence. Int J Behav Nutr Phys Act 2014; 11: 16.

14. Yuen HK, Wolf BJ, Bandyopadhyay D, Magruder KM, Salinas CF, London SD. Oral health knowledge and behavior among adults with diabetes. Diabetes Res Clin Pract 2009; 86: 239-46.

15. Kim EK, Lee SG, Choi YH, Won KC, Moon JS, Merchant AT, et al. Association between diabetes-related factors and clinical periodontal parameters in type-2 diabetes mellitus. BMC Oral Health 2013; 13: 64.

16. Ou L, Li RF. Effect of periodontal treatment on glycosylated hemoglobin levels in elderly patients with periodontal disease and type 2 diabetes.

Chin Med J (Engl) 2011; 124: 3070-3.

17. Singh S, Kumar V, Kumar S, Subbappa A. The effect of periodontal therapy on the improvement of glycemic control in patients with type 2 diabetes mellitus: A randomized controlled clinical trial. Int J Diabetes Dev Ctries 2008; 28: 38-44.

18. Sun WL, Chen LL, Zhang SZ, Wu YM, Ren YZ, Qin GM. Inflammatory cytokines, adiponectin, insulin resistance and metabolic control after periodontal intervention in patients with type 2 diabetes and chronic periodontitis. Intern Med 2011; 50: 1569-74.

19. McGrath C, Lawrence HP, Blinkhorn A. Guest editorial on the Festschrift "Challenges in population oral health for the 21st century". Community Dent Oral Epidemiol 2012; 40 (Suppl 2): 1-4.

20. Centers for Disease Control and Prevention. Controlling your diabetes [Internet]. 2011 [cited 2013 Jun 27]. Available from: http://www.cdc.gov/diabetes/pubs/tcyd/control.htm2013.

21. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients: a systematic review and meta-analysis. Diabetes Care 2010; 33: 421-7.

22. Promsudthi A, Pimapansri S, Deerochanawong C, Kanchanavasita W. The effect of periodontal therapy on uncontrolled type 2 diabetes mellitus in older subjects. Oral Dis 2005; 11: 293-8.

23. Substance Abuse & Mental Health Services Administration (SAMHSA). Motivational Interviewing [Internet]. 2002 [cited 2013 Jun 30]. Available from: http://www.samhsa.gov/co-occurring/topics/training/motivational.aspx2013

24. Al Maskari F, El Sadig M, Al Kaabi JM, Afandi B, Nagelkerke N, Yeatts KB. Knowledge, attitude and practices of diabetic patients in the United Arab Emirates. PLoS One 2013; 8: e52857.

25. Upadhyay DK, Palaian S, Shanker PR, Mishra P. Knowledge, attitude and practice about diabetes among diabetes patients in Western Nepal. Rawal Med J 2008; 33: 8-11.

26. Ismaeil FM, Neima A. Diabetic patients knowledge, attitude and practice toward oral health. J Eedu Pract 2013; 4: 19-25.

27. Eknithiser R, Hongsranagon P, Havanond P. Knowledge, attitude, and practice (KAP) of diabetes mellitus type II patients in multidisciplinary program at diabetes mellitus clinic, Phanomphrai Hospital, Phanomphrai District, Roi-et Province, Thailand. J Health Res 2010; 24 (Suppl 2): 87-92.

28. Inoue M, Takahashi M, Kai I. Impact of communicative and critical health literacy on understanding of diabetes care and self-efficacy in diabetes management: a cross-sectional study of primary care in Japan. BMC Fam Pract 2013; 14: 40.

29. Bayat F, Shojaeezadeh D, Baikpour M, Heshmat R, Baikpour M, Hosseini M. The effects of education based on extended health belief model in type 2 diabetic patients: a randomized controlled trial. J Diabetes Metab Disord 2013; 12: 45.

30. Khunti K, Gray LJ, Skinner T, Carey ME, Realf K, Dallosso H, et al. Effectiveness of a diabetes education and self management programme (DESMOND) for people with newly diagnosed type 2 diabetes mellitus: three year follow-up of a cluster randomised controlled trial in primary care. BMJ 2012; 344: e2333.

31. Dasgupta K, Hajna S, Joseph L, Da Costa D, Christopoulos S, Gougeon R. Effects of meal preparation training on body weight, glycemia, and blood pressure: results of a phase 2 trial in type 2 diabetes. Int J Behav Nutr Phys Act 2012; 9: 125.

