Original Article

Effects of diabetes education program on metabolic control among Saudi type 2 diabetic patients

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ABSTRACT

Objective: To assess the effect of the 5-days intensive diabetes health education program on metabolic control among Saudi type 2 diabetic patients.

Methodology: The study included 438 individuals, 158(36.1%) females and 280(63.9%) males with type 2 diabetes. All patients completed the 5-days diabetes education program. They did not require any change in their current therapy regimen, had not previously participated in any diabetes education programs, Saudi patients, of both genders, non-pregnant and older than 30 years. They were followed for one year after attending a 5-days structured education program conducted at University Diabetes Center in Riyadh, Saudi Arabia. Data were collected for each individual before attending the program, three months later, and one year after completion of the program.

Results: After one year, all metabolic parameters had improved significantly (*P*<0.0001) except for high density lipoprotein(HDL) (P =0.097) as follows: body weight (mean ± SD) 78.72 ± 13.77 to 78.11 ± 13.33 Kg; systolic blood pressure 137.69 ± 15.56 to 129.5 ± 15.09 mmHg; diastolic blood pressure 77.27 ± 8.11 to 72.9 ± 7.30 mmHg; fasting blood sugar 10 ± 2.62 to 8.19 ± 2.04 mmol/l; HbA1c 8.78% ± 1.78% to 7.87% ± 1.56% ; triglycerides 1.98 ± 0.9 to 1.51 ± 0.67 mmol/l; total cholesterol 4.77 ± 0.83 to 3.9 ± 0.83mmol/l; low density lipoprotein 2.71 ± 0.66 to 2.15 ± 0.59mmol/l, and high density lipoprotein improved by an increase from 1.28 ± 0.4 to 1.31 ± 0.24 mmol/l.

Conclusions: This study demonstrates that intensive education program provided by a trained professional healthcare team is an effective approach and reinforces the need for implementing such education program as an essential part for metabolic control among diabetic patients.

KEY WORDS: Diabetes Mellitus, Education Program, Metabolic Control.

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INTRODUCTION

Diabetes is a major global public health problem with a dramatic increase. The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030 and the total number of people with diabetes was projected to rise from 171 million in 2000 to 366 million in 2030.[1] In the Kingdom of Saudi Arabia; the number of people with diabetes is increasing due to population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity. The overall prevalence of diabetes was

23.7%, with 26.2% being males and 21.5% females. The calculated age-adjusted prevalence for Saudi population for the year 2000 is 21.9%. Diabetes mellitus is more prevalent among Saudis living in urban areas 25.5% compared to rural areas as 19.5%. Despite the readily available access to healthcare facilities in Saudi Arabia, 28% of diabetics were unaware of having diabetes.[2]

The importance of patient education has been known and emphasized as early as the late eighteenth century. In the early 1920's Dr. E. P. Joslin stated that "the diabetic who knows the most lives the longest".[3] This was confirmed by recent data that patient education is highly beneficial in improving metabolic control and reducing acute complications of diabetes.[4] Effective and good diabetes education has also been acknowledged as essential in the maintenance of good glycemic control and prevention of chronic diabetic complications. It is widely accepted as the cornerstone of successful diabetes management.[5] Since diabetes mellitus is associated with high rates of acute and chronic medical, social and psychological problems; the reduction and prevention of these problems cannot be achieved without health education to the patients and their involvement in caring for themselves.[6]

Studies on the impact of diabetes health education on metabolic control in Saudi Arabia are very few, and almost all of these studies were conducted to determine the role of knowledge and attending the education program on patients' glycemic control.[7,8] However the aim of this study was to evaluate the effectiveness of 5-days diabetes education program on metabolic control among type 2 diabetic patients at University Diabetes Center in King Abdul Aziz University Hospital, Riyadh, Saudi Arabia.

METHODOLOGY

A total of 438 diabetic patients attended the 5-days Diabetes Education Program at the University Diabetes Center in Riyadh, Saudi Arabia from January 2005 to January 2007. The inclusion criteria for participants were: type 2 diabetes, Saudi, older than 30 years, of both genders and completed the 5-days Education Program. Exclusion criteria were: participation in previous diabetes education program, pregnancy and those who required changes in their current therapy regimen.

