



IMPACT OF EDUCATION ON DISEASE KNOWLEDGE AND GLYCAEMIC CONTROL AMONG TYPE 2 DIABETIC PATIENTS IN FAMILY PRACTICE

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ABSTRACT

In patients with diabetes type 2, good knowledge about disease often doesn't follow appropriate behavior in their life. Therefore, we wanted to find out basic level of disease knowledge and glycaemic control among type 2 diabetic patients, and after that impact of passive and intensive education on knowledge and glycaemic control. Starting with 130 participants, 91 patients with type 2 diabetes, from four family medicine services in Tuzla Canton, completed six months education about their disease. Disease Knowledge Test of Michigan Diabetes Training and Research Center was used to evaluate knowledge about diabetes and glycaemic control was assessed by HbA_{1c}. Participants were tested at the beginning of survey, after 3 months of passive education and additional 3 months of intensive one. Basic test showed good knowledge of participants (score 8,3 out of 15), improved knowledge after passive education (score 9,23) and intensive one (11,19) ($P < 0,0001$). Demographic characteristics of patients (age, sex, living area, level of education, duration of disease and type of treatment) had no influence on disease knowledge and glycaemic control during education. Generally, patient education improved significantly glycaemic control by HbA_{1c} reduction 0,45% ($P = 0,011$) without significant differences between passive and intensive one. Education of patients improves both disease knowledge and glycaemic control among type 2 diabetic patients.

KEY WORDS: patient education, diabetes mellitus type 2, family practice

INTRODUCTION

Diabetes mellitus type 2 is becoming pandemic worldwide. This is a result of changes in life style, obesity problems, trends of urbanization as well as increase in number and aging of population in general (1). Unfortunately, diabetes type 2 is not only connected with elderly and middle aged population but is often found among younger people and even children (2). General prevalence of diabetes in 1995 was 4%, however by 2025 an increase to 5,4% is expected (3). According to the results of Hadžiahmetović from 1985 (4) the prevalence of diabetes in the Northeast region of Bosnia and Herzegovina was 0,45%. More recent data from 1997 (5) showed that the prevalence of diabetes on Tuzla Canton was 1,06%, and it also showed that women have this disease more often (70,6%). In the middle of 1980s treatment of diabetes type 2 in Tuzla region was relocated from the hospital level to the primary practice, through counseling units for diabetic patients. With the beginning of the new millennium, as the reform of the primary health care started, the important part of care in the treatment of this disease was taken over by the health professionals in family practices. The measurement of HbA_{1c} values have become the standard in glycemetic control and estimates that HbA_{1c} ≤7,0%, or even better HbA_{1c} ≤6,5%, according to International Diabetes Federation guideline from 2005, lowers the risk of diabetic complications (6). The large and prospective study from 1998 showed that the reduction of HbA_{1c} for 1% is followed by reduction of overall deaths from diabetes for 21%, microvascular complications for 37% and myocardial infarctions for 14% (7).

The management of diabetes mellitus involves: health education, balanced diet, physical activities, self-monitoring and medications (8).

Education of people with diabetes is a process of teaching the knowledge and skills important for this disease that these persons are able to care for themselves on daily basis. However, there is significant lack of knowledge and skills among 50% to 80% of diabetics. A good glycemetic control with HbA_{1c} <7.0% was achieved in less than half of diabetics with type 2 diabetes (9).

The goal of this research was to determine basic knowledge about disease among patients with diabetes type 2, and knowledge after passive and intensive education and to determine impact of the acquired knowledge during passive and intensive education on glycemetic control.

PATIENTS AND METHODS

The research has been done as the multicentric before and after study from December 2004 to December 2005. Patients were included from four family medicine practices, two in urban and two in rural areas, of Tuzla Canton. Including criteria for participants in this research were that all patients had diabetes type 2, in accordance to criteria of the World Health Organization from 1999, both sexes, age 40 to 60 years, with minimum primary school education (factor of literacy), who were treated by same family physician and nurse at least for 2 years and those who voluntarily agreed to educate themselves about their disease. For disease knowledge assessment the Test of Michigan Diabetes Research and Training Center was used (10). This test consists of 15 questions and each answer scores one point. Test result ≤7 points showed poor knowledge about the disease and score of ≥8 points indicated good knowledge about the disease. This knowledge test each participant had to fill in at the family practice and submit it to the nurse during their regular visits. This was done at the beginning of the research and then after 3 and after 6 months. At the same time the HbA_{1c} values were controlled. *Passive education:* after basic knowledge test about disease, the patients were given an educational brochure "A Healthy Life with Diabetes Type 2" (11) as a way of passive education. The result of this passive education was evaluated after 3 months. The patients were tested on their knowledge and HbA_{1c} was controlled at that time. *Intensive education:* during next three months, a monthly, intensive group education of patients was performed with the focus on the knowledge about disease. Duration of these meetings was 1,5 hours, so that total number of hours of education was 4,5. After the intensive education was completed, the knowledge of patients was tested again (modified Michigan Test with reversed order of questions) and their HbA_{1c} was again controlled. Only the patients attended at least one of three educational sessions were tested to find out the success of intensive education. Statistical analysis was done by comparing the mean values with t test or analysis of variance. The difference between samples is considered statistically significant if it is P<0,05.

