Research Article

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The effect of educational intervention on knowledge, attitude and glycemic control in patients with type 2 diabetes mellitus

Marwa M. Ahmed^{1*}, Hanaa M. El Degwy², Mayssa I. Ali², Nashwa H. Hegazy³

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*Correspondence:

Dr. Marwa M. Ahmed,

E-mail: marwamostafa@kasralainy.edu.eg

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ABSTRACT

Background: Diabetes is a chronic disease associated with high morbidity and mortality rate. The present study aimed to assess the effect of educational intervention on knowledge, attitude and glycemic control in type 2 diabetic patients. **Methods:** An interventional study carried out on 100 diabetic patients attending three primary health care units in Port Said City. Patients were subjected to three health education session where information about diabetes was provided. Knowledge, attitude and glycemic control were assessed before and 3 months after the intervention.

Results: After implementation of the educational intervention, a significant improvement was observed in patients' knowledge and attitude. The mean of total knowledge score increased from 2.69 ± 1.44 in the first visit to 5.30 ± 1.36 in the second visit and there was marked improvement in the patient awareness regarding different aspects of diabetes. The mean levels of fasting blood glucose (FBG) and Glycosylated Hemoglobin (HbAlc) has significantly decreased at the second visit compared to the first visit (180.33±34.81; 8.69 vs. 168.04±28.56, 8.50±0.97 respectively). Also there was a strong negative correlation between the knowledge Attitude (KA) score and HbA1c, and between the KA score and FBG.

Conclusions: The results concluded that educational intervention is an effective tool that implicated a significant change in patients' knowledge and attitude and effectively improved patient glycemic control.

Keywords: Diabetes mellitus, Health education, Awareness, Attitude, Self care, Management

INTRODUCTION

Diabetes mellitus is considered a major clinical and public health problem accounting for 5.1 million deaths worldwide. The International Diabetes Federation (IDF) estimated that there were 382 million diabetic patients worldwide in 2013, 80% of them lived in low- and middle-income countries. It is predicted to reach 592 million by the year 2035, The Diabetic population in Egypt was estimated to be 7.5 million in 2013 and is projected to reach 13.1 million by the year 2035. \(^1\)

Management of diabetes greatly depends on the ability of the affected person to carry out self-care in his daily lives, and patient education is the corner stone to achieve this objective.² Diabetic patients often have inadequate knowledge about the nature, risk factors and associated complications of diabetes and this negatively affect their attitudes and practices towards its care.³ Hence, diabetes education and on-going diabetes support are considered an integral part of comprehensive diabetes care to achieve better control of diabetes. Also, patient self-management education has an important role in preventing acute complications and reducing the risk of long-term complications.⁴

¹Department of Family Medicine, Faculty of Medicine, Cairo University, Egypt

²Department of Internal Medicine, Faculty of Medicine, Cairo University, Egypt

³Primary health care unit, Port Said City, Egypt

Since, one of the main elements of primary health care is health education that empowers and motivates people to take informed decisions to ensure attainment of health.⁵ Hence, the primary health care units are considered the best place to provide health education to patients and the general population. In this study, we made an attempt to assess the effectiveness of diabetes education program on knowledge and attitude in type 2 diabetic patients attending three primary health care units in Port Said City. And to assess the improvement in their diabetic control by measuring fasting blood sugar and Glycosylated Hemoglobin (HbA1c).

METHODS

This is a cross sectional intervention study carried out in three primary health care units in Port Said City in Egypt (Omar Ben ElKhatab Center, Osman Ben Affan Center and Elamnakh Center). It started in March 2011 and ended by the end of October 2011.

Selection of site of the study:

The three centers were chosen due to their high flow of diabetic patients who were visiting the health units regularly every month irrespective to the different socioeconomic nature of the patients. The highest flow was in Omar Ben ElKhatab Center then Osman Ben Affan Center then Elmanakh Center.

Type of patients:

Adult type 2 diabetic patients with duration of the disease less than 5 years were enrolled in the study. Exclusion criteria included patients on Insulin therapy, presence of any major diabetes complications (i.e., proliferative retinopathy, cardiovascular disease and lower limb amputation) and patients who failed to attend one or more of the three educational sessions.