The educational program was designed and adapted to local conditions by a trained health care professional team to improve the healthcare behavior among a group of diabetic patients and help them to share their experiences, beliefs, and opinions with the educators and thus allowing the participants to achieve optimum level of self-management and prevent or minimize diabetes complications.

The participants were divided into groups; each consisted of a maximum of 15 patients. This allowed interaction between the educators and all participants. It lasted for five days with males and females attending alternatively. All the participants were under medical staff supervision during the whole duration of the program. The University Diabetes Center Research Committee, College of Medicine Research Centre (CMRC) Ethical Committee, King Saud University approved the study.

The program consisted of: comprehensive information on the main topics of diabetes; explanation of diabetes and its different types, hyper and hypoglycaemic symptoms and management, the role of diet and physical exercise in diabetes control, hypoglycaemic agents, associated diseases, chronic complications, dental and foot care, diabetes care during special gatherings and occasions (Ramadan, Hajj, and travelling etc), practical training on home-self monitoring of blood glucose, insulin injection technique, physical activity, proper meal preparation and food exchange.

The education program was conducted by a diabetologist, diabetic educators, podiatrists, dieticians and physiotherapists using interactive approach to achieve active participation of patients rather than passive listening. Different educational methods were used in the course, writing boards, photographs, various demonstrations and videos. Individual log book was provided to each patient for recording self home-blood glucose monitoring data. The materials used for educating the diabetic patients including, pamphlets and handouts, were made available in Arabic language.

Data was collected using a common data form for the following information: medical history, drug history (oral hypoglycemic agents, insulin, anti-hypertensive drugs, lipid -lowering agents), body weight, blood pressure, fasting blood sugar (FBS), HbA1c, total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), and high density lipoprotein (HDL), before attending the 5-Days Educational Program, three months later and one year after completion of the program. The accepted reference values for these measures were those recommended by the Guidelines for the prevention, management and care of diabetes mellitus, WHO, 2006.[9]

Statistical Analysis: Data entry and analysis were performed using Statistical Program for the Social

Table-I: Patients' baseline parameters on joining the 5-days Education Program showing that most of them were well matched among the two genders.

Baseline Parameters		Total Mean	Gender								P-value
			Min	Max	Male Mean	Min	Max	Female Mean	Min	Max	
Age		55.84±10.0	32.0	80.0	57.36±9.58	37.0	80.0	53.14±10.20	32.0	80.0	<0.0001
Weight		78.72±13.77	47.0	129.0	78.56±13.73	47.0	116.0	78.99±13.88	50.0	129.0	0.75
Blood Pressure Systolic		138±15.55	99.0	190.0	139±13.16	106.0	186.0	136±18.99	99.0	190.0	0.072
	Diastolic	77±8.1	60.0	100.0	78±8.31	60.0	100.0	77±7.72	60.0	100.0	0.227
Fasting blood glucose		9.99±2.62	5.60	19.0	19.0	6.0	19.0	10.04±2.77	5.6	18.0	0.815
HbA1c		8.78±1.78	5.1	13.0	13.0	5.1	13.0	9.12±1.93	5.6	13.0	0.002
Lipid profile	TG	1.98±0.90	0.7	6.0	2.04±0.99	0.7	6.0	1.86±0.69	0.9	4.0	0.043
	T. Choles.	4.77±0.83	2.6	7	4.72±0.78	2.6	7.0	4.87±0.74	3.2	6.2	0.057
	LDL	2.71±0.66	1.0	4.4	2.79±0.64	1.1	4.4	2.55±0.67	1.0	4.0	< 0.0001
	HDL	1.28±0.40	0.4	2.5	1.13±0.32	0.6	2.0	1.54±0.40	0.4	2.5	< 0.0001

Sciences (SPSS) version 17.0 software for descriptive statistics such as frequency, percentage, mean and standard deviation and repeated measure ANOVA was used for comparison of repeated measures. A P-value of less than 0.05 was considered statistically significant.

