EFFECT OF DIABETES EDUCATION PROGRAM ON TYPE 2 DIABETIC PATIENTS IN PALESTINE

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Diabetes education program for people with type 2 diabetes: An international perspective

Osama A. Rashed[a], Haleama Al Sabbah[b], Mustafa Z. Younis[c,*], Adnan Kisa[c], Jai Parkash[d]

[a] Diabetes Clinic, Tulkarim Directorate of Health, Tulkarim, Palestine
[b] Public Health Nutrition Department, Zayed University, Dubai, United Arab Emirates
[c] Zirve University, Gazianteap, Turkey
[d] Biomedical Sciences and Natural Sciences, Keiser University, Fort Myers, FL, USA

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ABSTRACT

Background: In the Palestinian community, lifestyle changes, rapid urbanization and socioeconomic development, stress, smoking, and changes in food habits has increased the risk of non-communicable diseases especially *diabetes mellitus*. Diabetes complications can be prevented if the glycemic status of patients with diabetes is maintained within a nearly normal range. Therefore, patient education is critical in controlling blood glucose levels within the normal range.

Objective: This study aimed at measuring the effect of diabetes educational intervention program for patients suffering from type 2 diabetes attending the Diabetes Clinic in Tulkarim Directorate of Health.

Methods: A short duration observational study involving pre- and post-test educational intervention program was carried out on a relatively small number of type 2 diabetes patients at the Diabetes Clinic in Tulkarim Directorate of Health. In total, 215 patients attended a group-based 4 h educational intervention session about diabetes. The program included explaining *diabetes mellitus*-symptoms, risk factors, types, treatment and complications and main aspects of self-care of the disease (foot care, eye care, and blood glucose monitoring), main aspects of dietary management, weight reduction, blood pressure, smoking cessation, periodic investigations, home monitoring and importance of physical activity. Knowledge evaluation questionnaire were evaluated pre- and post-study. Anthropometric measurements such as body weight (WT), body mass index (BMI) and laboratory tests such as fasting blood glucose (FBG), hemoglobin A1C (HbA1c), cholesterol (Chol), and triglycerides (TG) were measured both at the beginning and at the end of the study. Significance of the results was assessed by paired *t*-test at 95% confidence interval.

Results: The participant's mean age was 51.07 that ranged between 31 and 70 years. For a total of 215 participants, 41.4% were males and 58.6% were females. The mean weight before educational intervention was 80.81 ± 14.95 kg (82.6 kg for males and 79.5 kg for females) that decreased to 78.9 ± 14.33 kg (81.1 kg for males and 77.3 kg for females) after educational intervention program. The BMI also decreased significantly after educational intervention. The mean fasting blood sugar was 188.65 ± 71.45 mg/dL before educational intervention that decreased to 177.7 ± 66.11 mg/dL after the educational intervention ($p = 0.049$). The mean glycosylated hemoglobin was 8.57 ± 1.21 before educational intervention that decreased to 7.95 ± 1.42 after educational intervention. The mean value of cholesterol before educational intervention was 183.27 ± 37.74 mg/dL that decreased to 169.57 ± 34.23 mg/dL after educational intervention. The mean triglycerides value decreased after educational intervention from 209.85 ± 171.04 mg/dL to 183.28 ± 152.4 mg/dL ($p = 0.025$). The mean score of knowledge questionnaire before educational intervention was 60.6 ± 20.65 that increased to 78.1 ± 13.4 after conducting educational intervention.

Conclusions: Diabetes education was found to be effective on BMI, FBG, HbA1c, Chol, TG, and knowledge.

Recommendations: Diabetes education is a cornerstone in the management and care of diabetes and should be an integral part of health planning involving patient's family, diabetes care team, community, and decision makers in the education process.

* Corresponding author at: Jackson State University, Jackson, MS, USA.
E-mail addresses: palestinerashed@yahoo.com (O.A. Rashed), Haleemah.AlSabah@zu.ac.ae (H.A. Sabbah), younis99@gmail.com (M.Z. Younis), adnan.kisa@zirve.edu.tr (A. Kisa), jaiparkash@hotmail.com (J. Parkash).