Sample size:

Non probability sampling technique was used in which 100 patients were included in the study. The researcher visited each center once per week for six months.

Data collection tool:

Data were collected by a pre-constructed and pre-tested questionnaire that was designed to include the following:

- Personal data (name, age, sex, and marital status), socioeconomic data (occupation and education), smoking status and family history of diabetes.
- Questions about knowledge and attitude of different aspects of diabetes. Closed ended questions were used to assess meal plan, physical exercise and foot care. Open ended questions were used to assess knowledge regarding; symptoms of hypoglycemia and hyperglycemia, frequency

of assessing and optimal level of blood glucose level and complications of diabetes. The evaluation of the knowledge was obtained from the proportion of correct answers in each topic of the questionnaire. The question inquiring about diabetes complication was considered correct if at least two complications were mentioned.

The questionnaire was tested on 20 patients to estimate the time needed to complete the questionnaire and to carry out the health education sessions. Those patients were not included in the study sample.

The data collection phase:

The clinical work was divided into three parts; the first visit (pre-intervention), the intervention (health education messages) then the second visit (post-intervention).

The pre-intervention visit:

Following consent, participants completed an interview that includes personal history and initial assessment of the participants' knowledge by the study questionnaire. Focused clinical examination (including Body Mass Index and waist circumference), foot examination and neurological examinations (including assessment of touch, pain and vibration senses) were done. Blood samples were taken to measure HbA1c level and fasting blood sugar.

The intervention (health education):

The study participants were divided into ten groups. Each group (around ten patients) received health education messages in three different sessions; one session per week with duration of two hours for each session. Repetition of each health message was done before giving the new message.

The health education messages were prepared to involve items concerning anatomy and pathophysiology of the DM, glycemic control of the DM, complications particularly hypoglycemic coma, its symptoms and its management, effect of diabetes on eye and foot, importance of adherence to treatment, diet plan, physical exercise and importance of regular follow up. Also prevention of diabetes and its complications particularly diabetic foot and hypoglycemic coma were included in the message. Different educational methods were used including writing boards, photographs, videos and printed handouts. All the educational materials were available in Arabic language.

The post-intervention visit:

After three months, reassessment of the patients' knowledge and attitude was done by repeating the questionnaire. HbA1c and fasting blood sugar level were re-checked and compared to baseline. The study participants were contacted by phone calls if they did not show up on the expected time of follow-up.

Statistical analysis of data:

The collected data were organized, tabulated and statistically analyzed using statistical package for social sciences (SPSS) version 16. For qualitative data, frequency and percent distribution were calculated. For quantitative data, mean, standard deviation (SD), minimum and maximum were calculated. For comparison between groups, paired (t) test was used. For correlation between two parameters, the Pearson's correlation was calculated. Correlation was mild if correlation coefficient (r) was less than 0.3, moderate if $0.7 \ge r \ge 0.3$, powerful if more than 0.7. For interpretation of results, $p \le 0.05$ was considered significant.

RESULTS

A total of 100 males and females with type 2 diabetes were included in the study and all of them completed the three sessions of diabetes education. Fifteen patients did not attend the post-intervention visit; attrition rate was 15%. The mean age of the participants was 46 ± 11 years. The baseline characteristic of the study subjects have been summarized in Table 1. BMI of the study participants ranged from 26.66 to 54.68 with a mean of 36.43 ± 4.6 while the waist circumference ranged from 80 to 140 with a mean of 104.99 ± 10.87 cm. The degree of obesity was in the form of overweight (BMI 25-29.9) in 7.0%; moderate or class I obesity (BMI 30-34.9) in 27%; severe or class II obesity (BMI 35-39.9) in 48% and morbid or class III obesity (BMI >40) in 18% of cases.

Foot examination revealed that 44.0% of cases were free. While, dryness was observed in 12.0% of study participants, tinea pedis infection in 18%; tinea pedis infection and decreased peripheral pulse in 9.0%; tinea pedis infection and dryness in 16.0% and tinea pedis infection, dryness and decreased pulse was found in 1.0% of cases.

