The Effect of Diabetes Self-Management Education on Hba1c Level and Fasting Blood Sugar in Type 2 Diabetes Mellitus Patients in Primary Health Care in Binjai City of North Sumatera, Indonesia

Rusdiana[1*], Maya Savira[2], Rina Amelia[3]

[1]*Departement of Biochemistry, Faculty of Medical Universitas Sumatera Utara, Medan, Indonesia;* [2]*Departement of Physiology, Faculty of Medical Universitas Sumatera Utara, Medan, Indonesia;* [3]*Departement of Public Health, Faculty of Medical Universitas Sumatera Utara, Medan, Indonesia*

Abstract

AIM: The study aimed to evaluate the effect of short-term diabetes self-management education (DSME) on Hba1and Fasting Blood Sugar in type 2 diabetes mellitus patients attending the Primary Health Care (PHC) in Binjai city of North Sumatera, Indonesia.

SUBJECTS AND METHODS: A quasi-experimental (pretest-posttest) study was conducted in 4 PHCs, involving 80 patients with type 2 diabetes mellitus. The patients in received a 3-months intervention, including an 8 week education on self- management of diabetes mellitus and subsequent 4 weeks of practice of the self- management guidelines.The patients received standard advice on diet management.

RESULTS: There was a significant reduction in Hba1c levels. The statistical analysis using t-test found that there was a significant difference of Hba1c value between pre and post education among type 2 diabetes mellitus patients ($p < 0.005$).

CONCLUSIONS: Diabetes self-management education in PHC of Binjai city can reduce the Hba1c level in type 2 diabetes mellitus patients.

Introduction

Diabetes mellitus, commonly type 2 diabetes mellitus, is an increasing health problem worldwide. It has been estimated that there will be 552 million patients with diabetes and 300 million people with impaired glucose tolerance in 2030 [1]. Diabetes mellitus is associated with various atherosclerotic complications, including cerebrovascular and cardiovascular diseases, causing significant morbidity and mortality [2].

Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the need, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. Therefore, it plays an important role in the clinical management of diabetes [3].

Monitoring of metabolic markers, such as blood pressure, body weight, lipid profile, fasting blood sugar and Hba1c, is essential in the clinical management of patients with diabetes because hypertension, obesity and dyslipidemia are well-known risk factors of atherosclerosis and are common

---

_____

in diabetic patients [4]. Monitoring of these risk factors also helps in evaluation of treatment response of the patients [5]. As a long-term disease, diabetes mellitus needs lifetime care and management. However, 50-80% of patients with diabetes did not have enough skills and knowledge for self-care of the disease [6]. Previous studies have shown that DSME improves homeostasis of metabolism of the patients, and healthy lifestyle prevents the development of atherosclerosis in patients with type 2 diabetes [7][8].

This study was undertaken to evaluate the effect of DSME on Hba1c and Fasting Blood Sugar.

Methods

In this study, a total of 80 patients with type 2 diabetes mellitus were recruited from four Primary Health Care in Binaji city, North Sumatera, Indonesia. This is quasi-experimental research with One Group Pretest-Posttest Design. This was conducted from April to September 2017. From each PHC 20 samples were taken. The patients were recruited in accordance with the inclusion criteria, age > 40 years old-cooperative patients and willing to join the research and exclusion criteria (using diuretic and the middle of cancer therapy). Among the 80 patients, two of them did not complete the DSME programme or did not attend the follow-up examination and thus were excluded from the study. This research was approved by Health Research Ethical Committee, Medical Faculty of University Sumatera Utara/H. Adam Malik General Hospital number 591/TGL/KEPK FK USU-RSUP HAM/2016. Patients were informed of the detail of the study, and written consent was obtained from the patients before they participated in the study.

Blood samples were collected (using syringe) twice before and after interventions and transferred to the laboratory immediately to conduct glycosylated haemoglobin test by Alere Afinion as 100 Analyzer. Fasting blood sugar of samples, we examined by using a portable measuring instrument (Gluco DR). We examine blood pressure, weight, and height and waist size as well.

A questionnaire interview method was adopted to collect information about the family history of the disease, education level and type of the job.

The patients in the intervention participated in a DSME programme in which the patients were required to attend a two-hour lesson weekly for eight weeks and to follow the self-management guidelines of the education programme in the daily activities within the study period. For the DSME programme, all the lessons were focused on the skill and knowledge for healthy eating, being active, monitoring, taking medication, problem-solving, reducing risks, and

healthy coping [9]. For the samples blood test (fasting blood sugar and HBa1c), height, weight waist size examinations were performed before the commencement of the DSME programme as the baseline and one month after the completion of the DSME programme.

