Self-care behaviour, treatment satisfaction and quality of life in people on intensive insulin treatment

Elena Gurkova^{a,b}, Katarina Ziakova^a

Aim. The aim of this cross-sectional study was to identify self-care behaviours and their relationships with treatment satisfaction and quality of life in people attending a structured educational programme for patients on intensive insulin therapy.

Methods. A sample of 104 people with diabetes (62 with type-1; 42 with type 2) was recruited from the National Institute of Endocrinology and Diabetology in Lubochňa over six months. The majority of respondents were women (62.5%); had multiple daily injections of insulin (73%); diabetic late complications (68%) and had not previously participated in the structured educational programmes in the specialized diabetes centre (64.4%). Self-management behaviour data were collected by means of structured interviews with patients as well as during clinic visits. For measuring quality of life, the Audit Diabetes Dependent Quality of Life questionnaire and for measuring satisfaction with their treatment regimen, the Diabetes Treatment Satisfaction Questionnaire status version was used.

Results. General satisfaction with the treatment was significantly higher in people with diabetes, who implemented regular self-monitoring of the concentration of glucose in plasma (SMPG). We also demonstrated low adherence in the frequency of SMPG. 17% of respondents in our study performed daily SMPG. However, 52% respondents reported adaptation of insulin dosage in relation to factors such as carbohydrate intake, glycaemia values or degree of physical activity. Differences in quality of life due to performing the regular self-monitoring of glycaemia, adjustments of insulin doses in specific situations as well as carbohydrate counting were not significant.

Conclusion. Performing the regular self-monitoring of glycaemia was associated only with higher treatment satisfaction. No significant improvement in quality of life was seen in people performing the regular self-monitoring of glycaemia, adjustments of insulin doses in specific situations or carbohydrate counting.

Key words: self-management, diabetes mellitus, intensive insulin therapy

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^aInstitute of Nursing, Comenius University in Bratislava, Jesseniuss Faculty of Medicine in Martin, Malá Hora 5, 036 01 Martin, Slovak Republic

^bFaculty of Health Sciences, University of Bielsko-Biala, M. Konopnickiej 6, 43-300 Bielsko-Biala, Poland

Corresponding author: Elena Gurkova, e-mail: gurkova@jfm.uniba.sk

INTRODUCTION

The emphasis in diabetes care has been shifting over the past decade towards providing a primary care diabetes service which has patient education and self-management at the forefront of policy initiatives^{1,2}. This emphasis on active self-management and empowerment requires appropriate support for patients from healthcare professionals to enable them to engage confidently and competently in managing the complex metabolic condition of diabetes.

Diabetes self-management is fundamentally different from many health behaviors studied, such as smoking etc. Due to the nature of diabetes, ongoing self-care is essential³, and the behavior changes required are more complex, numerous, expensive, and restrictive⁴. Diabetes is one of the most psychologically demanding of the chronic diseases; with psychosocial factors pertinent to nearly every aspect of the disease and its treatment⁵. The chronicity of diabetes and potential for serious complications often require life long self-management^{2,6}, major lifestyle changes for patients and their families⁷ and present disease management challenges to physicians and patients^{6,8}.

Individuals are expected to quickly integrate major lifestyle changes in multiple domains (e.g. in diet, exercise) which are the cornerstones of treatment and the most difficult components of self-management⁷. Improving clinical outcomes in diabetes requires patients to undertake and sustain a complex of demanding self-care behaviors in multiple domains, including food choices, physical activity, medications, self-monitoring of the concentration of glucose in plasma (SMPG), and symptom management^{9,10}. Because no universally accepted regimens incorporating all of these domains exist for the treatment of diabetes, assessment of self-care behaviors is extremely challenging and remains a critical problem for clinical care and research⁹. The American Association of Diabetes Educators (AADE) believes that behavior change can be most effectively achieved using the AADE7 Self-Care Behaviors™ framework¹¹. The primary goal of diabetes education is to provide knowledge and skill training, as well as help individuals identify barriers, facilitate problem-solving and develop coping skills to achieve effective self-care management and behavior change^{2,11}. In the context of evidence based medicine, diabetes educators must gather

the evidence to support their practices and modify their approaches in response to the evidence.