As regard neurological examination, there was sensory deficit in 35% of the study participants where 20 (20%) of them had lost touch sensation while 15(15%) had lost both touch and vibration sensations.

There was statistically significant increase (p value <0.001) in the participants' attitude regarding meal plan, exercise and foot care in the post-intervention visit in comparison to pre-intervention visit (68.2%, 44.7%, 89.4% vs. 20.0%, 23.0% and 5.0% respectively).

Table (2 and 3) shows a statistically significant difference between pre and post intervention results in all items of knowledge and in the total awareness score after the implementation of the health education program. Also, there was statistically significant decrease of both FBS and HA1C at the second visit compared to the first visit (Table 4).

Table 1: Basic characteristic of the study population.

Baseline Characteristic	No. (n=100)	%
<u>Gender</u>		
Male	17	17%
Female	83	83%
<u>Marital status</u>		
Married	87	87%
Single	3	3%
Widow	9	9%
Divorced	1	1%
<u>Education</u>		
Non educated	16	16%
Educated<8 years	35	35%
Educated>8 years	49	49%
<u>Smoking</u>		
Non smokers	87	87%
Smokers	13	13%
<u>Work</u>		
Unemployed	59	59%
Employed	41	41%
Family history of diabetes		
Positive	75	75%
Negative	25	25%

Table 2: Distribution of patients' knowledge about type 2 diabetes before and after health education.

Items	Correct answers Pre intervention visit No.=100		Correct answers Post intervention visit No.=100		P value #	
	no.	%	no.	%		
Symptoms of hypoglycemia (Q1)	89	89.0%	85.0	100.0%	0.003*	
Symptoms of hyperglycemia (Q2)	82	82.0%	85.0	100.0%	<0.001*	
Optimum Fasting blood sugar level (Q3)	33	33.0%	85.0	100.0%	<0.001*	
Investigations for DM (Q4)	18	18.0%	73	85.9%	<0.001*	
Importance of healthy life style (Q5)	13	13.0%	45	52.9%	<0.001*	
Complications of DM (Q6)	34	34.0%	54	63.5%	<0.001*	
Intervals of assessment of HbA1c (Q7) * P value signifi	1	1.0%	26	30.6%	<0.001*	

^{*} P value significance <0.05; #: McNemar x2 test

Table 3: Comparison between pre- and post- intervention visits as regard total awareness score (correct answers).

	Mean	S.D	Minimum	Maximum	Paired(t)	P value
Total Knowledge score at first visit	2.69	1.44	0.00	7.00	29.55	<0.001*
Total knowledge score at second visit	5.30	1.36	3.00	7.00		

^{*} P value significance < 0.05

Table 4: Comparison between pre- and post-intervention visits as regard FBS and HbA1C.

	Mean	S.D	Minimum	Maximum	Paired(t)	P Value
FBS at first visit	180.33	34.81	94.00	331.00	9.92	<0.001*
FBS at the second visit	168.04	28.56	110.00	290.00		
HbA1c at first visit	8.69	1.15	6.50	12.60	13.70	<0.001*
HbA1c at the second visit	8.50	0.97	6.50	11.50		

^{*} P value significance <0.05; FBS: Fasting blood sugar

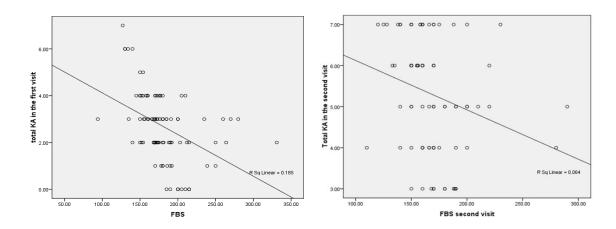


Figure 1: Correlation between total knowledge and FBS in the first visit (to the left) and second visit (to the right).

