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The Effect of Health Education on Control Glycemic at Type 2 Diabetes Mellitus Patients

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Abstract

AIM: The aim of this study was to evaluate the effect of short-term education on glycemic control (glycated hemoglobin [HbA1c] and fasting blood sugar [FBS]) among type 2 diabetes mellitus patients attending to primary health care (PHC) in Medan Johor of North Sumatera, Indonesia.

METHODS: The study was performed on type 2 diabetes mellitus patients in Johor PHC, Medan of North Sumatera, on 40 patients with type 2 diabetes mellitus. We took the samples of all the patients of type 2 diabetes mellitus who attend PHC in Medan Johor. The patients received for 3 months intervention by education. An educational course of diabetes together with exercise training and nutritional education was designed for the study population in order to increase the patients' knowledge and attitude toward diabetes and to increase their participation in the self-monitoring of glycemic control. Samples of FBS and HbA1c were recorded for each patient at the time of the baseline survey, then health education was conducted to the diabetic patients of both sexes attending PHC. The patients received standard advice on diet management and variation about activity. We put HbA1c <6.5% as cut limit for the control of diabetes mellitus.

RESULTS: All 40 type 2 diabetes patients completed the educational course. The mean of age of the samples is 62.53 years old, the mean of body mass index was 24.81 kg/m, and the mean of waist size was 92.15 cm. Before the education, the mean of FBS level was 238.83 mg/dl and the mean of Hba1c value is 8.90%. After education, the FBS was 216.88 mg/dl, the mean of HbA1c value was 8.74%.

CONCLUSION: The effect of health education in Johor Public Health Care Medan city reduced glycemic control (FBS) in type 2 diabetes mellitus patients, North Sumatera, Indonesia.

Introduction

Diabetes mellitus is a metabolism disorder, a major clinical, and public health problem. In 2011, the global prevalence of diabetes was 366 million and caused 4.6 million deaths [1]. This figure is expected to rise to 552 million by 2030 and will be the 7th leading cause of death [1], [2]. Indonesia is the world's fourth most populated country, has the seventh-largest number of diabetic patients (7.6 million), and despite relatively low prevalence (4.8%, including both diabetes type 1 and 2 in individuals aged 20–79 years) in 2012 [3]. The prevalence of diabetics in North Sumatra in 2013 was 1.8% higher than the national rate, and the results of the previous Indonesian Basic Health Research were 0.8% and 2.3%, the prevalence of diabetes diagnosed by doctors based on symptom interviews was also higher than the national figure (2.1%) [4]. Diabetes mellitus is an important health problem due to its high morbidity and mortality [5]. The prevalence of diabetes mellitus in urban Indonesia is 5.7% [6], and the incidence of diabetes mellitus is starting to rise at a younger age [7].

American Diabetes Association (ADA) suggested glycemic control as one of the important strategies for the management of type 2 diabetes mellitus and glycosylated hemoglobin which is the best measure of glycemic level over the previous 3 months [8]. The management of diabetes is dependent to a great extent on the affected person's own abilities to carry out self-care in his daily lives and patients' educations are considered an essential component of achieving this objective [9]. There is evidence that people affected with the disease often have inadequate knowledge about the nature of diabetes, its risk factors and associated complications, and that this lack of awareness may be the underlying factor affecting attitudes and practices toward its care [10]. Stabilization of blood glucose is the primary goal of diabetes management [11]. This depends on carrying out a number of different self-care behaviors and complex management regimens involving exercise, dietary modification, foot care, self-monitoring glycemic control, and administration of medications [12]. Giving education for diabetes mellitus patients, consequent improvement in knowledge, attitudes, and skills, leads to better control of the disease and is widely accepted

to be an integral part of comprehensive diabetes care [13]. Many factors are shown to affect the health of individuals and communities. One of these factors is the low education level, which is linked with poor health, more stress, and lower self-confidence [14]. It was documented in some studies that low educational status had been associated with a negative effect on glycemic control [15], while others have shown that educational status had no effect on glycemic control [16]. Diabetes education is considered to be essential in reaching good glycemic control [17].

The aim of this research was to provide health education for type 2 diabetes mellitus education to increase the knowledge of self-management principles and skills to achieve sufficient glycemic control.

Methods

Patients were recruited from Medan Johor Primary Health Care (PHC), North Sumatera, Indonesia. This was conducted from April to September 2018, we took 40 samples of type 2 diabetes mellitus who attend for controlled from this PHC. This is a quasi-experimental research with one group pretest-posttest design. In accordance with the inclusion criteria which are: age> 40 years old and cooperative and have a will to join this research, and exclusion criteria which are: letter less, seriously ill such as cardiovascular disease, and the middle of cancer therapy. All participants gave written, informed consent to participate in the study. This research was approved by Health Research Ethical Committee, Medical Faculty of University of Sumatera Utara/H. Adam Malik General Hospital by number 591/TGL/KEPK FK USU-RSUP HAM/2017.

