

## INFLUENCE OF DIABETIC EDUCATION ON PATIENT WELL-BEING AND METABOLIC CONTROL

Tatjana Milenković<sup>1</sup>, Suzana Gavrilović<sup>2</sup>, Viktorija Percan<sup>1</sup>, Goran Petrovski<sup>1</sup>

*Key words: patient overall well-being, group education, metabolic control*

### SUMMARY

*The aim of this study was to evaluate the possible influence of a structured teaching program for interactive group education of diabetic patients on their overall well-being and metabolic control. The study included 110 insulin-treated diabetic patients. They were followed for one year after a 4-day structured teaching program performed at University Department of Endocrinology, Diabetes and Metabolic Disorders, School of Medicine in Skopje. At re-education sessions one year after education we noticed significant improvement in metabolic control, HbA<sub>1c</sub> decreased from 9.2±1.3 to 7.7±1.8% ( $p < 0.0005$ ), diabetes related knowledge improved from 49.1±16.8 to 85.4±14.3% ( $p < 0.05$ ), and patient overall well-being improved from 46.6±8.3 to 54.8±5.9 ( $p < 0.05$ ) due to reduction of depression ( $p < 0.003$ ) and anxiety ( $p < 0.004$ ), and increase in energy ( $p < 0.0006$ ) and well-being ( $p < 0.002$ ). Study results confirmed the improvement of overall well-being, metabolic control and diabetes related knowledge in insulin-treated diabetic patients after a structured education program.*

---

Correspondence to: Prof. Tatjana Milenković, M.D., Ph.D., University Department of Endocrinology, Diabetes and Metabolic Disorders, School of Medicine, Vodnjanska 17, 1000 Skopje, Macedonia  
E-mail: tamil@freemail.org.mk

### INTRODUCTION

Since the beginning of the last century, patient education has been considered as an integral part of diabetic treatment. It was shown 30 years ago, and has been repeatedly confirmed by recent data that patient education has great efficiency in improving metabolic control and reducing acute complications of diabetes (1-5). In the last decade several studies demonstrated that patient education also contributed to the reduction of chronic complications of diabetes (6-9). In fact, patient education helps in diabetic treatment, however, its efficiency varies according to the aspect of the disease that has to be controlled and to behavioral changes that are needed to reach the goal (10). The outcome of diabetic education is commonly evaluated in terms of the prevalence of complications or biomedical parameters. During the last few years ever growing interest has been directed towards the impact of diabetes on the quality of life and patient's overall well-being (10-12). It is well known that diabetic patients must deal with their diabetes every day, which influences their quality of life. There are several categories of factors related to quality of life (11): disease-specific medical predictors (type and duration of diabetes, treatment regimen, level of glycemic control, presence of complications), diabetes-specific attitudinal predictors (diabetes self-efficacy, locus of control, social support), demographic predictors (gender, education, ethnicity, age, marital status). The

true causal relationships among all of the variables are complex and often reciprocal, and they may affect each other as well as the quality of life. The quality of life is a multidimensional construct comprising the individual's subjective perception of physical, emotional and social well-being. Most study reports can be summed up as follows:

- worse quality of life for people with diabetes compared to persons without diabetes;
- treatment regimen, especially intensified insulin treatment, age and duration of diabetes reduce the quality of life or make no difference;
- quality of life is better in those with better metabolic control;
- some demographic variables influence the quality of life in diabetic patients; men seem to report better quality of life than women; increasing age seems to be associated with a decreased quality of life; and those with higher education or better social status generally report better quality of life (13,14).

The quality of life and patient's overall well-being is generally stated in the list of therapeutic goals and that is the way they were evaluated as influenced by diabetes teaching programs (15-17). Finally, DCCT study demonstrated that diabetes education and improved metabolic control could improve the quality of life in diabetic patients (18).

The aim of our study was to prospectively evaluate the efficacy of 4-day program for interactive group education in diabetic patients on insulin therapy. The patients had been followed up for one year after interactive education when we evaluated patient overall well-being, metabolic control, and diabetes related knowledge.

