ผลของการสร้างแรงจูงใจจากการสัมภาษณ์และโปรแกรมสุขศึกษาในระยะเวลา 1 ปี ที่มีต่อสารเคมีในเลือดของผู้ป่วยเบาหวานชนิดที่ 2

EFFECTS OF ONE-YEAR FOLLOW-UP OF A GROUP-BASED TYPE 2 DIABETES MOTIVATIONAL INTERVIEWING INTERVENTION AND HEALTH EDUCATIONAL PROGRAM ON THE BLOOD CHEMICAL LEVEL AMONG TYPE 2 DIABETES PATIENTS

ธัญญาวัฒน์ หอมสมบัติ*
Thanyawat Homsombat

คณะวิทยาศาสตร์การกีฬาและสุขภาพ มหาวิทยาลัยการกีฬาแห่งชาติ
Faculty of Sport Science and health, Thailand National Sports University

Received: 23 March 2021 Accepted: 28 Novemberh 2021

บทคัดย่อ

การให้โปรแกรมสุขศึกษาและการสัมภาษณ์เพื่อสร้างแรงจูงใจของผู้ป่วยเบาหวานชนิดที่ 2 ต่อระดับสารเคมีในเลือด เป็นการวิจัยกึ่งทดลองระยะเวลา 1 ปี เพื่อติดตามการให้โปรแกรมสุขศึกษาและการสัมภาษณ์เพื่อสร้างแรงจูงใจของผู้ป่วยเบาหวานชนิดที่ 2 ต่อระดับสารเคมีในเลือด กลุ่มตัวอย่างคือผู้ป่วยเบาหวานชนิดที่ 2 จำนวน 70 คน ที่โรงพยาบาลส่งเสริมสุขภาพตำบลหนองนาคำ อำเภอเมือง จังหวัดอุดรธานี ผู้ป่วยมารับยาทุกๆ 2 เดือน พยาบาลจะเจาะเลือดเพื่อตรวจหาค่าสารเคมีในเลือด จากนั้นจะได้รับโปรแกรมการให้สุขศึกษา และการสัมภาษณ์เพื่อสร้างแรงจูงใจ โดยค่าความเที่ยงตรง (Index of item objective congruence: IOC) ของโปรแกรมการให้สุขศึกษาเท่ากับ 0.78 และค่าความเที่ยงตรงของโปรแกรมการให้สุขศึกษาเท่ากับ 0.82 สถิติเชิงพรรณนา คือ ค่าเฉลี่ย ($\bar{X}$) และส่วนเบี่ยงเบนมาตรฐาน (S.D.) และ สถิติเชิงอนุมาน คือ paired t-test เพื่อเปรียบเทียบระดับสารเคมีในเลือดก่อนและหลังการทดลอง ที่ระดับนัยสำคัญทางสถิติ 0.05