Before starting education activities, each sample we examine weight, height, waist size, blood pressure, and laboratory tests such as fasting blood sugar (FBS) levels and glycated hemoglobin (HbA1c). FBS of samples were measured using a portable measuring instrument (Gluco DR). Blood samples were collected (using syringe) twice before and after intervention by education and transferred to Pramita Clinic Laboratory immediately to be conducted glycosylated hemoglobin test by HPLC method.

The participants completed a general information form included question on age, marital status, family history of the disease, duration of the disease, clinical characteristics, awareness of diabetic complications, taking oral diabetic or insulin injection, smoking, following any diet, daily activity, education level, and job. We recorded the last reading for HbA1c for each patient. Education intervention was conducted in type 2 diabetes mellitus samples for 3 months containing lectures and discussion. At the meetings, they were recommended and gave the information about diabetes and its complications, proper diet, exercise every day at least 30 min such as bike, walking, and aerobic, taking education regularly as directed by the physician, self-monitoring patient's blood sugar, diabetic foot care, and not smoking. Each giving education, we always examine weight, waist size, blood pressure, and FBS.

The education services included, about self-management plan like examined FBS by self with the portable measuring instrument, and injected insulin by self, knowledge about glycemic control by HbA1C every 3 months. Since almost all patients did not know about HbA1c, they just know that FBS examination was enough for glycemic control. We explain about using our country's health insurance for every control in the PHC. Furthermore, we gave the patient diet and exercise management. Giving the education for diabetes mellitus patients was necessary for increasing of the understanding the patients about the disease because there were still many type 2 diabetes mellitus patients that have a lack of knowledge about the management of the disease both about the diet and the physical exercise. We advised the patients for exercise every day minimal for 30 min. Every month until 3 months, we gave the education and we always examine FBS the patients every month and in the 3rd month, we examined HbA1c for the patients. In this study, we determined HbA1c <6.5% as an indicator for the control of type 2 diabetes mellitus. The continuous data were expressed as the mean ± standard deviation (SD). Shapiro–Wilk test was used for checking the normality of distribution. If the data were normally distributed, a t-test was used. Otherwise, a nonparametric test was applied.

Results

The samples of the study in Johor of Public Health Care were 40 subjects. The number of female subjects was 30 (75%) and male was 10 (25%), achieved the assigned target of interviews before and after intervention. The demographic data were gender, age-group, education level, family history, and type of treatment Table 1. We gave the leaflet for the samples which the content about the management diet and physical exercise. The education for 3 months was only about the management diet, physical exercise for the samples, and complication the illness. We recommended blood sugar level examination of the samples once a month and Hba1c value examination every 3 months. The samples who received health education were the same with pre-education. We tried to encourage the sample to follow the diet and exercise arrangements as contained in the leaflet that we provide.

Table 1: The content of the education program for the patients

Management diet		
Menu for breakfast	Menu for lunch	Menu for dinner
100 gr red rice bread	150 g red rice	100 gr red rice or 1–4 sheet of
100 gr boiled vegetables	1 bowl of vegetables	1–2 grilled eggplant
One egg	50 g sweet and sour fish	500 g grilled chicken 1 pear
½ avocado	1 piece of tofu meatballs	
	1 orange	
Management physical exercise		
Kind of physical exercise	Duration of sports	
Jogging	Ideal time about 20–60 min 3–5 times in a week,	
Cycling	Duration for DM with obesity must reach 60 min	
Brisk walking		
Swimming		
Gymnastics		
Aerobic		

The baseline of the characteristic of the samples, the mean of age was 62.53 ± 7.81 years old, the mean of body mass index of the samples was 24.81 ± 3.18 kg/m, the mean of the waist size of the samples was 92.15 ± 8.62 cm, the mean of FBS of the samples was 238.83 ± 88.75 mg/dl, and the mean of HBA1c of the samples was 8.90 ± 1.81% [Table 2].

Table 2: Respondent characteristic

Parameter	n	%
Gender		
Male	10	25
Female	30	75
Age group		
Early elderly (40–55 y)	11	27.5
Further elderly (55–65 y)	15	37.5
Seniors (>65 y)	14	35
Education levels		
Primary high school	2	5
Junior high school	12	30
Senior high school	14	60
Academy university	2	5
Familial history		
Maternal history	4	10
Paternal history	6	15
Not knowing	30	75
Management of diet		
Regular	12	30
Irregular	28	70
Type of physical activity		
Jogging	15	37.5
Aerobic	3	7.5
Cycling	-	-
No activity	22	55
Type of treatment		
Oral diabetic	38	95
Insulin injection	2	5

This study aimed to analyze the comparison of HbA1c and FBS levels in type 2 diabetes mellitus pre-intervention (pre-test) and post-intervention (post-test) with education, so we used the statistical analysis with the continuous data were expressed as the mean ± SD. Shapiro–Wilk test was used for checking the normality of distribution [Table 3].