RESULTS

The baseline characteristics of the target group who met the inclusion criteria are shown in Table-I. The mean age of the target group was 55.84± 10 years with 63.9% males and 36.1% females. The mean of

body weight was 78.72 ± 13.77 kilograms, systolic blood pressure had the mean of 138± 15.55 mmHg, diastolic blood pressure 77± 8.1mmHg, fasting blood glucose 9.99± 2.62 mmol/L, HbA1c:8.78%± 1.78%, triglycerides (TG):1.98± 0.90, total cholesterol, 4.77± 0.83, Low Density Lipoprotein (LDL): 2.71± 0.66, High Density Lipoprotein (HDL)1.28± 0.40. All of these parameters were non-significantly different between males and females except for age, HbA1c, LDL and HDL. (Table-I)

Table-II shows the changes in the means of metabolic parameters of study subjects after attending
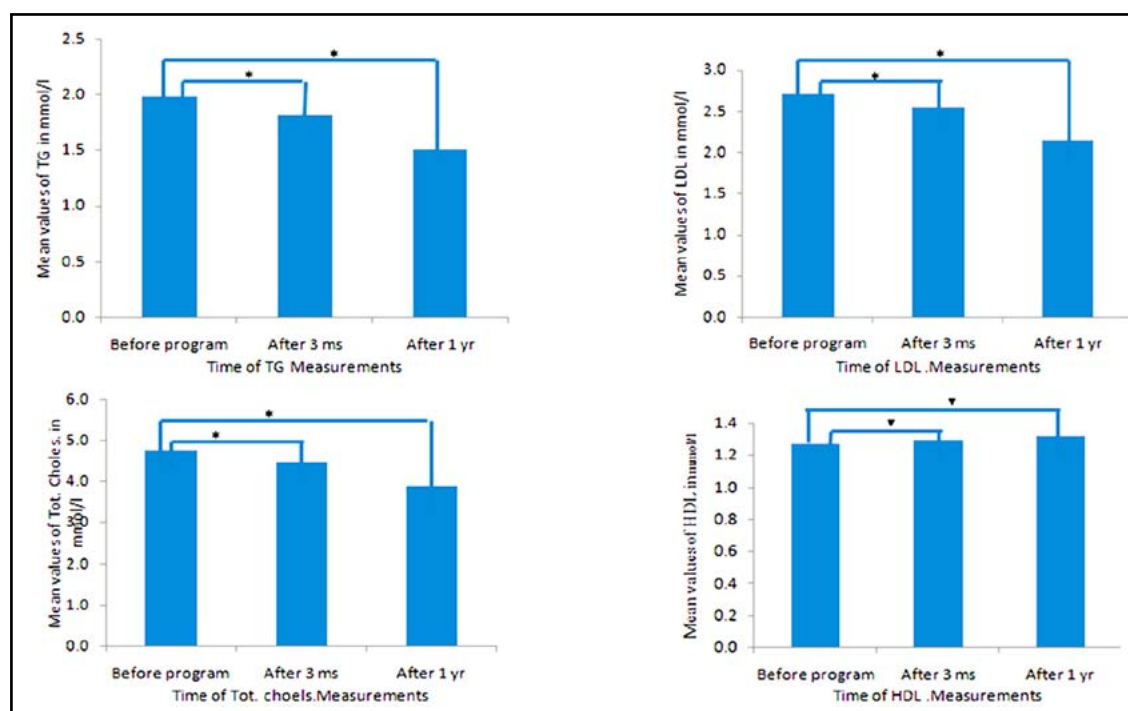

Fig.1: Pair wise comparison of lipid profile parameters: Before education, 3 months and 12 months after 5 days education program.

Table-II: Changes in the means of metabolic parameters of study subjects after attending the 5-days education program (using repeated measures ANOVA test).

Subjects' Parameters	Mean (SD)			
	Before Education	After 3 months	After one year	P-value
Weight (Kg)	78.72 (13.77)	78.57 (13.49)	78.11 (13.33)	<0.0001
Systolic Blood Pressure (mmHg)	137.69 (15.56)	134.09 (15.19)	129.5 (15.09)	< 0.0001
Diastolic Blood Pressure (mmHg)	77.27 (8.11)	74.99 (7.53)	72.9 (7.30)	< 0.0001
Fasting Blood Sugar (mmol/l)	10 (2.62)	8.97 (2.24)	8.19 (2.04)	< 0.0001
HbA1c (%)	8.78 (1.78)	8.47 (1.8)	7.87 (1.56)	< 0.0001
Triglycerides (mmol/l)	1.98 (0.9)	1.82 (0.9)	1.51 (0.67)	< 0.0001
Total Cholesterol (mmol/l)	4.77 (0.83)	4.46 (0.85)	3.90 (0.83)	< 0.0001
Low Density Lipoprotein (mmol/l)	2.71 (0.66)	2.55 (0.64)	2.15 (0.59)	< 0.0001
High Density Lipoprotein (mmol/l)	1.28 (0.4)	1.30 (0.32)	1.32 (0.24)	0.097