However, diabetes self-management can be difficult and frustrating for both patients and practitioners¹². A better understanding of variables pertinent to self-care behaviours in people with diabetes may provide valuable insight to diabetes practitioners (educators) regarding the multifaceted impact of this complex disease. In turn, this understanding can facilitate nurse/physician-patient communication and improve adherence to treatment regimes and treatment plans tailored to the individual needs of the patient.

Study aim

The aim of this cross-sectional study was to identify self-care behaviours and their relationships with treatment satisfaction and quality of life in people attending the structured educational programme for people with intensified insulin therapy.

MATERIALS AND METHODS

Study population

A sample of 104 persons with diabetes (PWD) was recruited from the National Institute of Endocrinology and Diabetology in Lubochňa (NEDU) over six months. A total of 150 PWD participated in the study; 46 respondents were excluded from the study because they did not complete instruments. Hence, the final number of responses for data analysis was 104. PWD were included if they were at least 18 years of age; had had diabetes longer than 1 year and were attending the structured edu-

cational programme (*Düsseldorf Diabetes Treatment and Teaching Program*) offered at the National Institute of Endocrinology and Diabetology in Lubochňa for patients with intensified insulin therapy. Newly diagnosed, as well as PWD with advanced complications (patients with significant target organ dysfunction, mainly advanced cardiac disease, renal failure, stroke or foot ulcer, which on their own could increase patients' symptom burden) were excluded from the study. Exclusion criteria also included inability to understand and complete the questionnaire and severe psychiatric illness. The characteristics of PWD are shown in Table 1. Data are expressed as means, $\pm$ SD or percentage. All PWD were attending structured educational programme offered for patients with intensified insulin therapy and had already performed intensified insulin therapy. The majority of PWD had Type 1 diabetes; had multiple daily injection therapy (MDI); diabetic late complications and had not previously participated in the structured educational programmes in the specialized diabetes centre. To ensure a high response rate, PWD were asked to complete the questionnaires during the educational programme.

Demographic and diabetes associated data (glycaemic control, type, duration, therapy of diabetes, a frequency of mild and severe hypoglycaemia) and self-management behaviour data (frequency of blood glucose self-monitoring, self-adaptation of insulin dosage, carbohydrate counting) were collected by means of structured interviews with PWD as well as during clinic visits.

For measuring satisfaction with their treatment regimen, the Diabetes Treatment Satisfaction Questionnaire status version (DTSQs) was used. This diabetes-specific measure was developed by Bradley¹³ and collaborators for

Table 1. Characteristics of PWD (n=104).

Characteristics	n	%
Sex		
Male	39	37.5
Female	65	62.5
Type of diabetes		
Type 1 diabetes	62	59.6
Type 2 diabetes	42	40.4
Diabetic late complications		
With complications	68	65.4
Without complications	36	34.6
Insulin regimen		
MDI /Type 1	34	32.7
MDI /Type 2	41	40.4
Continuous subcutaneous insulin infusion (CSII)	29	26.9
Hypoglycaemia		
PWD with severe hypoglycaemia/ last year	11	10.6
PWD without a presence of mild symptomatic hypoglycaemia/ last 6 months	41	39.4
	Mean ($\pm$ SD)	Range
Duration of known diabetes (years)	12.66 ($\pm$ 9.19)	1 - 40
Age (years)	46.31 ($\pm$ 16.91)	18 - 81
HbA1c (% , reference range 4.3-6.1)	8.87 ($\pm$ 1.79)	7.5 - 13.8

the WHO programme on the quality of care of diabetes mellitus.

For measuring quality of life, the Audit Diabetes Dependent Quality of Life (ADDQoL) questionnaire was used. The ADDQoL assess an impact of diabetes on 19 life domains (revised version, Bradley C. [developer and copyright holder]) (ref.¹⁴). For each of these domains, PWD provided both impact (ranging from -3 to 1) and importance (ranging from 0 to 3) scores. The impact rating was multiplied by the importance rating for each applicable aspect of life to provide weighted impact scores (ranging from -9 to 3), which was averaged across all applicable domains to form a single, average-weighted impact (AWI) score. Less negative scores indicate better QoL and less negative impact of diabetes on QoL.