Table 1: The content of the diabetes self-management education programme for the patients in the PHCs of Binjai city

Contents	
Management diet and Healthy eating	Common misunderstanding of diet for self-management of type 2 DM
	Understanding about healthy food for type 2 diabetes
	Limiting sugar consumption
	Appropriate caloric intake for type 2 diabetes
	Kinds of food, drink, fruits for type 2 diabetes
	Understanding the effect the heated food over and over again
	When the time to eat
Exercising DM	Understanding about exercise for self-management of type 2 DM
	The importance of regular exercise for type 2 DM
	Understanding what is the right exercise for type 2 DM
	An individualised plan for regular exercise every day for 30 minutes
	Self-check and control body weight
	The wrong belief that all activities are an exercise
	Understanding that exercise is a regular and rhythmic activity
Monitoring	The importance of regular monitoring of fasting blood sugar.
	Monitoring of fasting blood sugar by self
	Self-management of fasting blood sugar
Medication	Pathology and medical treatments for type 2 diabetes mellitus
	The importance of taking diabetic medications
	Knowing the type of medication for each patient (drugs, injected)
	The right time and frequency of taking diabetic medication
Reducing risks	Common complication of type 2 DM (stroke, renal failure, cataract, etc.))
	Stopping unhealthy behaviours like smoking, drinking with much sugar,
	Maintaining a healthy lifestyle
	Risk factors for type 2 diabetes
Problem-solving	Avoid unhealthy foods
	Regular medication
	Appropriate time and frequency of exercise every day for 30 minutes

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 number of the samples from the four PHCs were 80 comprising 52 females (65%) and 28 males (35%), achieving the assigned target of interviews before and after the intervention. The demographic data; about gender, age-group, education level, kinds of job, family history and type of treatment are presented in Table 1. We give the education for 3 months only. Two of samples did not complete the DSME programme or did not attend the follow-up examination and thus were excluded from the study.

Table 2 shows that BMI values had a minimum of 18.20 kg/m^2 and a maximum of 35.25 kg/m^2, FBS values minimum of 76 mg/dL and a maximum of 600 mg/dL and Hba1c values had a minimum of 5.7% and a maximum of 12.50%.

When we did the post-test the number of samples is 78 because two of that are excluded because one of them was is died, and the other did not complete all of the education.

_____

Table 1: Baseline information about study participants

Respondent characteristic		N	%
Gender			
	Male	28	35
	Female	52	65
Age Group			
	Early Elderly (45-55y)	36	60
	Further Elderly (56-65y)	31	35
	Seniors (> 65 y)	13	16.25
Education Level			
	Primary School	27	33.75
	Junior High School	16	20
	Senior High School	23	28.75
	Academy/University	14	17.5
Job			
	Not work	40	50
	Labour		
	Harvester	2	2.5
	Self Employe	9	11.25
	State Employee	19	23.75
	Etc	6	7.5
Family History			
	Maternal history	4	5
	Faternal history	40	50
	Maternal and Paternal	20	25
	History	20	25
Type of treatment			
	Oral drug	79	98.75
	Insulin	1	1.25

We found that there was a significant difference in all variables between pretest and post-test.

Table 2: Baseline characteristics of the samples before intervention (Pretest)

Characteristics	N	Minimum	Maximum
BMI	80	18.20	35.25
FBS	80	76.00	600.00
Hba1c	80	5.70	12.50
Waist size	80	107	75
Valid N	80		

Discussion

This study aimed to evaluate the effect of diabetes self-management education on reducing Hba1c levels among the type 2diabetes mellitus patients by measuring glycaemic indexes before and after intervention in primary health care in Binjai city. One of the reasons for diabetic patients' failure to achieve the desired outcomes is their lack of participants in treatment. This participation is an important factor in the treatment of patients who are willing to follow a treatment plan throughout the life [10].

Table 3: Baseline characteristics of the samples after intervention (Postest)

Characteristics	N	Minimum	Maximum	Mean	Std. Deviation
BMI	78	18.20	32.25	24.03	3.12
FBS	78	98.00	345.00	149.22	52.704
Hba1c	78	5.7	11.90	7.8897	1.28018
Waist size	78	73	105.00	90.3321	8.5802
Valid N	78				

A study by Chuang Yuan ect showed that the patients in the intervention group had significant reduction of the Hba1c level and body weight after receiving the education as compared to the control group, indicating that education had positive effects for improving the health status of patients with type 2 diabetes [11]. Different with us all the patients with type 2 diabetes mellitus we gave diabetes self-management education, and it had a positive effect on improving the health status by reducing Hba1c after the intervention.

Table 4: Statistical analysis

Characteristics	Pretest	Posttes	P value
BMI	24.9944 ± 3.656	24.03 ± 3.12	P<0.0005
FBS	218.39 ± 96.99	149.22 ± 52.704	
Hba1c	8.66 ± 1.76	7.889 ± 1.280	
Waist size			

In spite of the short exposure time to education, our findings suggest that the educational intervention was successful in achieving some significant changes in the lifestyles of participating subjects. Among our target population there was an increase in the number of patients being involved in exercise like bike, aerobic and just walking for 30 minutes, an increase in the proportion of patients using the healthy diet that we suggested, increased vegetable intake, diet soft drinks, and the reason for those changes was the doctor's advice and more personal concern about their health care. This resulted in achieving a good change in the control of diabetes mellitus (mean HbA1c) in the post-educated than the pre-educated group.