* ผู้ประสานงาน: ธัญญาวัฒน์ หอมสมบัติ
อีเมล์: cmu_kku@hotmail.com

ผลการศึกษาพบว่ากลุ่มตัวอย่าง 70 คน เพศหญิง 62 คน (ร้อยละ 88.57) อายุเฉลี่ย 60 ปี (S.D. = 6.70) ดัชนีมวลกายส่วนใหญ่อยู่ในช่วงน้ำหนักเกิน 34 คน (ร้อยละ 48.57, เฉลี่ย = 25.03 (S.D. = 4.10) มีรอบเอวเกินค่ามาตรฐาน 12 คน (ร้อยละ 19.05) มีประวัติเป็นโรคเบาหวานและได้รับยา 1-12 ปี (เฉลี่ย 6.40 ปี) โดยมากที่สุดคือ น้อยกว่า 3 ปี ร้อยละ 40.00 รองลงมาคือ 10-12 ปี ร้อยละ 25.71 จากผลการศึกษาค่าเฉลี่ยของระดับน้ำตาลสะสมในเลือด (HbA1c) ก่อนและหลังการทดลองไม่แตกต่างอย่างมีนัยสำคัญทางสถิติ (p=0.71) เมื่อเปรียบเทียบระดับน้ำตาลในเลือดหลังอดอาหารอย่างน้อย 8 ชั่วโมง (FBS) ระหว่างก่อนการทดลองกับหลังการทดลองครั้งที่ 2 และหลังการทดลองครั้งที่ 5 และระหว่างหลังการทดลองครั้งที่ 2 กับหลังการทดลองครั้งที่ 5 ผลการศึกษาพบว่า แตกต่างกันอย่างมีนัยสำคัญทางสถิติ (F=2.49, p=0.03; F=4.22, p=0.04; F=4.21, p=0.04; F=4.21, p=0.04 ตามลำดับ) ในขณะที่ก่อนการทดลอง ระดับของไขมันในเลือดทุกชนิด พบว่าไม่แตกต่างจากค่าเฉลี่ยของไขมันในเลือดหลังการทดลอง (1 ปี) (p=0.67, p=0.43, p=0.81, p=0.55 ตามลำดับ)

คำสำคัญ: ระดับน้ำตาลในเลือด, โคเลสเตอรอล, โปรแกรมสุขศึกษา, การสัมภาษณ์เพื่อสร้างแรงจูงใจ

Abstract

The health educational program and motivational interviewing intervention towards the blood chemical level was a one-year quasi-experimental research aiming at following up on health educational programs and interviews to motivate the patients with type 2 diabetes on blood chemical level. The sample group comprised 70 type-2 diabetes mellitus (DM) patients in Nongnakham Sub-district Health Promoting Hospital, Muang District, Udon Thani Province. The patients came to Health Promoting Hospital every two months to receive the medication and the nurse would draw the patients' blood to test for blood chemical level both pre-intervention and post-intervention and there would be a face-to-face interview to educate the health educational program and motivate for changing behavior. The Index of Item Objective Congruence: IOC of the health educational program was 0.78. The validity of the health

educational program was 0.82. The descriptive statistic used were mean ($\overline{X}$), and standard deviation (S.D.). The inferential statistic used was paired t-tests for comparing the blood chemical levels both pre-intervention and post-intervention with the statistical significance at 0.05 level.

The research revealed that, among 70 DM patients, most of them were 62 female (88.57%), age average at 60 years old (S.D.=6.70), 34 DM patients had BMI in overweight level (48.57%, $\overline{X}$ = 25.03, S.D.=4.10), 12 female patients had over waist circumference (19.05%). Participants had DM record of diabetes and have been on medication for 1-12 years ($\overline{X}$ = 6.4 years), of those, most of them had DM underlying and took medication for less than 3 years (40.00%) followed by 10-12 years (25.71%). It was found that HbA1c level (pre-test) was not significantly different from HbA1c level (post-test) (p=0.71). For Fasting Blood Sugar (FBS) test, it was found that the FBS test comparison results between pre-test and 5th post-test, pre-test and 2nd post-test, and 2nd post-test and 5th post-test were significantly different (F=2.49, p=0.03; F=4.21, p=0.04; F=4.21, p=0.04, respectively). The results of Lipid Profile level comparison between pre-intervention and post-intervention reveal that all variables were not significantly different (p=0.67, p=0.43, p=0.81, and p=55 respectively).

Keywords: Fasting blood sugar, Total Cholesterol, Health Education Program, Motivational Interviewing Intervention

Introduction

High prevalence of Type 1 and 2 Diabetes Mellitus (DM) are increasing their worldwide (Roberto and Crisafulli, 2017). Especially type 2 DM has concerned medical problem due to obesity and metabolic syndrome, which has grown by highest proportions. One of these is increasing incidence of cardiovascular disease, especially patients who had these two pathologies, which has been significantly higher in DM patients when compared to normal

subjects. (Noble, 2015). Type 2 DM is a chronic metabolic disease influenced by chronic hyperglycaemia due to insulin resistance action at the skeletal muscles and the adipose cells and to be depleted in insulin secretion of ß cells (Padilla et al., 2015).