## PATIENTS AND METHODS

A total of 110 diabetic patients on insulin therapy were educated at University Department of Endocrinology, Diabetes and Metabolic Disorders, School of Medicine, in Skopje, Macedonia, from February till June 2001. The patients were consecutively recruited among patients scheduled for regular medical control and those admitted to the hospital for metabolic control, with a response rate of 67%. Late complications of diabetes were present in 65% of the patients: diabetic retinopathy in 32%,

diabetic nephropathy in 7%, diabetic neuropathy in 42% and macroangiopathy in 28% of them. Study patients attended a 4-day program of interactive group education and underwent follow up examinations on day 1 of educational program and one year after the program. Data on 108 patients are presented, because two patients did not present for re-education sessions, one patient died, and one patient was admitted to the hospital for cerebrovascular emergency. Despite longstanding diabetes, none of the patients had undergone any similar program before. Some of the patients had only been given some instructions on blood glucose self-measurement. After one year they were asked to come and participate in 1-day re-education session to refresh their diabetes related knowledge. At this 4-hour session, the main points of every topic discussed earlier were repeated, with active participation and questions from the patients.

The program for interactive group education was introduced at our Department in 1995 using the Geneva-Düsseldorf model adapted to our setting. The program consists of brief information on the main topics of diabetes (what is diabetes, nutrition, physical activity, sick-day rules, hypoglycemia, self-control, chronic complications and foot care), practical training on self-control, injection technique, preparing meals, insulin adjustment according to eating plan and physical activity, round-table discussion. The groups consisted of 5-8 patients. The education program is conducted by a diabetologist, nurses and a psychologist using interactive approach. The lectures took 3 hours *per* day.

A standardized evaluation protocol was used including patient data, laboratory results, evaluation of diabetes related knowledge, and overall well-being. This procedure was repeated at re-education session one year after the initial group education.

Diabetes related knowledge was assessed using a standardized and validated questionnaire according to the American Association of Clinical Endocrinologists (AACE) recommendation. The questionnaire contains 44 questions: what is diabetes – 11 questions, nutrition – 14 questions, physical activity – 5 questions, self-control – 9 questions, and therapy – 5 questions. It was evaluated as percentage of correct answers in total number of questions.

The patient's overall well-being was assessed using a WHO/IDF well-being questionnaire (translated forward and backward and validated with test-retest reliability in a sample of 30 patients who completed the questionnaire twice). The score of the questionnaire was 0-66, measuring separately depression (items 1-6), anxiety (items 7-12), energy (items 13-16), well-being (items 17-22) and overall well-being (items 1-22). Each item is scored on a 0-3 Likert scale. These scales should prove particularly useful where measures of overall well-being are required to complement metabolic variables when evaluating new treatment, education programs and other interventions, or in the routine auditing of established methods of treatment (19).

Data are expressed as means  $\pm$  standard deviation. Student's t-test (paired) and analysis of variance (ANOVA) of repeat measures, as well as Kendall-Tau correlation method were used for statistical evaluation of experimental data. Results were considered statistically significant at  $p < 0.05$ .

## RESULTS

One year after group education, we noticed significant improvement in overall well-being from  $46.6 \pm 8.3$  to  $54.8 \pm 5.9$  ( $p < 0.05$ ). This improvement was due to reduction in depression from  $4.5 \pm 1.2$  to  $3.3 \pm 0.9$  ( $p < 0.003$ ) and anxiety from  $6.3 \pm 1.4$  to  $5.2 \pm 1.1$  ( $p < 0.004$ ), and increase in energy from  $7.5 \pm 2.0$  to  $9.1 \pm 1.6$  ( $p < 0.0006$ ) and well-being from  $14.9 \pm 2.7$  to  $16.3 \pm 2.4$  ( $p < 0.002$ ). One year after the education program there was no correlation between overall well-being and gender ( $p = 0.78$ ), and between overall well-being and diabetes duration ( $p = 0.77$ ), however, significant correlation was recorded between overall well-being and metabolic control ( $p = 0.03$ ).