Statistical analysis

The data were analysed using the Statistical Package for Social Sciences 15.0 (SPSS, Inc., Chicago, IL, USA). For descriptive statistics means, SD, absolute and relative frequencies were used. For group comparisons, one way and multifactorial ANOVA, Fisher's least significant difference (LSD) and Pearson's chi-square tests were performed. A p-value 0.05 was taken as statistical significance.

RESULTS AND DISCUSSION

Distribution of Responses

Data pertinent to of self-care behaviours of PWD on intensified insulin therapy are included in Table 2. Diabetes had the greatest impact on quality of life on "freedom to eat" (mean [SD] impact rating: -2.0 [± 1.1]) and least impact on "people's reaction" (mean [SD]

impact rating: -0.7 [± 0.9]). "Family life and personal relationships" were rated as the most important (mean [SD] importance rating: 2.6 SD [± 0.5]) and "freedom to drink" was rated as the least important to them (mean [SD] importance rating: 1.6 SD [± 0.9]). "Freedom to eat" remained as the most (mean AWI scores: -4.3 SD [± 3.2]) and "people's reaction" as the least (mean AWI scores: -1.5 [± 2.5]) affected QoL domains, respectively, when weighting was considered. Only three PWD indicated any benefits of having diabetes. Five of the 19 domains in ADDQoL elicited responses indicating some positive effects of diabetes on the domain concerned, including "self-confidence"; "motivation"; "leisure activities"; "physical health", confirming the need for asymmetric response options. Weighted scores ranged from -9.0 for 15 of the 19 domains, with wider response ranges for the four domains where positive impact of diabetes was indicated. The flexibility (5th item of DTSQ) of the treatment (mean [SD]: 4.2 [± 1.3]) was perceived as a major problem in treatment satisfaction among PWD in intensified insulin regimen. PWD reported highest satisfaction with current treatment in general (mean [SD]: 4.9 [± 1.2]).

Frequency of SMPG and quality of life and treatment satisfaction

SMPG has long been recommended by health care professionals as a tool to help achieve blood glucose targets and improve self-management¹⁵. The frequency of SMPG - as an indicator of patient's of adherence to treatment recommendations and as a prerequisite for an adequate adaptation of insulin dosage proved to be a strong predictor of glycaemic control¹⁶. PWD with Type 1 as well as PWD with Type 2 diabetes who follow a MDI regime should consider monitoring their blood glucose levels between 2-4 times daily depending on their treat-

Table 2. Characteristics of self-care behaviours of PWD with intensified insulin therapy.

Diabetes self-care behaviors	n	%	n DM1	nDM2
SMPG (Self-monitoring of plasma glucose concentration)				
Irregular SMPG	44	42.4	17	27
Regular SMPG ≥ 1 glycaemic profile/week	42	40.3	30	12
Regular SMPG ≥ 3 /day	18	17.3	15	3
Total	104	100	62	42
Carbohydrate counting				
Never	56	53.85	24	32
In specific situations	48	47.15	38	10
Total	104	100	62	42
Self-adaptation of insulin dosages				
Only diabetologist	49	47.11	14	35
Self-adaptation in specific situations (results of SMPG, sick days, exercise, carbohydrate intake)	55	52.89	48	7
Total	104	100	62	42
Self-monitoring for sign/symptoms of hypoglycaemia				
Keeping hypoglycaemia records	23	22.1	23	0
Without hypoglycaemia records	81	77.9	39	42
Total	104	100	62	42

ment, lifestyle and individual needs¹⁷⁻¹⁹. People with diabetes mellitus type 1 should check their glycaemia 5 to 8 times per day, and persons with type 2 diabetes at least 3 times daily²⁰. Only 17% of respondents in our study reported that they perform daily SMPG but 52% respondents reported adaptation of insulin dosage in relation to factors, such as carbohydrate intake, glycaemia values or degree of physical activity. Therefore, for future research it is important to identify the perceived barriers to self-management of adults on intensified insulin therapy in a rural setting and to identify effective strategies in self-management to highlight infrastructure needs or changes in clinical practice that would facilitate the integration of diabetes self-management⁸. Not surprisingly, new guidelines from the World Health Organization (WHO) encourage practitioners to facilitate patient identification of strategies to reduce barriers and facilitate integration of self-care into daily activities²¹. Healthcare providers who are sensitive to the barriers experienced by patients and the effective strategies they use can work collaboratively to facilitate the development of realistic self-management programmes⁷⁻⁸. Underestimating or not identifying barriers to self-management adversely affects adherence²².