According to the American Diabetes Association reported that type 2 diabetes mellitus (TD2) is cause of death in world wide (Centers for Disease Control and Prevention, 2016) especially traditional diet behavior but lack of exercise leading to type 2 diabetes mellitus. In addition, they suggested that type 2 diabetes mellitus patients who received diet control program can decrease fasting blood sugar, blood pressure and lipid profile (Bantle et al., 2008). Most problems that prevent diabetic patients are changing diet local food culture behavior each a day and lack of motivation to change diet behavior (Miller, 2011).

There are several risk factors for the progression of Type 2 DM (T2DM) including family history, obesity, chronic physical inactivity, race or ethnicity, history of impaired fasting glucose, impaired glucose tolerance, HbA1c 5.7% to 6.4% (38.8 mmol/mol to 46.4 mmol/mol), hypertension, abnormal high-density lipoprotein cholesterol and/or elevated triglyceride levels. Lipid profile test is an appropriate method to plan for reduce complications as follow especially capillaries damage (Koro et al., 2004). Grundy et al. (2018) reported that the normal values of lipid profile consisted of total cholesterol < 200 mg/dL (< 5.1 mmol/L), triglycerides < 130 mg/dL (< 1.4 mmol/L), high-density lipoprotein cholesterol: (HDL-c) < 40 mg/dL (< 1.0 mmol/L) and low-density lipoprotein cholesterol: (LDL-c) < 130 mg/dL (< 3.4 mmol/L). Stratton et al. (2000) suggested that patients who were cholesterol > 170-199 mg/dL (4.3-5.1 mmol/ mol), triglycerides 90-129 mg/dL (1.0-1.5 mmol/L), high-density lipoprotein cholesterol: (HDL-c) 40-45 mg/dL, 1.0-1.2 mmol/L) and low-density lipoprotein cholesterol: (LDL-c) 110-129 mg/dL, 2.8-3.3 mmol/L) significant associated with capillaries damage.

Motivational Interviewing (MI) is a collaborative, person-centred approach to working with people in order to elicit and strengthen their motivation and commitment to change. It has been found to be more effective than traditional advice-giving in the treatment of a range of behavioral problems and diseases, including diabetes (Resnicow et al., 2015). According to Miller & Akohoue (2017) who studied the effect of two-year follow-up of a group-based type 2 diabetes for health education therapy and motivational interviewing intervention in 12 American DM patients. They found that, total cholesterol in post-intervention (8.8%) had decreased significantly compared with total cholesterol in pre-intervention (10.25%), and the behavior of eating high fat foods had decreased but the behavior of fruit and vegetable intake had increased. On the other hand, Whittemore et al. (2004) found that total cholesterol had not significantly different when compared between food intake group and exercise behavior modification group

In Thailand, department of control disease, Ministry of public health (2018) reported that the number of non-communicable disease patients especially diabetes had been increasing every year from 2012-2014. In 2012-2014, DM cases were 674,826, 698,720 and 670,664, respectively. In Udon Thani province, in 2012-2014, DM cases were 16,708, 17,853, 18,140, respectively. (Ministry of public health, 2018). The statistics of total population of Nongnakham sub-district, muang district, Udon Thani province (2017), total 475 DM patients (311 type 2 diabetes mellitus patients (HbA1c 7.00-10.00 %) who take medication at Nongnakham primary care unit) (Nongnakham Primary Care Unit, 2018). The processing of treatments of DM patients at Nongnakham primary care unit consists of medication, draw blood sampling by a nurse to test blood chemistry, health education and motivational interviewing (MI) to help DM patients understand better about their sickness and its preventive measures. The real problem of the villagers is poverty that increases their risk factors. Most of the

people are poor that every day they had a traditional Northeast Thailand diet which is very spicy and high in sugar and salts, the risk factors of type 2 diabetes mellitus. Therefore, the means to decrease high risk of type 2 diabetes mellitus (DM) is the evaluation of health education program and motivational interviewing intervention. Therefore, the 1 year quasi-experimental study aimed to investigate the effect of one-year follow-up of a group-based type 2 diabetes health education program and motivational interviewing intervention on blood chemistry among type 2 diabetes mellitus (DM) patients for 1 year.