Metabolic control showed significant improvement:  $HbA_{1c}$  decreased from  $9.2 \pm 1.3$  to  $7.7 \pm 1.8\%$  ( $p < 0.0005$ ), whereas diabetes related knowledge increased from  $49.1 \pm 16.8$  to  $85.4 \pm 14.3\%$  ( $p < 0.05$ ). There was no correlation between metabolic control and gender ( $p = 0.70$ ), and between metabolic control and diabetes duration ( $p = 0.99$ ).

## DISCUSSION

Diabetes education is an absolutely necessary part of diabetic treatment. Overall well-being is one of the main goals of this treatment and an important outcome of diabetic education, therefore there is ample evidence from different studies for the positive impact of educational programs on different aspects of quality

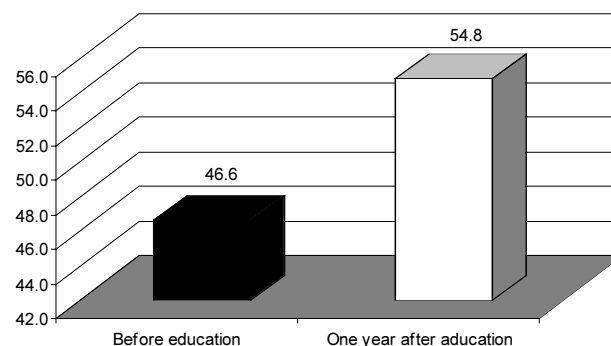
Table 1. Patient demographic characteristics

Characteristic	Mean value	Standard deviation
Age (years)	49.12	10.32
Gender m/f	42/66	-
Type of diabetes (type 1 / type 2)	59/49	-
BMI (kg/m <sup>2</sup> )	25.8	2.9
Diabetes duration (years)	11.12	4.16
Insulin therapy duration (years)	8	3

Table 2. Overall well-being scores before and one year after education

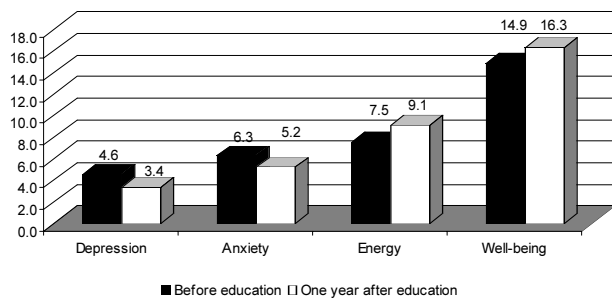
	Before education	One year after education	t-test	p
Depression	$4.5 \pm 1.2$	$3.3 \pm 0.9$	3.950139	0.003495
Anxiety	$6.3 \pm 1.4$	$5.2 \pm 1.1$	2.088932	0.004845
Energy	$7.5 \pm 2.0$	$9.1 \pm 1.6$	-3.73138	0.000655
Well-being	$14.9 \pm 2.7$	$16.3 \pm 2.4$	-3.25606	0.002464
Overall well-being	$46.6 \pm 8.3$	$54.8 \pm 5.9$	-6.59093	0.000002

Figure 1. Total score of overall well-being before and one year after group education: significance of difference  $p < 0.05$ .

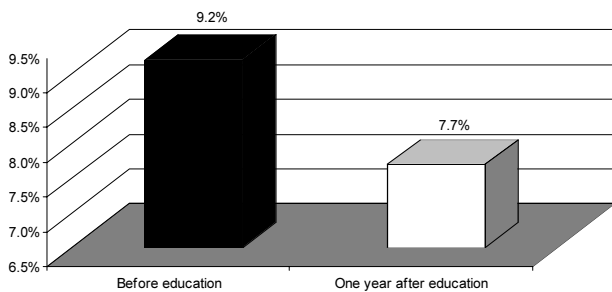


of life and overall well-being (11,13,18,19). Findings about quality of life and diabetes duration are varied. Few studies found that increased duration of diabetes was associated with a decreased quality of life and overall well-being (20,21), whereas a Swedish study using the same questionnaire employed in the present