Although large clinical trials have yet to be conducted to assess the impact of SMPG on diabetes outcomes, recommendations for use of SMPG in patients with Type 1 diabetes are clearly defined¹⁷. In type 2 diabetes, evidence supports that meal-related SMPG within a structured counselling program improves HbA1c levels. The Retrolective Study Self-monitoring of Blood Glucose and Outcome in Patients with Type 2 Diabetes (ROSSO) investigators reported that SMPG was associated with decreased diabetes-related morbidity and all-cause mortality in type 2 diabetes; this association was even seen in the subgroup of patients who were not receiving insulin therapy¹⁹. Surprisingly, only 35.7% of patients of Type 2 diabetes performed regular SMPG (3 times per day or 1 glycaemic profile per week) in our study and 35% of patients Type 2 diabetes reported self-adjustment of insulin dosage in specific situations.

We found that lower level of DTSQ was related to avoidance of frequent as well as regular SMPG. PWD who performed regular SMPG (3 times per day or 1 glycaemic profile per week) were more satisfied with therapy than those who performed SMPG irregularly

(in case of possible hypoglycaemia - for example in relation to carbohydrate intake, physical activity, as well as during sick days, etc., see Tables 3, 4). However, we did not confirm any significant differences in quality of life between respondents who performed regular and those who performed SMPG irregularly (Tables 3, 4). SMPG is an integral component of self-care behaviours and is widely regarded as a valuable tool to help individuals with diabetes understand the impact of foods, medications, and activities on their glucose levels¹⁶. The full potential of SMPG can be realized only when persons with diabetes appropriately apply the data provided by their monitoring to the other components of their overall plan of diabetes self-care. The optimal impact of SMPG is achieved only when data obtained through monitoring is consistently applied in an individualized programme of monitoring, assessment, reassessment, problem solving, and decision making to facilitate self-care¹⁵. Detection of certain barriers of frequent self-monitoring will help to focus patient care and counselling on essential behavioural aspects (e.g., supporting acceptance of frequent self-monitoring, risk of adaptation of insulin dosage, etc.).

Self-adaptation of insulin dosage in specific situations, carbohydrate counting and quality of life and treatment satisfaction

Significant differences in activities important for diabetes self-management depending on completing the structured educational programme (Table 5) were found only for carbohydrate counting (Pearson's chi-square test = 3.94; $P=0.04$). Patients who had previously participated in the structured educational programmes in the specialized diabetes centre implemented more frequently carbohydrate counting than patients without previous education in the specialized diabetes centre. Statistically significant differences between these two groups (see Table 5) were not found for performing the regular SMPG, adjustments of insulin dosage in specific situations as well as in keeping hypoglycaemia records. We also found that self-adaptation of insulin dosage in specific conditions associated with regular blood glucose self-monitoring had no significant association with perception of quality of life in people with diabetes. The impact of diabetes on quality of life (AWI score) was not affected by implementing adjustments of insulin dosage in specific situations

Table 3. Quality of life and treatment satisfaction score according type of SMPG.

	SMPG	Mean	n	SD	Minimum	Maximum
Quality of life	Irregular SMPG	-3.06	44	2.09	-8.5	0.0
	Regular SMPG ≥ 1 glycaemic profile/week	-3.25	42	2.32	-9.0	-0.2
	Regular SMPG ≥ 3/day	-3.09	18	2.24	-7.8	-0.1
	Total	-3.14	104	2.19	-9.0	0.0
Treatment satisfaction	Irregular SMPG	25.52	44	6.02	12	34
	Regular SMPG ≥ 1 glycaemic profile/week	27.48	42	5.00	14	35
	Regular SMPG ≥ 3/day	29.39	18	5.95	19	36
	Total	26.98	104	5.74	12	36

($F=2.03$; $P=0.86$) or by carbohydrate counting ($F=1.03$; $P=0.31$). The mean difference (in AWI score) was significant only in one of 19 items of ADDQoL 19 – in “physical activity” ($P=0.03$). Patients who did not implement self-adaptation of insulin dosage in specific situations reported greater negative impact of diabetes on physical activity than patients those self-adapted insulin dosage in specific situations. In addition, patients who implemented

carbohydrate counting in daily living did not report lower negative impact of diabetes on “freedom to eat” (18th item of ADDQoL) than patients those did not use it.