the 5-days Education Program, where most of the metabolic parameters differed significantly among the three measurements: before, three months and one year after implementation of the program. However after three months of the education program, there was no significant difference regarding body weight ($P=0.58$) and high density lipoprotein ($P=0.25$). On the other hand, significant differences were observed for all other metabolic parameters ($P<0.0001$). After one year, all parameters were found to be improved significantly ($P<0.0001$) except HDL ($P =0.097$) (Table-II & Fig. 1, 2 & 3).

DISCUSSION

Diabetes mellitus is a disorder that needs a multidisciplinary approach for its management including education. The educational part of diabetes care has an important role in prevention and treatment of diabetes complications and disabilities. Studies have shown that diabetes educational programs have positive impact on various aspects of quality of life and progression of diabetes complications.[10,11] The current management of DM includes: education, self monitoring of blood glucose and screening for any complications. Group
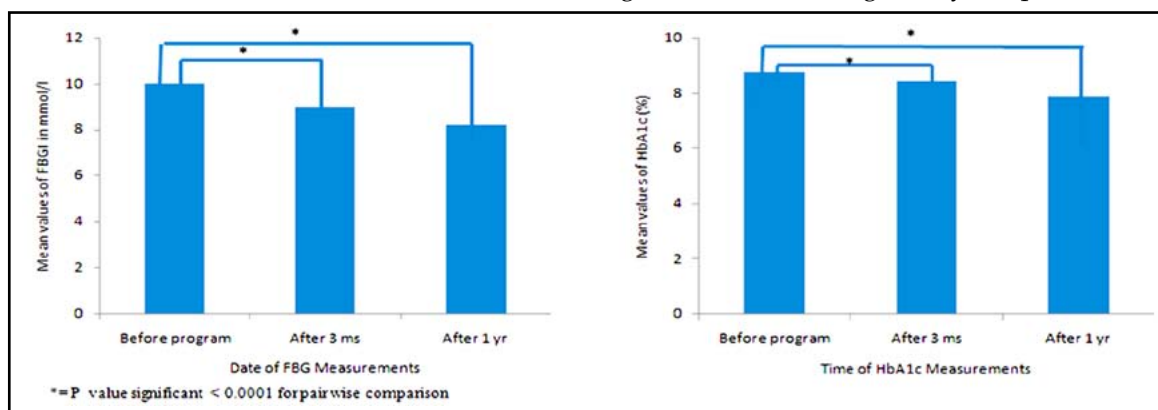

Fig.2. Pair wise comparison of fasting blood glucose & HBA1C: Before education 3 months & 12 months after 5 days education program.
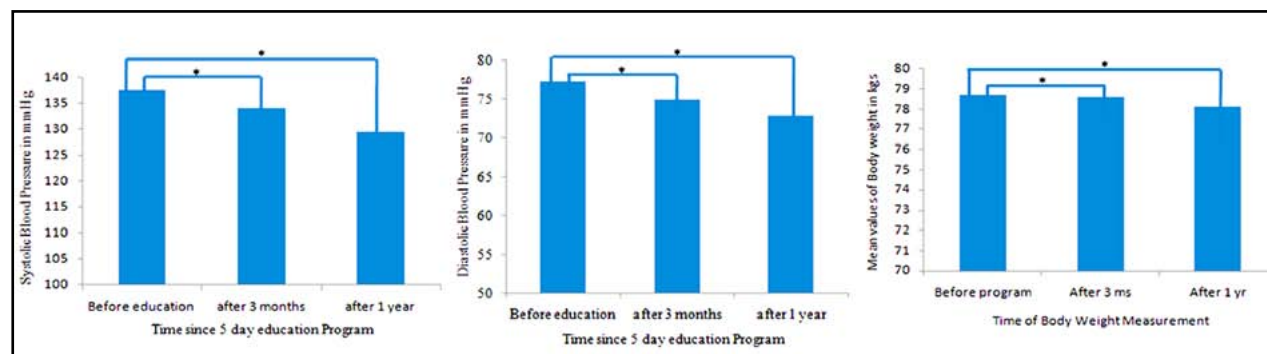