RESULTS

The basic questionnaire was filled in by 130 patients. After the passive education 110 patients showed up for the

Test knowledge (score -15 points)	Basic knowledge (n=91)		Passive education (n=91)		Intensive education (n=91)	
	LS; n=33	HS; n=58	LS; n=19	HS; n=72	LS; n=3	HS; n=88
Points x±SD	6,45±0,67	9,40±1,35	6,21±0,98	10,03±1,67	5,67±1,53	11,38±1,66
Total score x±SD	8,33±1,83		9,23±2,19		11,19±1,94*	

LS-low score, HS-high score *P<0,0001

TABLE 1. The basic and acquired knowledge after passive and intensive education

testing, while in the intensive education there were 91 questioned patients. Statistic analyses were done only for the 91 patients that had completed the entire cycle of education.

At the beginning of education from 91 patients 58 of them have had good knowledge about diabetes type 2 with high score of points and disease knowledge was improved after passive and intensive education (Table 1). Analysis of variance showed statistically significant difference between mean of points in three educational groups (P<0,0001). By using Scheffe's test it was found that all three groups were statistically different in mean of points: basic knowledge-passive education (P=0,0006), basic knowledge-intensive education (P=0,0001) and passive-intensive education (P<0,0001). So, patients have had a good disease knowledge even at the beginning of this research that was significantly improved during both cycles of education. Influence of demographic characteristic of patients on disease knowledge and glycaemic control during education is shown in Table 2.

There was no significant difference in knowledge improvement between age groups of 40-50yrs vs. 51-60yrs (P=0,061) nor in glycaemic control (P=0,30). Also, difference was not found in knowledge improvement between urban and rural group (P=0,76) nor in glycaemic control (P=0,94). By analysis of variance there was no significant difference in knowledge improvement during education regarding to the level of formal education of patients (P=0,55) nor in glycaemic control (P=0,44). There was no statistical difference in knowledge improvement during education in regards to duration of disease (P=0,68) nor in improvement of glycaemic control (P=0,94). Gender differences on disease knowledge as well as glycaemic control were analyzed during education (Table 3). There was no significant difference in knowledge improvement (P=0,76) and glycaemic control (P=0,28) between men and women during education. However, although women were less informed about their disease and had worse values of HbA1c at the beginning of the education, they had improved their score of knowledge more (+2,92 points vs. +2,77) in

Demographic characteristics (n=91)	Basic knowledge		Passive education		Intensive education	
	Points (x±SD)	HbA1c (%) x±SD	Points x±SD	HbA1c (%) x±SD	Points x±SD	HbA1c (%) x±SD
Age 40-50yrs; n=23	8,65±1,58	8,11±1,96	9,70±2,42	7,82±1,73	10,74±2,44	7,96±3,05
Age 51-60yrs; n=68	8,22±1,90	7,72±1,52	9,07±2,11	7,61±1,43	11,34±1,73*	7,13±1,32**
Urban; n=58	8,38±1,89	7,69±1,48	9,00±2,05	7,56±1,30	11,29±1,98	7,22±2,02
Rural; n=33	8,24±1,73	8,04±1,89	9,64±2,41	7,84±1,82	1,00±1,87'	7,54±1,76"
Elementary school; n=30	8,17±1,93	7,80±1,36	9,50±2,35	7,78±1,45	10,90±1,86	7,59±2,52
High School; n=50	8,04±1,59	7,75±1,73	8,78±2,03	7,61±1,58	11,10±2,03	7,20±1,60
College/University; n=11	10,09±1,70	8,23±1,98	10,55±2,02	7,56±1,40	12,36±1,29&	7,24±1,44&&
Duration of disease 0-5yrs; n=47	8,11±1,67	7,64±1,84	8,89±2,17	7,36±1,64	10,87±2,07	7,22±2,28
Duration of disease >5-10 yrs; n=22	8,14±1,75	7,96±1,53	9,41±2,09	8,06±1,22	11,32±1,25	7,38±1,41
Duration of disease >10 yrs; n=22	9,00±2,12	8,06±1,27	9,78±2,33	7,91±1,37	11,73±2,14#	7,55±1,59##

Knowledge (points): *P=0,061; 'P=0,76; &P=0,55; #P=0,68

HbA1c: **P=0,30; "P=0,94; &&P=0,44; # #P=0,94

TABLE 2. Basic and acquired knowledge on diabetes and glycaemic control regarding to demographic characteristics of patients

Patients (N=91)	Basic knowledge		Passive education		Intensive education	
	Points x±SD	HbA1c (%) x±SD	Points x±SD	HbA1c (%) x±SD	Points x±SD	HbA1c (%) x±SD
Women; n=51	8,18±1,98	7,86±1,44	9,02±2,28	7,73±1,25	11,10±2,00	7,19±1,31
Men; n=40	8,53±1,62	7,78±1,89	9,50±2,09	7,57±1,79	11,30±1,87	7,52±2,51

TABLE 3. Basic and acquired knowledge after passive and intensive education and glycaemic control regarding to sex