Materials and Method

1. Subjects

The quasi-experimental study had 1 year (1 october 2017-30 september 2018) quasi-experimental study. Subjects were 70 patients with type 2 diabetes mellitus by purposive random sampling at the Nongnakham primary care unit, Muang district, Udon Thani province. For the Inclusion criteria; ages 35-70 years old who were underlying 2 diabetes mellitus (HbA1c 7.10-10.00%) and take medication less than 1 year. All of them had drawn blood sampling by a nurse to test blood chemistry 2 times (pretest and post-test) 1 years ago.

2. Intervention

The intervention group received health education program and the contents was designed unit base on MI theory as follow. First, all participants visited Nongnakham primary care had blood sampling by a nurse to test blood chemistry (pretest-posttest) followed by a face to face health education program and the standardized health education program. The results revealed that the score of item-objective congruence index (IOC) was 0.78 in overall items of health education program and 0.82 in in overall items of motivational interviewing intervention, consist of:

2.1 Seven domains of motivation which were as followed my activities of daily living has caused problems for other people, I take medication continuously, some people think that I can't be DM, Being that I having to lie to other people just to take medication to make me unhappy, Some people try to avoid me when I am taking medication, Taking medication makes work lost, My family feel disappointed because of my take medication, and I lose trust and respect from my family because of take medication).

2.2 Ten domains of problems and obstacles which were as followed I like myself more when I take medicine for DM, Taking medication helps me to deal with problems, Taking medication makes me fun and can get along with other people, Taking medication makes me a fun person, Taking medication allows me to fully express, Taking medication gives me strength and keeps my life going, I feel more confident when I take medicine, If I am not take medication makes me feel bored and lifeless, my family like me more when I take medication and Not take medication makes me feel bad).

2.3 Eleven domains of motivational interviewing which were as followed I want to seriously change my take medication, If I don't change about medication soon, I will get worse, I have started to change about my medication, I am not just thinking about changing my medication habits, but I am preparing to do something, I have started to change my medication, I am seriously trying to reduce medication, I need help to return to take medication, I know that I have a problem with medication, There are times when I suspect that I use too much of medication, I try a lot to change my medication habits and I have changed something about take medication.) (Toobert et al., 2000).

After each diabetic patient receives MI- the points are collected and interpreted as follows: item 1, 3, 14 and 19 (4-20-points) are recognition item 16 (1-5-points) ambivalence, and item 4, 8, 9, 13, 15 and 16 (6-30-points) are taking-steps. Second, all patients received motivational interviewing (MI). This

is a collaborative, person-centred approach to working with people in order to elicit and strengthen their motivation and commitment to change. It has found to be more effective than traditional advice-giving in the treatment of a range of behavioral problems and diseases, including diabetes (Miller and Rollnick, 2002). According to expertise, they found that motivational interviewing has been more effectiveness to decreased total cholesterol and triglycerides than general health education (Whittemore et al., 2004). Finally, all patients received the standard checklist of follow-up motivational interviewing (Lane et al., 2005), consisting of 11 domains of behavior change (likert scale 0-4, 0 = never, 1 = rarely, 2 = sometime, 3 = often, 4 = always). Interpretation of the score as recognition (20. Points is always, 17 - 19.is often, ≥ 16- is-sometime), ambivalence: (5 points is always, 4. is often, ≥ 3.is sometime), taking steps: (28 - 30-points is always, 25-27 is often, ≥ 24 is sometime)

3. Statistical analysis

Statistical analysis used STATA 13 and Texus USA 2007. S-wilk test was used to test the normal distribution of values. Descriptive statistics were frequency, percentage, mean and standard deviation (S.D.) to express demographic and body composition. Inferential statistic was paired t-test used to compare blood chemistry (pre-test and post-test) at 95% confidence interval. We used $p < 0.05$ as the cut-off point of statistical significance (Miller, 2002).

