EFFECTS OF A HEALTH EDUCATION PROGRAM ON BEHAVIOR, HBA1C AND HEALTH-RELATED QUALITY OF LIFE IN DIABETIC PATIENTS

T. Aghamolaei[*1], H. Eftekhar[1], K. Mohammad[2], M. Nakhjavani[3], D. Shojaeizadeh[1], F. Ghofranipour[4] and O. Safa[5]

1) Department of Public Health Services, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
2) Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
3) Department of Endocrinology and Metabolism, Vali-e-Asr Hospital, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
4) Department of Health Education, School of Medical Sciences, Tarbiat Modares University, Tehran, Iran
5) Department of Immunology, School of Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Abstract- Diabetes mellitus is a chronic disease of lifelong duration and its management requires a fundamental change in patient's lifestyle. The aim of this study is to evaluate the efficacy of an interactive health education program on knowledge, behavior, HbA1c and health-related quality of life (HRQOL) of diabetic patients. Eighty patients were randomly selected and assigned to two groups, 40 to the intervention and 40 to the control group. All participants were followed for 4 months. At the initial visit and 4 months after education, knowledge was assessed by questionnaire, behavior assessed using an interview schedule, HbA1c measured by colorimetric method and health-related quality of life assessed by means of WHOQOL-BREF questionnaire. The intervention group showed statistically significant increase in mean of knowledge, behavior, physical and psychological health and also had a statistically significant reduction in mean of HbA1c. Control group had significant increase only in knowledge. It seems that this interactive approach is useful, worthwhile and applicable for behavior modification and improvement in HbA1c and health-related quality of life of diabetic patients.
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INTRODUCTION

Diabetes mellitus (DM) is an epidemic disease in most countries that are undergoing socioeconomic transitions. Worldwide, an estimated 150 million

people are affected by DM and the number is likely to reach to at least 300 million by the year 2025 if successful strategies are not implemented for its prevention and control. By 2025, approximately 75% of all persons with DM will be living in developing countries. Moreover, type 2 DM, the most common form, is affecting ever younger age groups, striking younger adults and the adolescents (1).

It has been reported that 2% of the Iranian population have DM and prevalence of diagnosed DM for those over the age of 30 years has been

estimated to be 7.3% (2). DM is a chronic disease caused by inherited deficiency in the production of insulin or by ineffectiveness of its action. The result is an increase concentration of glucose in the blood, which in turn leads to damage to many of the body's systems. The most common complications of DM are heart disease, kidney failure, nerve damage, male impotence and infection. These severe consequences may have a very deleterious effect on the quality of life of an individual with DM. However, these untoward complications may be delayed or even prevented by effective treatment and education (1).

DM is a chronic disease of lifelong duration, and its management requires a fundamental change in the patient's lifestyle (3). It is one of the most psychologically and behaviorally demanding of the chronic medical illnesses. The outcome of DM treatment is highly dependent on the self-care behavior of the patient. It is estimated that patients are expected to conduct 95% of their own DM management. They are expected to make multiple lifestyle changes simultaneously (4). Choosing interventions that work in general and are well matched to local culture, needs and capabilities and then implementing those interventions properly are vital steps for improving outcome among people with DM (5). In order to manage, diabetic individuals must understand their medication and diet, and know how to modify them according to exercise. They also need to know how to monitor their blood glucose levels and how to modify their regimen during illness (6).

Patient education is considered as an integral part of diabetes management (7). Several studies have shown that behavior modification is more effective than simple education about the disease in improving DM control. Although behavior modification training may be more important than education in controlling the metabolic parameters of DM, patients must possess basic knowledge of the pathophysiology, risks and management of their disease. They must be taught to recognize early the complications of their disease, the need for multidisciplinary surveillance, the benefits and risks of their medications, and the risks of untested alternative treatments (8). Many studies relied upon blood glucose levels as an index

of physiological control in order to evaluate the effects of teaching programs. Recently educators have suggested that other outcome criteria should be included, such as quality of life or patient satisfaction (6). The aim of this study is to evaluate the efficacy of a health education program on the knowledge, behavior, metabolic control and health related quality of life (HRQOL) of diabetic patients after following the patients' participation in the program.

MATERIALS AND METHODS

The study population consisted of diabetic patients attending at Bandar Abbas diabetic clinic which is located in Shahid Mohammadi Hospital in the city of Bandar Abbas in south of Iran. The patients were considered eligible for study if they had type 2 DM, had not attended a formal diabetes education and consented to participate in the study. Eighty patients were randomly selected and they were randomly assigned to two groups, 40 to the intervention and 40 to the control group.