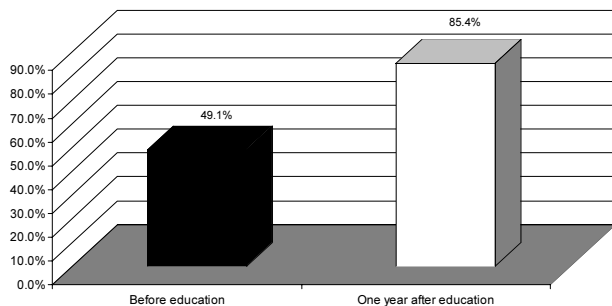
**Figure 2. Overall well-being of diabetic patients before and one year after education: reduction in depression ( $p<0.003$ ) and anxiety ( $p<0.04$ ), and increase in energy ( $p<0.0006$ ) and well-being ( $p<0.002$ ).**



**Figure 3. HbA<sub>1c</sub> values before and one year after education: significance of difference  $p<0.0005$ .**



**Figure 4. Diabetes related knowledge values before and one year after education: significance of difference  $p<0.05$ .**



study found no significant association between the disease duration and total score of overall well-being (22). In our study there was no significant correlation between diabetes duration and overall well-being.

The presence of chronic complications, particularly of two or more complications, is associated with worsened overall well-being, which especially holds for severe complications (21,23). In our study only 11% of patients had two or more chronic complications, and 8% had severe chronic complications. Therefore we did not assess the impact of education on overall well-being in this group of patients.

Significant improvement in overall well-being one year after group education was quite encouraging, and we have to emphasize the significant correlation between overall well-being and metabolic control. Similar findings of positive correlation between metabolic control and overall well-being have been reported elsewhere (21,22).

Diabetes related knowledge showed significant improvement after education program, which can be easily explained by the fact that during 4 days the patients attended a number of lectures and practical demonstration about diabetes and its management. Yet, diabetes related knowledge should not be overestimated, because the knowledge does not necessary mean appropriate behavior in practice (24,25).

On re-education sessions, we repeated the same issues of the program according to the patients' needs. We considered these sessions very important to reinforce the patients' motivation for maintenance of behavioral modification and improved metabolic control.

In conclusion, our results demonstrated that educational program improved overall well-being and metabolic control in diabetic patients. A weak point of our study was the fact that it was a non-randomized, uncontrolled study, thus we were not able to demonstrate the net effect of the educational program itself. Nevertheless, the results showed significant improvement in overall well-being and metabolic control in study patients, which could be related to the altered approach in diabetic treatment and the positive effect of diabetes team work with diabetic patients.