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1. Introduction

Diabetes mellitus is a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (Hamdan, 2007; WHO, 1999). Poorly controlled diabetes is associated with long term damage, dysfunction and failure of various organs especially the eyes (retinopathy) which is the leading cause of blindness especially in adult people suffering from diabetes (Hamdan, 2007), kidneys (nephropathy) as 10–20% of patients with diabetes die from renal diseases (WHO Media Centre, retrieved 2012), nerves (neuropathy) which affect up to 50% of patients with diabetes (Alkaissi, retrieved 2013), and cardiovascular and cerebrovascular diseases whereas the rate of heart diseases and stroke in adults with diabetes is 2–4 times higher than those without diabetes (El-Barbari, 2003). Therefore, the importance of diabetes educational intervention in improving self-care of patients suffering from diabetes is essential in preventing these complications.

Type 1 diabetes mostly affects children and young adults and it is prevalent in about 5–10% of total diagnosed cases of diabetes that is characterized by beta cell destruction, usually leading to absolute insulin deficiency (WHO/IDF, 2006). Type 2 diabetes accounts for about 90–95% of diagnosed cases of diabetes, associated with overweight and mostly people over the age of 30s, but it is also seen increasingly in younger people, ranging from predominantly insulin resistance with relative insulin deficiency to predominantly insulin secretion defect with or without insulin resistance (WHO, 2003). Lifestyle interventions with oral medications are often effective (WHO/IDF, 2006). Diabetes is undoubtedly one of the most challenging health problems in the 21st century and it is rapidly getting worse thus leaving the biggest impacts on adults of working age in developing countries (Buzzle.com, 2010; Dumaidi, 2000; IDF, 2012a, 2012b, 2012c; Nather & Wu, 2005; Palestinian Ministry of Health Report, 2008; Weinger & Carver, 2009).

The prevalence of diabetes in Palestine was determined based on a study conducted in 2000 in cooperation with Al Quds University and the Ministry of Health (MOH). The preliminary results indicated that the prevalence of diabetes in Palestine is about 9%.

We have evaluated the effectiveness of diabetes educational intervention program on patients with type 2 diabetes, at Diabetes Clinic of Tulkarim Directorate of Health and the results are described and discussed in this article.

2. Methods

2.1. Study design

An observational study with pre- and post-test was carried out through the Diabetes Clinic of Tulkarim Directorate of Health based on educational intervention program.

2.2. Study setting

Tulkarim is located 68 km to the north of Jerusalem with a total area of 326 sq. km and 188,870 inhabitants according to the Palestinian Central Bureau of Statistics estimation in 2009 (Palestinian Central Bureau of Statistics, 2009).

2.3. Study population and sampling

The population of this study included a total of 959 type 2 diabetes patients of different age groups, both males and females, taking oral hypoglycemic medications. These patients were registered in the Diabetes Clinic of Tulkarim Directorate of Health until the end of December 2009, and had been visiting the clinic on a monthly or biannually basis. A total of 824 patients with type 2 diabetes visiting this clinic during the period from May 10, 2010 to July 10, 2010 were selected and asked to participate in the study described in this article. Out of these 824 patients with type 2 diabetes, 689 patients agreed to participate in the study therefore showing a response rate of 85%, and a pre-test was conducted on these patients as shown in Table 1. Out of 689 patients, 330 patients attended the educational intervention program. Out of 330 patients, 215 patients agreed to participate in the post-test as shown in Table 1.

2.4. Inclusion criteria

Patients with type 2 diabetes-both males and females within various age groups, registered in diabetes clinic until the end of

Table 1
Study population and sampling.