Results

1. Demographic and body composition (base line)

Most participants were female (n = 63, 90.00%), age between 35-75 years old ($\overline{X}$ = 60, S.D. = 6.70), some of them were overweight (n = 32, 45.71%, $\overline{X}$ = 25.02, S.D. = 4.20), all males had standard waist circumference but 12 females had over standard waist circumference (19.05%). All participants had average underlying type 2 diabetes mellitus 6.40 years (0.7-14 year). (Table 1)

2. HbA1c level

The use of an ANOVA assumes that all the populations are normal distributed, all the populations variances are equal and all the samples were taken independently of each other and are ramdomly collected from their population (Munro, 2005). The results of HbA1c level found that HbA1c level (pre-test) was not significantly different from HbA1c level (post-test) (p=0.71). The results of fasting blood sugar (FBS) found that FBS (pre-test) was significantly different from FBS (post-test) (F=2.49, p=0.03). (Table 2).

2.1 Comparison between fasting blood sugar (FBS) (pre-test) and FBS (2nd time intervention)

The results of fasting blood sugar (FBS) found that FBS (pre-test) was significantly different from FBS (2nd time intervention) (F=4.22, p=0.04). (Table 3)

Table 1 Demographic and body composition (pre-test)

Variable	n (%)	Variable	n (%)
Sex		**Waist circumference (male)**	
Male	7 (10.00)	Standard	7 (100)
Female	63 (90.00)	Over standard (>90 cm)	0 (0)
Body mass index (BMI)		**Waist circumference (female)**	
Under weight (≤19.99)	7 (10.00)	Standard	51 (80.95)
Healthy weight (20-24.99)	31 (44.29)	Over standard (>80 cm)	12 (19.05)
Over weight (≥ 25)	32 (45.71)		
$\bar{X}$=25.02 (4.20) Min-max (17.31-38.05)		$\bar{X}$=75.05 (5.66) Min-max (56-95)	
Age (year)		**DM underlying**	
30-39		≤ 3 years	28 (40.00)
40-49	4-6 years	4-6 years	14 (20.00)
50-59	7-9 years	7-9 years	3 (4.29)
60-69	10-12 years	10-12 years	18 (25.71)
≥70	≥13 years	≥13 years	7 (10.00)
$\bar{X}$=60 (6.70) Min-max (35-75)		$\bar{X}$=6.40 (4.39) Min-max (0.7-14.00)	

Table 2 HbA1c level and Fasting blood sugar (FBS) (Within group)

Source	SS	df	MS	F	p
HbA1c level				0.14	0.71
Time	0.11	1	0.11		
Error	54.24	69	0.79		
Fasting blood sugar (FBS)				2.49	0.03
	121377.39	5	24275.48		
	3360441.44	345	9740.41		

Table 3 Comparison between fasting blood sugar (FBS) (pre-test) and FBS (2nd time intervention)

Source	SS	df	MS	F	p
Fasting blood sugar (Within group)				4.22	0.04
Time	4050.64	1	4050.64		
Error	66153.44	69	958.75		

2.2 Comparison between fasting blood sugar (FBS) (pre-test) and FBS (5st time intervention)

The results of fasting blood sugar (FBS) found that FBS (pre-test) was significantly different from FBS (5st time intervention) (F=4.21, p=0.04). (Table 4)

Table 4 Comparison between fasting blood sugar (FBS) (pre-test) and FBS (5st time intervention)

Source	SS	df	MS	F	p
Fasting blood sugar (Within group)				4.21	0.04
Time	3235.21	1	3235.21		
Error	52985.29	69	767.90		

2.3 Comparison between fasting blood sugar (FBS) (2nd time intervention) and FBS (5st time intervention)

The results of fasting blood sugar (FBS) found that FBS (2nd time intervention) was significantly different from FBS (5st time intervention) (F=4.21, p=0.04). (Table 5).