Table 3: Baseline characteristic of the participants

Parameter	n	Descriptive statistics			
		Minimum	Maximum	Mean	Std. deviation
Age (years old)	40	48	77	62.53	7.81
BMI (kg/m^2)	40	18.55	31.16	24.81	3.18
Waist size (cm)	40	73	106	92.15	8.62
FBS (mg/dl)	40	110	500	238.83	88.75
HbA1c (%)	40	6.00	14.00	8.90	1.81
Systole	40	90	160	127.60	13.23
Diastole	40	60	100	81.63	8.35
Valid n (listwise)	40				

HbA1c: Glycated hemoglobin, BMI: Body mass index.

If the data were normally distributed, a paired t test was used. The data of FBS before and after education used paired t test and the data of HbA1c were analyzed using the Wilcoxon test. There was significantly FBS before and after education ($p < 0.005$), but there was no significantly HbA1c value of the samples before and after education ($p > 0.005$) [Table 4].

Table 4: Percentage of respondents, controlled diabetes mellitus before and after the health education intervention

Parameter	Mean (± SD)		p
	Before education	After education	
FBS (mg/dl)	238.83 ± 88.75	216.88 ± 66.42	0.001**
HbA1c (%)	8.90 ± 1.8	8.74 ± 1.73	0.020*
Waist size (cm)	92.15 ± 8.62	91.6 ± 8.09	000
BMI (kg/m)	24.81 ± 3.18	24.56 ± 3.18	0000

**Wilcoxon signed ranks test, *Paired t-test, HbA1c: Glycated hemoglobin, BMI: Body mass index, SD: Standard deviation.

Discussion

This study was a randomized and controlled clinical study and evaluated the effect of health education on glycemic control (HbA1c and FBS) among adults with type 2 diabetes mellitus patients. The study results indicated a significant decrease on glycemic control on FBS for the type 2 diabetes mellitus participants, but there was no significant HbA1c value by the end of the health education for 3 months. HbA1c value examination showed that the average level of blood sugar over the past 2–3 months, although we can see on the table the mean of HbA1c value decreased after education by statistical, it did not show to be significant [18], [19]. Rusdiana *et al*. assessed the effect of diabetes self-management education on HBA1c level and FBS at type 2 diabetes mellitus patients in PHC in Binjai city showed that a decrease in HbA1c and FBS after giving education for 3 months [20], other research showed that educational interventions effectively improved glycemic control and are, thus highly recommended for diabetic patients [21]. Furthermore, the other research about analysis of factors affecting the self-care behaviors of diabetes mellitus type 2 patients in Binjai, North Sumatera – Indonesia showed that self-care behaviors of type 2 diabetes mellitus in Binjai are significantly influenced by motivation, self – efficacy, communication, knowledge, and attitude [22], [23]. The other research about the effect of education at type 2 diabetes mellitus from a local Chinese nonprofit-making organization for diabetic showed that the education effect, even though in low intensity, significantly improved glycemic and body weight control in patients with type 2 diabetes [24]. Many researches have done about giving the education for type 2 diabetes mellitus and always finding the significantly results at control glycemic, Hba1c, or FBS [25].

Our study was a short time, giving the health education, before that we examined the glycemic control Hba1c and FBS, and our findings suggest that the educational intervention was successful in achieving some significant changes in the lifestyles among our target population; there was a decrease in the number

of smokers, increase in the intake of a healthy diet concerning eating dates, fat intake, increase vegetable intake, diet soft drinks, and the reason for that change is the doctor's advice and more concern about their health care. Still, many people have not known yet about the control glycemic of HbA1c value; they knew just FBS as a control glycemic for diabetes mellitus, so by this education resulted in achieving a good change in the control of diabetes mellitus (mean HbA1c) in the post-educated than the pre-educated groups.

Conclusion

The conclusion of this study is that improving that the health education in Medan Johor PHC, North Sumatera, increasing awareness for diabetes mellitus patients about exercise such as jogging or aerobic for 30 min every day or awareness of activity daily does not consider exercise. This study has several limitations: A short period of health education and the subjects in the study were also more elder, so our education was less valuable if the subjects more younger than our subjects maybe the results more valuable. In the PHC, we left the leaflet in PHC which content the management of menu and physical exercise by hoping the staff in Public Health Care Clinic can give it for the type 2 diabetes mellitus patients who attend to the PHC, so each the patient type 2 diabetes mellitus except in our research can receive this education, so the aim of the study can be reached for reducing the glycemic control, especially the HbA1c value. Finally, it is expected that the impact of health education intervention may have been short-lived, as observed in several other studies.

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