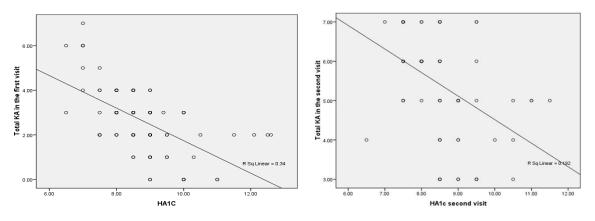


Figure 2: Correlation between total knowledge and FBS in the second visit (to the left) and second visit (to the right).

There was negative statistically significant correlation between level of knowledge and both fasting blood sugar and HA1C in the first visit (P value: <0.001, person correlation: -0.43 and P value: <0.001, person correlation: -0.58 respectively) and second visits (P value: <0.001, person correlation: -0.44 and P value: <0.02, person correlation: -0.25 respectively). This means that, with

increasing levels of knowledge, good diabetic control was achieved (Figure 1 and 2).

DISCUSSION

Diabetes-related complications may be prevented by achieving good metabolic control. To achieve good

metabolic control, it is important not only to measure HbA1c levels regularly, but also to provide efficient diabetic education. Diabetes education programs develop patients' awareness and understanding of the disease and strengthen motivation and self-care. Also, it has an important role in preventing acute complications, reducing the risk of long-term complications and consequently reducing the economic costs of diabetes treatment by preventing complications.⁴

In our study, providing three sessions of diabetic education significantly increase patients' diabetic knowledge and attitude (KA). The mean of total knowledge score increased from 2.69 ± 1.44 in the first visit to 5.30 ± 1.36 in the second visit and there was marked improvement in the patient awareness regarding different aspects of diabetes. These results are in line with other studies, where patients who attended a diabetes education program had a higher KA score and awareness of their disease. $^{6.7}$

Regarding glycosylated hemoglobin (HbAlc) and fasting blood sugar, a statistically significant improvement was found in their mean levels after application of face to face diabetic education. These results are in agreement with those reported by Ozcelik et al. in 2010^7 and Sharaf in 2013^8 who reported that, HbA1c levels were significantly lower in patients who received diabetes education. Also in 2015, Zibaeenezhad and his colleagues 9 had found that the mean level of HbA1C was significantly lower at the 3-month follow-up compared to the baseline (8.09 ± 0.31 versus 8.51 ± 0.26 , P < 0.001).

Wens et al. published an analysis of systematic review of Randomized Controlled Trials (RCTs) that assessed the effects of interventions on improving adherence to treatment recommendations in the individuals with type 2 diabetes. Three out of the four studies addressing face-to-face diabetic education showed improvement in HbA1c levels. Also, two studies indicated that group education effectively improved HbA1c. This highlights the importance of providing group diabetic education especially to newly diagnosed patient to achieve glycemic control.

In the current study, there was negative significant correlation between level of KA and both fasting blood sugar and HA1C in the first and second visit. These results are in agreement with those reported by Ozcelik and colleagues in 2010^7 who reported that, there was a strong negative correlation between the KA score and HbA1c, and between the KA score and FBG (r = -0.8101, P <0.0001 and r = -0.6524, P <0.0001, respectively).

The results of this study send a strong message to diabetes health care providers for the urgent need of providing diabetic education programs targeting type 2 diabetes patients at outpatient clinics. Training providers working in diabetes clinic and improving their skills for delivering adequate culturally-oriented health education message is highly needed.

Study limitation

There are a number of limiting factors in our study. One limitation was absence of a control group and therefore the results could not be compared to the situation in which no educational interventions are performed. But it is unethical to evaluate diabetic patients in a group receiving no educational interventions. Another limitation was the sampling technique where convenient sample was used.

CONCLUSION

In conclusion, the results of the present study showed that educational intervention is an effective tool that implicated a significant change in patients' knowledge and attitude and effectively improved patient glycemic control.

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Conflict of interest: All authors contributed fully in formatting the research proposal, data collection and analysis, as well as the manuscript editing and submission. Ethical approval: Ethical approvals were obtained from the Research Committee of Cairo University. Official approval was taken from the Head Manager of the primary health care sector and the three centers' managers. Informed written consents were taken from all participants after explaining the steps of the study to them.

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