## REFERENCES

1. Schiel R, Muller UA, Ulbrich S. Long-term efficacy of a 5-day structured teaching and treatment programme for intensified conventional insulin therapy and risk for severe hypoglycemia. *Diabetes Res Clin Pract* 1997;35:41-48.
2. Starostina EG, Antiferov MB, Galstain GR, Dedov II. Effectiveness of an intensive treatment and training program for patients with type I diabetes mellitus. *Probl Endokrinol (Mosk)* 1994;40:15-19.
3. Mühlhauser I, Bruckner I, Berger M, Cheta D, Jörgens V, Ionescu-Tîrgoviste C, Scholz V, Mincu I. Evaluation of an intensified insulin treatment and teaching programme as routine management of type 1 (insulin-dependent) diabetes. *Diabetologia* 1987;30:681-690.
4. Campbell LV, Chisholm DJ, Barth R. Evaluation of the benefits of a diabetes education programme. *Diabetes Educ Special* 1984;10:46-47.
5. Norris SL, Lau J, Smith SJ, Schmid CH, Engelgau MM. Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. *Diabetes Care* 2002;25:1159-1171.
6. Assal JP, Mühlhauser I, Pernet A, Gfeller R, Jörgens V, Berger M. Patient education as the basis for diabetes care in clinical practice and research. *Diabetologia* 1985;28:602-613.
7. Pieber TR, Holler A, Siebenhofer A, Brunner GA, Semlitsch B, Schattenberg S, Zapotoczky H, Rainer W, Krejs GJ. Evaluation of a structured teaching and treatment program for type 2 diabetes in general practice in a rural area of Austria. *Diabet Med* 1995;12:349-354.
8. Valk GD, *et al.* Patient education for preventing diabetic foot ulceration (8 RCTs). *Cochrane Database Syst Rev* 2001.
9. Assal JP. Educating the diabetic patients: which program is specific to IDDM and NIDDM? In: *Concepts for the ideal diabetes clinic*. Berlin-New York: Walter de Gruyter, 1992:89-104.
10. Campbell EM, Redman S, Moffitt PS, Sanson-Fisher RW. The relative effectiveness of educational and behavioral instruction programs for patients with NIDDM: a randomized trial. *Diabetes Educ* 1996;22:379-386.
11. Rubin RR, Peyrot M. Quality of life and diabetes. *Diabetes Metab Res Rev* 1999;15:205-218.
12. Bradley C, Gamsu DS. Guidelines for encouraging psychological well-being; report of a working group of WHO Regional Office for Europe and IDF European Region St.Vincent Declaration Action Program for Diabetes. *Diabet Med* 1994;11:510-516.
13. Glasgow RE, Ruggiero L, Eakin EG, Dryfoos J, Chobanian L. Quality of life and associated characteristics in a large national sample of adults with diabetes. *Diabetes Care* 1997;20:562-567.
14. Peyrot M, Rubin RR. Levels and risks of depression and anxiety symptomatology among diabetic adults. *Diabetes Care* 1997;20:585-590.
15. Rubin RR, Peyrot M, Saudek CD. Differential effect of diabetes education on self-regulation and life-style behaviors. *Diabetes Care* 1991;14:335-338.
16. Rubin RR, Peyrot M, Saudek CD. Effect of diabetes education on self-care, metabolic control and emotional well-being. *Diabetes Care* 1989;12:673-679.
17. Wredling R, Adamson U, Berne C, Dahlen M, Ostman J, Larsson Y, Stalhammar J. Quality of life among a representative sample of people with diabetes mellitus in Sweden. *Diab Nutr Metab* 1993;6:393-395.
18. The Diabetes Control and Complication Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in IDDM. *N Engl J Med* 1993;14:977-986.
19. Bradley C, Lewis KS. Measures of psychological well-being and treatment satisfaction developed from the responses of people with tablet-treated diabetes. *Diabet Med* 1990;7:445-451.

20. De Weerd I, Visser AP, Kok G, Van der Veen EA. Determinants of active self-care behavior of insulin treated patients with diabetes: implications for diabetic education. *Soc Sci Med* 1990;30:605-615.
21. Tankova T, Dakovska G, Koev D. Education of diabetic patients - one year experience. *Patient Educ Couns* 2001;43:139-145.
22. Aalto AM, Uutela A, Aro AR. Health related quality of life among insulin-dependent diabetics: disease-related and psychosocial correlates. *Patient Educ Couns* 1997;30:215-225.
23. Klein BE, Klein R, Moss SE. Self-rated health and diabetes of long duration. The Wisconsin Epidemiologic Study of Diabetic Retinopathy. *Diabetes Care* 1998;21:236-240.
24. Wredling R, Stalhammar J, Adamson U, Berne C, Larsson Y, Oestman J. Well-being and treatment satisfaction in adults with diabetes: a Swedish population-based study. *Qual Life Res* 1995;4:515-522.
25. Rodin G. Quality of life in adults with insulin-dependent diabetes mellitus. *Psychother Psychosom* 1990;54:132-139.
26. Bloomgarten ZT, Karmally W, Metzger MJ, Brothers M, Nechemias C, Bookman J. Randomised controlled trial of diabetic patient education: improved knowledge without improved metabolic states. *Diabetes Care* 1987;10:263-273.
27. Norris SL, Engelgau MM, Narayan KM. Effectiveness of self-management training in type 2 diabetes: a systematic review of randomized controlled trials. *Diabetes Care* 2001;24:561-587.