Table 5 Comparison between fasting blood sugar (FBS) (2nd time intervention) and FBS (5st time intervention)

Source	SS	df	MS	F	p
Fasting blood sugar (Within group)				4.21	0.04
Time	1351.61	1	1351.61		
Error	109021.89	69	1580.03		

3. Total cholesterol and triglycerides

At pre-test and post-test as total cholesterol mean were 190.21 and 187.16, respectively, triglycerides mean were 167.80 and 160.93, respectively. The results of total cholesterol and triglycerides found that both variables (pre-test) were not significantly different post-test (p=0.67 and p=0.55, respectively). (Table 6).

Table 6 Total cholesterol and triglycerides at pre-test and post test (n=70)

	Paired Differences					t	df	p-value
	Mean different	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Total cholesterol	3.06	60.36	7.21	-11.33	17.45	0.42	69	0.67
Triglycerides	6.88	95.53	11.48	-15.90	29.66	0.60	69	0.55

3.1. High-density lipoprotein cholesterol: HDL-C) and Low-density lipoprotein cholesterol (LDL-C)

At pre-test and post-test as HDL-c mean were 43.96 and 45.47, respectively, LDL-C mean were 112.08 and 110.56, respectively. The results of HDL-C and LDL-C found that both variables (pre-test) were not significantly different post-test (p=0.43 and p=0.81, respectively). (Table 7)

Table 7 HDL-C and LDL-C at pre-test and post test (n=70)

	Paired Differences					t	df	p-value
	Mean different	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
HDL-C	-1.51	16.09	1.92	-5.35	2.32	-0.79	69	0.43
LDL-C	1.53	52.10	6.23	-10.89	13.95	0.25	69	0.81

Discussion and conclusion

From the results of the study, it was found that the average blood glucose level (HbA1c) before the experiment (8.42%, SD=1.28) was not significantly different from HbA1c level (post-test) (p=0.71), may be because all the samples studied were diabetic patients with HbA1c values not exceeding 10% and they can control the sugar level manually, while more than 10 % of HbA1c diabetic patients are sent to receive treatment in a medical facility with a doctor later. American Diabetes Association (ADA) (2016) has reported that Hemoglobin A1c (HbA1c) has been a standard test of long-term average blood glucose control for patients with type 2 diabetes (T2D) for more than a decade, and blood levels above accepted thresholds are used to diagnose both pre-diabetes (between 5.7 and 6.4%) and diabetes (above 6.4%). While it is uniformly accepted that higher HbA1c levels are associated with greater risk

of complications from diabetes, as well as the incidence of other diseases, the targets for reducing this biomarker in people with existing diabetes remain open to debate. In particular, aggressive pharmaceutical therapy increases both side effects and costs, which need to be considered when assessing the net benefits accrued from meeting specific HbA1c targets. The American Association of Clinical Endocrinologists and American College of Endocrinology (AACE/ACE) (2015) confirmed that the panel recommends that HbA1c be universally adopted as the primary method of assessment of glycemic control. On the basis of data from multiple interventional trials, the target for attainment of glycemic control should be HbA1c values ≤6.5%. This level is three standard deviations above the mean HbA1c value in nondiabetic populations.In addition, the results FBS (pre-test) were significantly different from FBS (post-test), FBS (pre-test) was significantly different from FBS (2^{nd} time intervention), FBS (pre-test) was significantly different from FBS (5^{st} time intervention) and FBS (2^{nd} time intervention) was significantly different from FBS (5^{st} time intervention).