Location	Number of patients that registered till 2009	Number of patients that visited the clinic (May 10–July 10, 2010)	Number of patients that agreed to participate and pre-test	Number of patients that attended the educational intervention	Number of patients that attended the post-test
Shweke	31	17	17	8	6
Aljarosheye	10	9	3	2	1
Attel & Deir Algoson	121	113	103	32	34
Zeita	29	28	24	16	11
Illar	41	34	27	16	11
Saida	21	19	16	10	8
Baqa Asharqeye & Nazlat Essa	47	41	34	30	21
Anazia Asharqeye	19	14	9	2	2
Qafeen	98	86	79	34	19
Balaa	39	31	31	21	16
Kufr Ellabad	51	47	30	21	13
Anabta & Kufr Romman	43	34	27	13	9
Rameen	37	31	31	23	13
Biet Leid & Safareen	89	69	56	26	20
Shoofa	27	24	16	8	0
Faroon	12	12	10	10	6
Kufr Soor, Kufr Zebad & Aboosh	44	37	31	18	12
Kufr Jammal	33	24	21	11	6
Tulkarim	167	154	124	29	17
Total	959	824	689	330	215

December 2009; on hypoglycemic medications; visiting the clinic regularly for treatment or follow-up (monthly or biannually).

2.5. Exclusion criteria

Not registered in the diabetes clinic; on insulin or combined therapy.

2.6. Recruitment

Patients were recruited by the researcher through facilitators in civil society organizations and sport clubs in different locations (place of residence) in the district and given an appointment for the session.

2.7. Data collection

Data were collected by the researcher over the period of two months beginning May 10, 2010 and ending July 10, 2010 during the patient's routine visits (monthly and biannually) to the Diabetes Clinic of Tulkarim Directorate of Health. The researcher obtained official approval from the General Director of Tulkarim Directorate of Health.

Patients were interviewed by the researcher using a basic information questionnaire on demographic data, anthropometric measurement, and other health variables only after their informed consent was taken to participate in the study.

2.8. Intervention program components

A group-based educational intervention session about diabetes was conducted by a researcher working as a health educator at the Health Directorate of Tulkarim. This session was a 4 h duration education program. A plain flip chart was used as a teaching aid while presenting the session at all locations. The program included definition of *diabetes mellitus*, symptoms, risk factors, types, treatment and complications and main aspects of self-care of the disease (foot care, eye care, and blood glucose monitoring), main aspects of dietary management, weight reduction, blood pressure, smoking cessation, periodic investigations, home monitoring, and importance of physical activity.

At the beginning of the session, pre-test knowledge evaluation questionnaires were distributed to those type 2 diabetes patients who had consented to participate in the study. At the end of the session, colored educational materials printed in Arabic language were distributed. The educational materials were developed and approved by the Health Education and Promotion Department of the Palestinian Ministry of Health.

2.9. Anthropometric measurements

Anthropometric measurements were done at the beginning and at the end of the study by the researcher and the nurse of the same clinic. The following anthropometric measurements were obtained twice each time for the type 2 diabetes patients and then the average of the two readings was calculated (at the beginning and at the end of the study): height, weight, and BMI.

2.10. Laboratory tests

Patients were asked to fast for at least 12–14 h before the laboratory tests. Blood samples were drawn from the patients at the beginning and at the end of the study by a qualified laboratory technician of the Tulkarim Directorate of Health, and FBS, HbA1c, Chol, and TG were measured on these blood samples. In order to ensure accuracy, a separate blood sample was also drawn at the same time for analysis in a private laboratory (Biet Leid Med Lab) using the same procedures and assays for standardization.

2.11. Data analysis

The data obtained from the basic information questionnaire and knowledge evaluation questionnaire were analyzed by using the Statistical Package for Social Sciences, (SPSS) version 16 program and the chi-square test was determined to find whether there was a significant difference at the level of 0.05 in the categories listed in the questionnaire.

2.12. Ethical considerations

The researcher obtained the official approval from the General Director of the Tulkarim Directorate of Health. Before conducting the interview and investigations, patients were informed about the purpose of the study and their consent was taken for the intervention and they were also told that their participation will be voluntary.

3. Results

3.1. Anthropometric measurements and laboratory tests characteristics

As shown in Table 2, the proportion of the participants with obesity (BMI > 30) was about 60%. The proportion of females with BMI > 30 was significantly more than that for males (69.8% versus 45.5% respectively). While the proportion of over-weights was 37.5% and 26.2% between females and males respectively ($p = 0.000$).