Therapy (n=91)	Points x±SD HbA1c (%) x±SD	Basic knowledge	Passive education	Intensive education
Insulin		n=21	n=23	n=23
	Points	8,95±2,16	9,61±2,68	11,26±2,07
	HbA1c	8,41±1,38	8,50±1,42	8,26±1,71
Oral		n=60	n=55	n=61
	Points	8,27±1,72	9,26±2,05	11,16±1,93
	HbA1c	7,86±1,72	7,64±1,45	7,13±1,98
Diet		n=10	n=13	n=7
	Points	7,40±1,35	8,46±1,81	11,14±1,77
	HbA1c	6,35±0,43	6,28±0,57	6,11±0,53

TABLE 4. The level of basic and acquired knowledge and glycaemic control regarding to the type of therapy

comparison to men and they also had better reduced HbA1c values (-0,67% vs. -0,26%) during education. Table 4 shows the level of basic and acquired knowledge and glycaemic control during education regarding to the type of therapy.

There was no significant difference in knowledge improvement between these three treatment groups of patients (P=0,56). Also, there was no significant difference in improvement of glycaemic control during education in the group of insulin treated patients (P=0,28), nor in oral therapy group (P=0,74), as well as in diet group (P=0,35). Mean of HbA1c was statistically different between groups (P=0,011) during education (Table 5). Scheffe's test showed that the difference comes from mean of HbA1c among groups with basic knowledge and intensive education (P=0,0123). Among groups with basic knowledge and passive education, and passive knowledge and intensive education, there was no statistically significant difference (P>0,05).

DISCUSSION

Education of people with type 2 diabetes is an ongoing process and it is crucially important in treatment of this disease. The good knowledge of our patients about

diabetes, at the beginning of education, we can explain with the facts that it was a group of well motivated patients, who entered this research with free will and with the continuous treatment by the same family doctor and nurse. Participants had improved their knowledge on disease during education. The results were better after the intensive rather than passive education (+1,96 vs. +0,9 points) and from the initial 8,3 points at the end an average score was 11,19 points out of 15. The similar results were found by Rickheim and associates (12). They had followed the effects of individual as opposed to group education with diabetes type 2 patients. Education improved their score of knowledge from 8,4 to 12,6 points out of 14 d and improvement of HbA1c was marginally greater in subjects of group education. This research has emphasized poor basic knowledge about diabetes in women, patients with the lower education, shorter duration of the disease, which indicates omissions in the health system when educating patients with this disease. Unfortunately, at the end of the education the poorest knowledge and HbA1c values was evident among a group of younger patients (40-50yrs) what is a warning sign to work more intensively on the motivation of this group of patients to better control their disease. In the beginning of our research 23% of patients were on

Glycaemic control	Basic knowledge (n=91)		Passive education (n=91)		Intensive education (n=91)	
	LS; n=33	HS; n=58	LS; n=19	HS; n=72	LS; n=3	HS; n=88
HbA1c x±SD	7,46±1,51	8,02±1,69	8,12±2,07	7,54±1,31	7,53±3,02	7,33±1,91
Total HbA1c x±SD	7,82±1,64		7,66±1,50		7,34±1,93*	

LS-low score, HS-high score *P=0,11

TABLE 5. Mean of HbA1c during education

insulin therapy, 66% on oral and 11% were on a diet. This therapy arrangement was not changed during education since we have had no influence on patient's treatment. The best results on basic test were shown by patients on insulin therapy and the worst results were among patients on a diet. At the end of education, the best knowledge improvement (+3,74 points) was evident among a group of patients on a diet, and then followed the group on oral therapy (+2,89 points) and lastly the group on insulin (+2,31 points). In our health system, the patients with diabetes that are on insulin are more likely to be better educated about their disease in comparison to other groups on therapy. Since the insulin therapy is a later choice among patients with diabetes type 2, they lose a lot of time until they get a proper education on their disease. During the six months cycle of education the HbA1c value was lowered for 0,49%. This was better af-

ter the intensive rather than passive education (-0,33% vs. -0,16%). Study of Raji and associates showed (13) the average value of HbA1c lowered similarly in intensive educated group (-2%) and in passively educated (-1,9%). In a meta analysis of 72 studies (9) which compared group vs. individual education it was found that the effects to knowledge and metabolic control of the disease were positive immediately after education and these effects were lowered after 6 months, especially in regards to the metabolic control of the disease. The predictors of better knowledge after education were the number of contacts between patients and educators and duration of each one. Continuity in education of patients with diabetes and a long life motivation in proper behavior, life style changes following with as good as possible self-monitoring of disease is the minimum that the health professionals should offer to patients with this chronic disease.

CONCLUSION

Patients with diabetes type 2 have had good knowledge about their disease at the beginning of education and this knowledge was improved during both passive and intensive education. The total impact of education, regardless of the way the knowledge was acquired, led to improvement of glycemic control. This research stressed that special attention regarding education about disease should be paid to women with diabetes type 2, patients with the lower education, shorter duration of the disease, while younger patients (<50yrs) have to be closely monitored for glycemic control.

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