	Mean	Std. Deviation
BMI	24.9944	3.65590
FBS	218.387	96.98799
Hba1c		
Waist size	92.0313	8.38541

Respondents in the two surveys were similar about gender, age, marital status, educational level, the presence of a maternal history of diabetes. On our studying we took the samples at the age > 60 years old is a little compared than < 60 years old, the reason was it make us easy for giving education, for the samples with age>60 years old we gave education besides for the patient we gave to the education for their close family. Most respondents had received some form of health education in the recent past and the follow-up survey. However, the recent health education was well organised and directed mainly to diabetic patients and their close family. All the study participants received the drugs of diabetes mellitus type 2 from PHCs because we included patients diagnosed with type 2 diabetes mellitus. Only one patient received insulin.

The level education was more at the middle level (30 people) than at the low (20 people), the high (25 people) and academic (5 people). We can say that these results are encouraging, considering that the health education intervention was of very short duration and was of limited scope and quality. A large-scale, effective and high-quality health education program is likely to have much better results; such a program is expected to reduce the burden of diabetes mellitus in Binjai city, North Sumatera.

The conclusion of this study is that improving the quality of health education in PHC in Binjai city through well-designed programs will improve the awareness and practices among the population in

general, but particularly among patients with diabetes mellitus, increasing awareness for diabetes mellitus patients about exercising like aerobic in PHC each week and exercise every day at least for 30 minutes. Several studies concluded that lack of knowledge, self -care skills, and correct information about the treatment programs hinder the improvements. One important problem is non-compliance and adherence to treatment plan [12] however, we must not forget emphasis just on knowledge, because in many cases, people know what to do, but do not put their knowledge in action [13].

There are several limitations in our study: Firstly; the time interval between pre and posttest was relatively short. Secondly; the possibility of bias in the end line survey cannot be excluded (patients exposed to health education and/or a similar interview at the end-line are more likely to give 'adequate' answers to the questions). Thirdly, we recorded data only for pretest and post-test time points. Finally, it is expected that the effect of diabetes self-management education intervention may have been short-lived, as observed in several other studies.

Acknowledgements

References

1. Alberti KGMM, Zimmet P. Epidemiology: global burden of disease-where does diabetes mellitus fit in? Nature Reviews Endocrinology. 2013; 9(5):258-260,2013.

2. Naslafkih A, Sestier F. Diabetes mellitus related morbidity, riskof hospitalization and disability. Journal of Insurance Medicine. 2003; 35(2):102-113, 2003.

3. Martha M. Funnell, MS, RN, et al National Standards for Diabetes Self- Management Education. Diabetes Care. 2008; 31(Supplement 1): S97—S104. https://doi.org/10.2337/dc08-S097 PMid:18165344

4. Tripathi BK, Srivastava AK. Diabetes mellitus: complication and therapeutics. Medical Science Monitor. 2006; 12(7):RA 130-147

5. Clement S. Diabetes sel-management education. Diabetes Care. 1995; 18(8):1204-1214. https://doi.org/10.2337/diacare.18.8.1204 PMid:7587866

6. Kreutzenberg SV, Tiengo A, Avaogaro A. Cerebrovascular S.V.de Kreutzenberg, A.Tiengo, and A.Avaogaro disease in diabetes mellitusa: the role of carotid intima –media thickness," Nyutrition, Metabolism and Cardiovascular Diseases. 2009; 19(9):667-673. https://doi.org/10.1016/j.numecd.2009.03.014 PMid:19500958

7. Kim SH, Lee SJ, Kang ES, et al. Effects of lifestyle modification on metabolic parameters and carotid intima media thickness in patients with type 2 diabetes mellitus, Metabolism: Clinical and Experimental. 2006; 55(8):1053-1059. https://doi.org/10.1016/j.metabol.2006.03.017 PMid:16839841

8. Mulnier H, Barnard M, Forbes A, et al. Effect of self-management programme on glycaemic control and weight in people with established Type 2 diabetes. Diabetic Medicine. 2013; 30(Supplement 1): 131.

9. AADE. AADE7 self-care behaviours. Diabetes Educator. 2008; 34(3):445-449. PMid:18535317

10. Abdoli S, Ashktorab T, Ahmadi F, Parvizi S. [Barriers to and Facilitators of Empowerment in People with Diabetes]. Iran J Endocrinol Metab. 2009; 5:455-64.(Persian)

11. Yuan C, Lai CW, Chan LW, Chow M, Law HK, Ying M. The effect of diabetes self-management education on body weight, glycemic control, and other metabolic markers in patients with type 2 diabetes mellitus. Journal of diabetes research. 2014; 2014.

12. Tan AS, Yong LS, Wan S, Wong ML. Patient education in the management of diabetes mellitus. Singapore Med J. 1997; 38:156-60. PMid:9269394

13. Heisler M, Smith DM, Hayward RA, Krein SL, Kerr EA. How well do patients assessments of their diabetes self management correlate with actual glycemic control and receipt of recommended diabetes services? Diabetes Care. 2003; 26:738-43. https://doi.org/10.2337/diacare.26.3.738 PMid:12610031