Also shown in Table 2 indicates that 86% of the participants showed fasting blood sugar more than 115 mg/dL with no statistically significant difference between males and females (82.0% compared with 89.7% respectively) ($p = 0.105$). Also 75% of participants had poor diabetes control with no significant difference between males and females (82.0% compared with

Table 2
Anthropometric measurement and laboratory tests characteristics.

Variable	Male (n = 89)		Female (n = 126)		Total		P-Value
	N	%	N	%	N	%	
BMI							
18.5–24.99	15	17.0	5	4.0	20	9.3	0.000
25–29.99	33	37.5	33	26.2	66	30.8	
>30	41	45.5	88	69.8	129	59.9	
Fasting Blood Sugar (mg/dL)							
70–115	16	18.0	13	10.3	29	13.5	0.105
>115	73	82.0	113	89.7	186	86.5	
<70	0	0.0	0	0.0	0	0.0	
HbA1c							
5.4–6.8	2	2.3	12	9.6	14	6.5	0.069
6.9–7.6	15.7	14	24	19.0	38	17.7	
>7.6	73	82.0	90	71.4	163	75.8	
Cholesterol (mg/dL)							
<200	68	76.4	92	73.1	160	74.5	0.245
200–240	11	12.4	25	19.8	36	16.7	
>240	10	11.2	9	7.1	19	8.8	
Triglycerides (mg/dL)							
<150	37	41.6	59	46.8	96	44.6	0.780
150–199	14	15.7	16	12.7	30	14	
200–500	35	39.3	45	35.7	80	37.2	
>500	3	3.4	6	4.8	9	4.2	

71.4%) and 17% had fair control as assessed by HbA1c level (p = 0.069). In addition, no significant differences between males and females were reported regarding lipid profile where 25.5% of the participants had hypercholestremia (23.6% versus 26.9%) and 55.4% had hypertriglyceridemia (58.4% versus 53.2%) (p = 0.780) as shown in Table 2.

3.2. Anthropometric measurements at pre- and post-educational intervention program

By using paired *t*-test to compare the weight changes before and after intervention, a significant decrease (p = 0.000) in weight was observed as shown in Table 3 .The mean weight before intervention was 80.81 ± 14.95 kg that decreased to 78.9 ± 14.33 kg after the educational intervention. Accordingly, BMI also decreased significantly (p = 0.000) after educational intervention to 31.23 ± 5.8 from 32.1 ± 5.76 before intervention.

3.3. Laboratory tests at pre- and post-educational intervention program

As shown in Table 4, a significant decrease was observed in fasting blood glucose after educational intervention (p = 0.049), where the mean fasting blood sugar was 188.65 ± 71.45 mg/dL before educational intervention that decreased to 177.7 ± 66.11 mg/dL after educational intervention. Moreover, significant decrease in glycosylated hemoglobin (HbA1c) after educational intervention (p = 0.000) was reported where mean glycosylated hemoglobin was 8.57 ± 1.21 before educational intervention that decreased significantly to 7.95 ± 1.42 after educational intervention. In addition, a significant decrease was observed in cholesterol level after educational intervention (p = 0.000). The mean value of cholesterol before educational intervention 183.27 ± 37.74 mg/dL that decreased to 169.57 ± 34.23 mg/dL after educational intervention. A slight but significant decrease in triglycerides level was reported after conducting the educational intervention (p = 0.025). The mean triglycerides value had decreased after educational intervention from 209.85 ± 171.04 mg/dL to 183.28 ± 152.4 mg/dL.

3.4. Knowledge scores at pre- and post-educational intervention program

As shown in Table 5, by using paired *t*-tests, a significant increase in knowledge evaluation test scores was observed after the educational intervention (p = 0.000). The mean score of the knowledge test before the educational intervention was 60.6 ± 20.65. That increased to 78.1 ± 13.4 after conducting the educational intervention; further the variance decreased from 20.65 to 13.40 which means that knowledge became more homogeneous after the educational intervention than before which gave an indication that the educational intervention improved the knowledge for the patients.