Diabetes is a chronic disease that is difficult to control. Therefore, the treatment team must have an algorithm to adjust the care depending on FBS and HcA1c. This study provides a health education program and followed up for blood sugar levels every 2 months, therefore, diabetes patients can control blood sugar levels by themselves. They must re-check a validated marker of short-term glycemic control, especially fructosamine and 1,5 anhydroglucitol (1,5 AG). Fructosamine is measure of glycated serum proteins depicts relatively short-term changes (1-2 weeks) in glycemic status. Hence they may be utilised in certain situations like gestational diabetes or in those where HBA1c is unreliable (Lindsey et al, 2004). 1,5 anhydroglucitol (1,5 AG) is a validated marker of short-term glycemic control. It is a metabolically inert polyol that competes with glucosefor reabsorption in the kidneys. Otherwise stable levels of 1, 5-AG are rapidly depleted as blood glucose levels exceed the renal

threshold for glucosuria. 1,5-AG more accurately predicts rapid changes in glycemia than hemoglobin A1C (A1C) or fructosamine (Dungan, 2008).

The present results of total cholesterol, triglycerides, HDL-C and LDL-C (pre-test) found that were not significantly different from total cholesterol, triglycerides, HDL-C and LDL-C (post-test) ($p = 0.67$, $p = 0.43$, $p = 0.81$, $p = 0.55$, respectively. Dsylipidemia is a chronic disease that is quite difficult to control. Therefore, the medical team must have a plan for treatment over a long time period and may change the treatment plan from time to time because the cholesterol level can rise or fall within a day or 2-3 days, depending on the health care behavior of patients. In this study is a health education program every 2 months for 1 year, therefore may make patients with high blood cholesterol unable to control cholesterol levels, particularly in those who do not strictly control health care behavior. While, Boren et al. (2009) supported that health education program for long period may be not can reduce total cholesterol. Therefore the cooperation between diabetic patients and medical team are benefit. According to Hemmati et al. (2017) found that the best practice of health education program is face to face health education program, nevertheless it difficult way for many diabetic patients. So the most time-saving way is to give out brochures or booklets, including video teaching or listening the radio. But these methods have not yet been confirmed studies that can change the behavior of diabetic patients.

This research does not change any variables. This may be because MI is not suitable for changes in blood chemistry levels because of the reduction in lipid levels may take longer period, including many other treatment methods. Present study is the routine to research of nurse practice among DM patients who were take medication at Nongnakham primary care unit, Muang district, Udon Thani. For further study should be study in a large group to get results

that can actually apply to real change behavior DM patients for reduce blood lipid level.

References

American Association of Clinical Endocrinologists and American College of Endocrinology. (2015). Clinical practice guidelines for developing a diabetes mellitus

Bantle, J. P. Wylie-Rosett, J., Albright, A. L., Apovian, C. M., Clark, N. G., Franz, M. J., Hoogwerf, B. J., Lichtenstein, A. H., Mayer-Davis, E., Mooradian, A. D., & Wheeler M. L. (2008). Nutrition recommendations and interventions for diabetes: a position statement of the American Diabetes Association. *Diabetes Care*, *31*(1), S61–S78.

Boren, S. A., Fitzner, K. A. Panhalkar, P. S., & Specker, J. E. (2009). Costs and benefits associated with diabetes education: a review of the literature. *The Diabete Educator*, *35*(1), 72–96.

Dungan, K. M. (2008). 1, 5-anhydroglucitol (GlycoMark) as a marker of short-term glycemic control and glycemic excursions. *Expert Rev. Mol. Diagn*, *8*(9), 9–19.

Grundy, S. M., Stone, N. J., Bailey, A. L., Beam, C., Birtcher, K. K., Blumenthal, R. S., Braun, L. T., de Ferranti, S., Faiella-Tommasino, J., Forman, D. E., Goldberg, R., Heidenreich, P. A., Hlatky, M. A., Jones, D. W., Lloyd-Jones, D., Lopez-Pajares, N., Ndumele, C. E., Orringer, C. E., Peralta, C. A., Saseen, J. J., Smith Jr, S. C., Sperling, L., Virani, S. S., & Yeboah, J. (2018). Guideline on the Management of Blood Cholesterol: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Circulation, 139*(25), 1-11.