Education sessions were held at the diabetic clinic for 2 hours weekly for 4 weeks and participants were followed for 4 months. The education program was according to protocol of Iranian Diabetes Association and it consisted of definition of DM, treatment of DM, dietary control, complications, action of insulin and oral hypoglycemic agents, symptoms and treatment of hypoglycemia and uncontrolled hyperglycemia, foot care, blood glucose testing, practical training on self-monitoring, injection, physical exercises, smoking cessation and weight monitoring. The education classes were held by one health educator and one nurse, using the interactive approach for groups of 10 patients. This approach means that there is a discussion during the education sessions with the active participation of the patients and that all the information is derived and analyzed on the basis of patients' knowledge and experience. All patients in intervention group received printed materials with guidelines after each lesson.

During the classes, patients were encouraged to ask questions, interject their own experiences and

receive feedback from other patients and instructors. Behavior modification of patients was an important aspect of the intervention.

The 40 patients assigned to the control group gave the appropriate consent and completed questionnaires at baseline and after 4 months. During the study, the patients in both the intervention and control group were visited by their physicians as usual, and the physicians prescribed medications according to their clinical judgment. At the initial visit, data were collected on demographic characteristics such as gender, age, level of education, method of treatment, and date of initial diabetes diagnosis. At this initial visit and 4 months after health education program, data were also collected on the following four variables:

1. Diabetes knowledge: knowledge was assessed using a series of validated tests before teaching program and 4 months after education. The range of scores was from 0 to 20.

2. Behavior: behavior of patients in relation to management of their disease was assessed using an interview schedule before teaching program and 4 months after education. The range of scores was from 0 to 10.

3. HbA1c: glycosylated hemoglobin (HbA1c) was measured by colorimetric method before teaching program and 4 months after education.

4. HRQOL: WHO defines quality of life as individuals' perceptions of their position in life in the content of the culture and value systems in which they live and in relation to their goals, expectations, standards and concern (9). HRQOL was assessed before teaching program and 4 months after education by means of WHOQOL-BREF questionnaire which contains 26 items having a range of 1-5. It also includes four domains: physical health, psychological health, social relationships and environment. In each domain raw scores were converted to transformed scores and the range of transformed scores was from 0 to 100 (9). It was shown to be reliable before study.

The data were analyzed by independent and paired Student's *t* test, also Mann-Whitney, Wilcoxon, Chi square and Fisher's Exact test and $P<0.05$ was considered statistically significant.

RESULTS

Three patients were dropped from the intervention group because they did not attend the health education program completely, and six patients were dropped from the control group because we did not have access to follow them up after program.

The demographic and clinical characteristics of the intervention and control groups are shown in table 1. They were similar in regard to age, sex, education, duration of DM, current management, smoking, self-monitoring blood glucose, HbA1c, knowledge of diabetes, behavior and domains of health-related quality of life.

Table 1. Demographic and clinical characteristics of patients at the beginning of study*†.

Variables	Intervention group (n= 37)	Control group (n= 34)
Age (years)	51.27±7.74	51.2±9.39
Sex (male/female) ‡	15/22	14/20
Education‡		
Illiterate	11	12
Primary school	13	16
Middle school	5	4
High school and university	8	2
Duration of diabetes (years)	6.05±5.21	5.98±4.56
Current management‡		
Diet only	3	2
Oral medication	24	17
Insulin	10	15
Smoking (yes/no) ‡	9/28	9/25
Self-monitoring blood		
Glucose (yes/no) ‡	2/35	2/32
HbA1c	9.44±1.38	9.05±0.63
Knowledge	6.76±1.80	7.30±1.79
Behavior	3.94±1.20	4.26±1.37
HRQOL		
Physical health	64.75±10.54	62.85±14.51
Psychological health	56±8.86	55.41±11.81
Social	57.08±15.87	63.76±12.83
Environment	57.04±10.21	55.38±7.76

*Data are given as mean±SD unless otherwise specified.
† All *P* values are not significant, using independent *t* test, Chi square, Fisher's exact test and Mann-Whitney test.
‡number.

Table 2. Impact of the intervention program*

Item	Intervention group (n= 37)			Control group (n= 34)		
	Baseline	After 4 months	*P* Value	Baseline	After 4 months	*P* Value
Knowledge	6.76±1.80	15.8±1.85	0.000	7.30±1.79	8.67±1.32	0.000
Behavior	3.94±1.20	7.7±1.07	0.000	4.26±1.37	4.51±1.55	NS
HbA1c	9.44±1.38	8.24±0.94	0.000	9.05±0.63	8.89±1.12	NS
HRQOL						
Physical health	64.75±10.54	77.24±9.68	0.000	62.85±14.51	62.7±14.21	NS
Psychological	56±8.86	71.37±7.91	0.000	55.41±11.81	57.55±10.0	NS
Social	57.08±15.87	60.13±15.9	NS	63.76±12.83	62.55±11.96	NS
Environment	57.05±10.21	59.43±9.56	NS	55.38±7.76	56.11±8.37	NS

Abbreviations: NS, not significant; HRQOL, health related quality of life.