4. Discussion

One of the most important aspects of diabetes management is diabetes education which is considered as a key component of prevention of diabetes related complications. In addition to improving the glycemic control, diabetes education improves patients and their families' self-care knowledge, health skills, and confidence, thus enabling them to take increasing control of their lives. Diabetes education also promotes the patients' ability in making therapeutic decisions in order to manage their diabetes through instituting life-style changes to minimize the impact of chronic complications of diabetes (Al-Sobhi, 2007; Bawadi, 2000; Palestinian Ministry of Health Report, 2008).

It has been reported that patient education improves diabetes knowledge and its management as well as physiological measures such as metabolic control, body weight and blood pressure. Of equal importance, the literature also suggests that patient education improves the quality of life for diabetes patients when it is appropriate to the cultural context of the population.

Our results show that 59.9% (45.5% and 69.8% for males and females respectively) of the participants were obese and this is consistent with the available scientific data about type 2 diabetes patients as most of type 2 diabetes patients suffer from obesity (Weinger & Carver, 2009). Palestinian females especially the housewives, often eat the remaining food after meals, which results in extra weight gain (Al-Sabbah, 2000). Other related factors that may have effect on the tendency to weight gain are personal attitude toward weight and fatness which varies between different social and cultural groups. It is considered in some developing countries as a symbol of affluence (Al-Sabbah, 2000).

As indicated in Table 2, fasting blood sugars levels were more than 115 mg/dL in more than 80% of study sample with no significant difference between males and females (89.7% females and 82.0% males). This argues for poor control of daily blood sugar among the majority of the participants and may be linked to a lack of awareness about the disease. Thus, there seems to be reasonably bad compliance towards appropriately prescribed dietary, exercise, and medication regimens.

HbA1c levels reflect the average level of glucose control when measured over the period of two to three months. The outcomes of diabetes education intervention were measured in terms of HbA1c which was compared with the participants following the diabetes

Table 3
Anthropometric measurements at pre- and post-educational intervention program.

Measurements	Before Intervention mean ± SD	After Intervention mean ± SD	P-Value
Weight	80.81 ± 14.95	78.9 ± 14.33	0.000
Body Mass Index	32.1 ± 5.76	31.23 ± 5.80	0.000

Table 4
Laboratory tests at pre- and post-educational intervention program.

Investigations	Before Intervention mean ± SD	After Intervention mean ± SD	P-Value
Fasting Blood Sugar (mg/dL)	188.65 ± 71.45	177.70 ± 66.11	0.049
Glycosylated Hb HbA1c	8.57 ± 1.21	7.95 ± 1.42	0.000
Cholesterol (mg/dL)	183.27 ± 37.74	169.57 ± 34.23	0.000
Triglycerides (mg/dL)	209.85 ± 171.04	183.28 ± 152.42	0.025

Table 5
Knowledge scores at pre- and post-educational intervention program.

Sum of knowledge questionnaire score (100)	mean ± SD score	t-value	P-value
Before Intervention	60.60 ± 20.65	−15.654	0.000
After Intervention	78.1 ± 13.40		

educational program instructions. HbA1c is considered normal or well controlled when the value is less than 6.8%. In this study, at least 75% of the participants had poor control of their diabetes and they were at a high risk of cardiovascular diseases (CVD). This is in agreement with the results of Palestinian Ministry of Health 2008 report where it was found that 80% of patients registered in diabetes clinics had poor control of their diabetes thus indicating a poor self-management for type 2 diabetes patients as demonstrated by patients in this study and that may be due to lack of knowledge about the disease (Palestinian Ministry of Health Report, 2008). The triglycerides measured in our present study were high in more than 50% of the study sample.

In conclusion, the results from this short educational intervention program on Type 2 diabetes patients at Diabetes Clinic in Tulkarim Health Directorate indicates that lifestyle changes involving dietary, exercise and diabetes self-management was effective in bringing about a significant decrease in weight, FBS, HbA1c, Chol, and TG and was also effective in improving patient's knowledge. Since primary health care providers have a better chance to meet with patients, promotion of diabetes education intervention programs by these centers will increase the effectiveness of diabetes therapy and will delay the onset or the progression of complications, improve the quality of life for diabetes patients and reduce the associated medical costs (Asha, Pradeepa, & Mohan, 2004). The present study supports that diabetes education for type 2 diabetes patients can be effectively implemented and that important health indicators do significantly improve.

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