Hemmati, M. M., Razmara, S., & Niazkhani, Z. (2017). Effects of Face-to-Face and Telephone-Based Family-Oriented Education on Self-Care Behavior and Patient Outcomes in Type 2 Diabetes: A Randomized Controlled Trial. *Journal of Diabetes Research*, *11*, 1-10.

Koro, C. E., Bowlin, S. J., Bourgeois, N., & Fedder. D. O. (2004). Glycemic Control From 1988 to 2000 Among U.S. Adults Diagnosed With Type 2 Diabetes A preliminary report. *Diabetes Care 27*(1): 17-20.

Lane, C., Huws-Thomas, M., Hood, K., Rollnick, S., Edwards, K., & Robling, M. (2005). Measuring adaptations of motivational interviewing: The development and validation of the behavior change counseling index (BECCI). *Patient Educ. Couns*, *56*(3), 166-173.

Lindsey, C. C., Carter, A. W., Mangum, S., Dorothy Greene, D., Richardson, A., Brown, S. J., Essary, J. L., & McCandless, B. (2004). A prospective, randomized, multicentered controlled trial to compare the annual glycemic and quality outcomes of patients with diabetes mellitus monitored with weekly fructosamine testing versus usual care. *Diabetes Technol Ther, 6*(7), 370–7.

Miller, W. R., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for change*. New York: Guilford Press. p. 271.

Miller, S. T. (2011). Diabetes and psychological profile of younger rural African American women with type 2 diabetes. *J. Health Care Poor Underserved*, *22*(4), 1239-1252.

Miller S. T. & Akohoue S. A. (2017). Two-year follow-up study of a group-based diabetes medical nutrition therapy and motivational interviewing intervention among African American women. *Patient Relat Outcome Meas. 15*(8): 57-61.

Ministry of Public Health. (2018). *Thailand Noncommunicable Disease and Injury Behavior Risk Surveillance Survey*. Retrieved September 23, 2018, from http://ghdx.healthdata.org/record/thailand-noncommunicable-disease-and-injury-behavior-risk-surveillance-survey-2018

Munro, B. H. (2005). *Statistical methods for health care research (5th ed.)*. Philadelphia: Lippincott Williams & Wilkins.

Nongnakham primary care unit. *Statistics of patients*. (2018). Nongnakham primary care unit, Muang district, Udon Thani province. Department of control disease, Ministry of public health. Retrieved September 23, 2018, from http://www.thaincd.com/2016/mission/documents.php?tid=32&gid=1020&searchText=& pn= 2.

Noble, J. A. (2015). Immunogenetics of type 1 diabetes: *A comprehensive review J. Autoimmun*, *64*(7), 101-12.

Padilla, J., Olver, T. D., Thyfault, J. P., & Fadel, P. J. (2015). Role of habitual physi cal activity in modulating vascular actions of insulin. *Exp. Physiol*, *100*(12), 759-771.

Kenneth Resnicow, K., McMaster, F., Bocian, A., Harris, D., Zhou, Y., Snetselaar, L., Schwartz, R., Myers, E., Gotlieb, J., Foster, J., Hollinger, D., Smith, K., Woolford, S., Mueller, D., &d Wasserman, R. C. (2015). Motivational interviewing and dietary counseling for obesity in primary care: An RCT. *Pediatrics, 135*(4), 649-657.

Roberto, S., & Crisafulli, A. (2017). Consequences of Type 1 and 2 Diabetes Mellitus on the Cardiovascular Regulation During Exercise: A Brief Review. *Current Diabetes Reviews*, *13*(6), 560-565.

Stratton. I. M., AAdler, A. I., Neil, H. A., Matthews, D. R., Manley, S. E., Cull, C. A., Hadden, D., Turner, R. C. and Holman R. (2017). Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ. 12*(321): 405-12.

Toobertm, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes Care*, *23*(7), 943–950.

Whittemore, R., Melkus, G. D., Sullivan, A., & Grey, M. (2004). A nurse-coaching intervention for women with type 2 diabetes. *Diabetes Educ, 30*(3), 795-804.