* Data are given as mean±SD.

Table 2 shows effects of the health education program on variables at the end of the 4 months. After education, the intervention group had statistically significant increase in the mean of knowledge score ($t = -26.55$, $P = 0.000$), behavior score ($t = -15.52$, $P = 0.000$), physical health ($t = -8.57$, $P = 0.000$) and psychological health ($t = -13.02$, $P = 0.000$). Although mean of social relationship score improved from 57.08 to 60.13 and environment score improved from 57.05 to 59.43, the paired *t* tests weren't statistically significant. Also intervention group had statistically significant reduction in the mean of HbA1c from 9.44 to 8.24 ($t = 6.81$, $P = 0.000$). Patients in control group showed no significant changes in the outcome measured except for knowledge ($t = 8.2$, $P = 0.000$). Although there was a mild increase in knowledge in the control group, the increase in knowledge was much greater in the intervention group (Table 2). Moreover, the mean increase in knowledge of intervention and control groups were 9.03 ± 2.06 and $1.37 \pm .98$, respectively, and there was significant difference between them ($t = 19.60$, $P = 0.000$).

DISCUSSION

The primary intervention associated with assisting individuals with lifestyle change in DM has been education. The major components of DM self-management (medication, diet, exercise, and self-monitoring blood glucose) require challenging lifestyle changes for even the most disciplined people (10). The underlying assumption is that education influences behavior, which subsequently influences glycemic control. Education about DM has gradually changed from imparting knowledge about the cause and treatment of DM to an interactive approach in DM self-management. The approach has changed from passive learning to active participation in self-care and decision-making (10). The focus of the patient DM education approach has changed from compliance to adherence to self-efficacy and empowerment. The power of the patient-educator intervention shifted from the educator to the patient (11).

The main results of the present study are an increase in knowledge, behavior change, improvement in HbA1c and HRQOL. The patient's knowledge about the disease and its management is important. In our study the intervention group had statistically increase in mean of knowledge score. One of the reasons why people don't manage their diabetes fully may be lack of knowledge (6). Several studies have concluded that lack of knowledge of self-care skills and wrong information or misunderstanding of the therapeutic plan was major aspects of involuntary noncompliance (12). However, knowledge should not be overestimated because people may know what to do but don't transfer it into practice (7). The success of DM management depends largely upon patient compliance with the prescribed management plan (12). They must change several behaviors all at once: diet, exercise, and self-

monitoring blood glucose. In this study the intervention group had statistically significant increase in mean of behavior score. The greatest barriers to lifestyle change are related to dietary and exercise behavior with few barriers associated with medication and glucose testing (10). The greatest barriers were related to changes such as conducting self blood glucose monitoring, dietary and exercise behavior and few barriers were associated with medication, weight monitoring and foot care. The metabolic control of the intervention group improved significantly following the health education program and the decrease in HbA1c level is comparable with other similar studies (7,13). Decrease in HbA1c mostly is due to change in behavior and it is a measure of a person's blood sugar level in the past 6-8 weeks. It has shown that long term near normal HbA1c levels decrease the risk of diabetic complications (14). Although there are some doubt about association between knowledge and metabolic improvement of people with DM, some authors have reported beneficial effects of patients education on lowering HbA1c (15).

One of the main objectives of management of DM is to improve the quality of life of patients so that they can have as normal a life as possible (3). The quality of life of diabetic patients is one of the main targets in management. It is an important outcome measure that should be routinely examined in clinical trials concerning evaluation of patient education (7). In this study the quality of life of patients increased significantly 4 months after the program due to increase in physical and psychological health, however, there were no significant changes in social relationship and environment domains before and 4 months after program. Improvement in quality of life and physical and psychological health are comparable with some (7, 13) but not with other studies (8). DM education improved physical health significantly which implies that diabetes education encouraged patients to do more exercise, moreover physical health can improve psychological health.

The study confirms that using interactive approach in education is effective in management of DM and improves metabolic control and health-related quality of life especially in physical and psychological health domains. Any method used for

better control of type 2 DM by avoiding pharmacologic means will require a plan for long-term maintenance (8). Significant changes in knowledge, behavior, HbA1c and quality of life occurred in the 4 months period. However, living with diabetes is a lifelong process and observation of behaviors over a longer period would provide useful information about patterns that can evolve. We believe that our program is clinically worthwhile for patients with type 2 DM; it is also is an aid to physicians, is cheap, well-suited for primary care and applicable.

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