The DTTP (The Düsseldorf Diabetes Treatment and Teaching Program) approach was evaluated in several controlled and uncontrolled studies in Germany and the UK (ref.^{16,23,24}) with almost identical results demonstrating that intensified insulin therapy, which combines treat-

Table 4. Multiple comparisons of quality of life and treatment satisfaction score between irregular and regular SMPG.

Dependent Variable	SMPG	SMPG	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
Quality of life	Irregular SMPG	SMPG ≥ 1 glycaemic profile/week	0.18	0.47	0.69	-0.76	1.13
		SMPG ≥ 3 /day	0.02	0.61	0.96	-1.20	1.25
	SMPG ≥ 1 glycaemic profile/week	Irregular SMPG	-0.18	0.47	0.69	-1.13	0.76
		SMPG ≥ 3 /day	-0.16	0.62	0.79	-1.40	1.07
	SMPG ≥ 3 /day	Irregular SMPG	-0.02	0.61	0.96	-1.25	1.20
		SMPG ≥ 1 glycaemic profile/week	0.16	0.62	0.79	-1.07	1.40
Treatment satisfaction	Irregular SMPG	SMPG ≥ 1 glycaemic profile/week	-0.95	1.21	0.11	-4.36	0.45
		SMPG ≥ 3 /day	-3.86 (*)	1.57	0.01	-6.99	-0.75
	SMPG ≥ 1 glycaemic profile/week	Irregular SMPG	1.95	1.21	0.11	-0.45	4.36
		SMPG ≥ 3 /day	-1.91	1.58	0.23	-5.05	1.23
	SMPG ≥ 3 /day	Irregular SMPG	3.86 (*)	1.57	0.01	0.75	6.99
		SMPG ≥ 1 glycaemic profile/week	1.913	1.58	0.23	-1.23	5.05

Table 5. Comparison of self-care behaviors between PWD with and without previous education in NEDU.

Previous educational programme in NEDU	Regular SMPG		Adjustments of insulin dosage		Carbohydrate counting		Hypoglycaemia records	
	n	%	n	%	n	%	n	%
PWD with previous education in NEDU (n=37)	27	72.9	28	75.7	26	70.3	10	27.02
PWD without previous education in NEDU (n=67)	33	49.2	27	40.3	22	32.4	13	19.4
Total (n=104)	60	57.6	55	52.9	48	77.2	23	22.1

ment and education patients to self-adapt insulin dosage flexibility, leads to improved glycaemic control, quality of life and reduced short-term complications including incidence of severe hypoglycaemia. These outcomes mainly resulted from the potential liberalisation of diet¹⁶. However, these benefits can only be achieved if PWD undergo a structured and comprehensive diabetes education as an integral part of diabetes care. In contrast to these studies, we did not confirm that a self-adaptation of insulin dosage in specific situations or carbohydrate counting decreased the negative impact of diabetes on quality of life. Carbohydrate counting was also not associated with better diet flexibility or freedom to eat.

CONCLUSION

Diabetes had the greatest impact on the quality of life parameter "freedom to eat". Patients reported lowest satisfaction with the flexibility of treatment. The general satisfaction with the treatment was significantly higher in patients, who implemented a regular glycaemia self-monitoring. We also demonstrated low adherence in the frequency of SMPG. Only 17% of respondents in our study reported that they perform daily SMPG. However, 52% respondents reported adaptation of insulin dosage in relation to factors, such as carbohydrate intake, glycaemia values and degree of physical activity. Significant differences in activities important in diabetes self-management depending on completing the previous structured educational programme were observed only for carbohydrate counting. We found no differences in quality of life due to regular self-monitoring of glycaemia, adjustments of insulin doses in specific situations or carbohydrate counting.

CONFLICT OF INTEREST STATEMENT

The authors state that there are no conflicts of interest regarding the publication of this article.

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