32. Kim SY, Hongsranagon P. Preventive behaviors regarding foot ulcers in diabetes type II patients at BMA health center no.48, Bangkok, Thailand. J Health Res 2008; 22 (Suppl): 21-8.

33. Rise MB, Pellerud A, Rygg LO, Steinsbekk A. Making and maintaining lifestyle changes after participating in group based type 2 diabetes self-management educations: a qualitative study. PLoS One 2013; 8: e64009.

โปรแกรมการปรับเปลี่ยนพฤติกรรมร่วมกับการดูแลสุขภาพช่องปากสามารถปรับปรุงความรู้ทัศนคติ และพฤติกรรมต่อสุขภาพช่องปากและโรคเบาหวานในผู้สูงอายุที่เป็นเบาหวาน

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ภูมิหลัง: ปัจจุบันความชุกของโรคเบาหวานเพิ่มขึ้นในผู้สูงอายุ การอักเสบเรื้อรังมีผลต่อการควบคุมเบาหวานและส่งเสริมการเกิดโรคแทรกซ้อนของโรคเบาหวาน

วัตถุประสงค์: เพื่อศึกษาประสิทธิภาพของโปรแกรมการปรับเปลี่ยนพฤติกรรมร่วมกับการดูแลสุขภาพช่องปากต่อความรู้ ทัศนคติ และพฤติกรรมต่อสุขภาพช่องปากและโรคเบาหวานในผู้สูงอายุที่เป็นเบาหวานชนิดที่ 2

วัสดุและวิธีการ: เป็นการศึกษาวิจัยกึ่งทดลอง (quasi-experimental study) ศึกษาในผู้ป่วยเบาหวานจำนวน 66 ราย ต่อกลุ่มที่มารับบริการที่ศูนย์บริการสาธารณสุข 54 (กลุ่มทดลอง) และศูนย์บริการสาธารณสุข 59 (กลุ่มควบคุม) ระหว่างเดือนตุลาคม พ.ศ. 2556 ถึง เมษายน พ.ศ. 2557 กลุ่มทดลองได้รับโปรแกรมการปรับเปลี่ยนพฤติกรรมร่วมกับการดูแลสุขภาพช่องปากประกอบด้วยการให้ความรู้รายกลุ่มเรื่องเบาหวานและสุขภาพช่องปาก ให้คำปรึกษารายบุคคลโดยใช้การบำบัดเพื่อเสริมสร้างแรงจูงใจ (motivational interviewing) อธิบายการใช้คู่มือการดูแลสุขภาพสำหรับผู้ป่วยเบาหวาน การให้ทันตสุขศึกษารายบุคคล นอกจากนี้ผู้ป่วยเบาหวานได้รับความรู้โดยใช้วีดิทัศน์เพื่อทบทวนความรู้ในทุกเดือน กลุ่มควบคุมได้รับการรักษาตามปกติ ผู้ป่วยเบาหวานได้รับการวัดผล 3 ครั้ง ก่อนการทดลอง 3 เดือน และ 6 เดือน วัดความรู้ ทัศนคติ และพฤติกรรมต่อสุขภาพช่องปากและโรคเบาหวานโดยใช้แบบสอบถาม วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา Chi-square test, Fisher's exact test และ repeated measure ANOVA

ผลการศึกษา: การติดตามผล 6 เดือน พบว่าผู้ป่วยเบาหวานกลุ่มทดลองมีความรู้และทัศนคติต่อสุขภาพช่องปากและโรคเบาหวานเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ ผู้ป่วยเบาหวานกลุ่มทดลองออกกำลังกาย ปรับเปลี่ยนอาหาร ได้รับการตรวจสุขภาพเท้าจากเจ้าหน้าที่ สวมใส่รองเท้าหุ้มส้นเป็นประจำ ตรวจสุขภาพเท้าด้วยตนเอง ใช้ไหมขัดฟัน และใช้แปรงซอกฟัน มากกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ

สรุป: การศึกษานี้แสดงถึงการปรับเปลี่ยนพฤติกรรมร่วมกับการดูแลสุขภาพช่องปาก เพิ่มความรู้ ทัศนคติ และพฤติกรรมต่อสุขภาพช่องปากและโรคเบาหวานในผู้สูงอายุที่เป็นเบาหวานชนิดที่ 2