Fig.3: Pair wise comparison of blood pressure and weight: Before education 3 months and 12 months after 5 days education program.

oriented learning improves relationship between patients and healthcare professionals, allows peer interaction, and creates a sense of competition.[12]

The study results demonstrated that 5-Days Education Program is an effective approach in improving metabolic parameters among type 2 diabetes patients after one year of education program except for HDL (Fig1, 2 & 3). Similar findings have been reported that patient education on lifestyle modifications results in reduction in body weight and better control of blood pressure, glucose and serum lipids.[13,14]

Stern et al in 1989 stated that half of all diabetic patients are observed to be dyslipidemic.[15] The present study showed that 61.2% of patient had hyper-triglycerima and 27.1% had hypercholesterolemia. For most diabetic patients, the first priority of dys-lipdemia therapy is to lower LDL cholesterol to a target goal of less than 2.6 mmol/L.[16] After one year of the education program, we reached the target of less than 2.6 mmol/l : 2.15 mmol/l LDL, for TC it reached less than 5.2 mmol/l :3.90, TG reached less than 1.7 mmol/l,: 1.51. For HDL, it reached 1.32 mmol/l (Table-II). It was found that about 38% of patients had adequate metabolic control with HbA1c levels of < 7% after one year of the program. Epidemiological analyses of the UKPDS and DCCT definitely showed that improved glycemic control (A1c < 7%) is associated with sustained decreased rates of micro vascular complications.[17]

This study confirmed other study results that demonstrate the effectiveness of the education model in reduction of the body weight (Fig.3) as a result of the behavioral changes after one year of the education program.[14] The significant reduction in both systolic and diastolic blood pressure (p-values <0.0001) was beneficial for the diabetic patients (Fig.3). Randomized clinical trials have demonstrated the benefit (reduction of coronary heart disease [CHD] events, stroke, and nephropathy) of lowering blood pressure to <140 mmHg systolic and <80 mmHg diastolic in individuals with diabetes.[18,19] After one year, all parameters had improved significantly (P<0.0001) except high density lipo-protein (HDL) (P =0.097). This could be a reflection of the genetic effect as consanguineous marriages amongst the Saudis are as high as 52.1-67.7%, with the first cousin and closer marriages between 25-42%.[20,21] Complex disorders such as diabetes, hypertension and coronary artery diseases are etiologically heterogeneous with multi-factorial inheritance in most families. High susceptibility genes could play a significant role in the expression of these complex disorders.[22] Moreover there is a close association of genetics and HDL cholesterol.[23]

Based on the results of the present study; it is recommended that diabetes education should be an essential component of successful diabetes care. Such structured educational programs should be implemented all over the Kingdom (hospitals and primary health care centers) and monitored as part of diabetes care. Furthermore; improved training and educational skills of healthcare team can help and promote adherence to educational recommendations. It is also important to involve family members of diabetic patients in the process of therapeutic education. Diet planning should be based on individual life style habits, learning levels and diabetes management goals.

Moreover, mass media has a role in educating the whole community by increasing the awareness of the people about diabetes and its risk factors. Mass media should communicate educational message to the diabetic patients to prevent further diabetic complications by adopting healthy life style. Multi-sector efforts are needed to encourage the role of physical activity in diabetes management care by providing a suitable environment for both genders and for all age groups. Re-education sessions for diabetic patients are needed to maintain the positive effect of the education program that can be achieved through a well organized follow-up.

CONCLUSION

The present study revealed that 5 Day Diabetes Health Education Program had significant improvement in the metabolic control of Saudi patients with type 2 diabetes. These results confirm that lifestyle modifications through patient education result in reduction of body weight and better control of fasting glucose, both systolic & diastolic blood pressure and lipid profile especially TG, total & LDL cholesterol. Moreover; the study supports the concept that an educational program provided by a trained professional health team promotes behavioral changes that lead to improved food selection, physical activity, quality of life and control of diabetes risk factors. Thus, the results reinforce the need for implementing such education programs or other alternative programs, as essential part of metabolic control and reduction of complications related to diabetes. Further research should be conducted in other settings by using a control group and for longer follow up to confirm the effects of such educational program on metabolic control of type 2 diabetic patients.

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