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SELF-CARE ACTIVITIES AS PREDICTORS OF GOOD GLYCAEMIC CONTROL IN DIABETES: DIFFERENCES BETWEEN TYPE 1 AND TYPE 2 DIABETES

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Diabetes mellitus is a chronic disease that is mostly controlled by the affected individual nowadays. Activities in self-control of diabetes include self-monitoring of blood glucose, eating a healthy diet, being physically active, taking the recommended medication, and consulting health care professionals. Different studies have shown that educational and psychosocial interventions can have a significant effect on improving diabetes self-control and reducing complications. The aim of this study was to examine the differences in self-care activities between patients with Type 1 and Type 2 diabetes as well as the role of these activities in predicting good glycaemic control. Our results suggest that in Serbia people with Type 1 diabetes have a much harder task in achieving good glycaemic control than people with Type 2 diabetes, even when there is no difference between these groups in practicing the majority of self-care activities. In future, education for people with Type 1 diabetes should emphasise monitoring blood glucose. For both types of diabetes, a healthy diet should be addressed.

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Key words: *diabetes, self-care in diabetes, glycaemic control, diabetes education*

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Introduction

Diabetes mellitus is a chronic disease that is mostly controlled by the affected individual nowadays (1). This self-control involves health behaviours in accordance with medical recommendations that affect various aspects of everyday life, such as self-monitoring of blood glucose, eating a healthy diet, being physically active, taking the recommended medication, and consulting health care professionals (2). This shift of responsibility from healthcare professionals to individuals with diabetes places a high burden on patients (3). Most people with diabetes perceive their treatment regimen as challenging (4). Failure to successfully manage diabetes, leads to poor health outcomes, regardless of the progress in diabetes treatment technology (5). Unfortunately, inadequate management of diabetes is much more common than expected with up to 74% of people with diabetes having bad blood glucose control (6). This can lead to different complications associated with diabetes such as cardiovascular diseases, neuropathy, limb amputation, and retinopathy (7), as well as higher risks for developing depression and anxiety (8), resulting from distress associated with disease management known as diabetes distress (9). This puts an additional burden on people with diabetes as they fear the risk of developing various complications as a consequence of inadequate diabetes regulation. To avoid the complications associated with diabetes, active, problem-oriented behaviour is necessary—people with diabetes must take full responsibility for the daily control of the disease, in various situations, over a long period of time (5).

Certain studies show that more than half of people with Type 2 diabetes lack knowledge about their disease and its regulation (10). Research (11) has shown that educational and psychosocial interventions have a significant effect on improving diabetes self-control and reducing complications. These benefits associated with self-management education and lifestyle change for people with diabetes have demonstrated the cost-effectiveness of interventions at an economic level as they exceed the costs associated with the intervention (12).

Because it reflects average glycaemia over a long period and has been shown to be a good predictor of later complications of diabetes (13), the HbA1c parameter has often been used in research as a measure of successful diabetes control (14, 15). We can simply define it as an average glucose level in the last 3 months. According to the recommendations of the American Diabetes Association, the target values of HbA1c for people with diabetes should be below 7% (7). Research has shown that up to 84% of people with Type 1 diabetes fail to maintain an HbA1c level below 7% (6).

Research (16) has shown that blood sugar control in people with Type 1 diabetes is much more sensitive to variations in self-care behaviours and monitoring than in people with Type 2 diabetes, where the emphasis is placed on lifestyle changes (diet and physical activity) in order to improve sugar control. In people with Type 2 diabetes, in most cases the body produces a certain amount of insulin on its own, so therapy for this type of diabetes may or may not include insulin, in which case the burden of self-management is much smaller. Regardless of the type of therapy, most people with diabetes perceive the therapy regimen as challenging (4).

In 2021, with a prevalence rate of 9.1%, Serbia ranked fifth in Europe in the number of people with diabetes (17). It is predicted that by 2045 the rate will increase to 10.9%, indicating a very worrying trend. This global epidemic of diabetes calls for attention to developing better education and support systems for successful control of the disease. In order to successfully define goals and develop effective educational and support programs for people with both Type 1 and Type 2 diabetes, differences in the effects of self-care activities on health outcomes between these two types of diabetes need to be addressed.

Aim

The aim of this study was to examine the differences in self-care activities between patients with Type 1 and Type 2 diabetes as well as the role of these activities in predicting good glycemic control.

Material and Methods

This research was conducted online, during June and July of 2023, by distributing online forms of questionnaires on groups and pages on social media dedicated to people with diabetes in Serbia. At the beginning of the questionnaire, the aim and purpose of the research were explained, and the respondents gave their consent for participating and data processing before accessing the questionnaire itself.

The research sample included 285 participants, out of which 52 (18.2%) were men and 233 (81.8%) were women. The participants' age ranged from 17 to 73 years with an average age of 43.35 years. The majority of the respondents, i.e., 235 (82.5%), reported that they lived in the city, while 50 (17.5%) lived in a village. The highest percentage of respondents had completed college (39.6%) or high school (38.6%), and 66.7% of them were employed. The majority of the respondents (58.9%) described their financial situation as satisfactory. In terms of marital status, 55.1% were married, 22.5% were single, 11.2% were living with a partner but unmarried, 7.7% were divorced, and 3.5% were widowed. Out of the total respondents, 163 (57.2%) suffered from Type 1 diabetes, 114 (40%) suffered from Type 2 diabetes and 8 (2.8%) suffered from other types of diabetes.

Summary of Diabetes Self-Care Activities (SDSCA) (Toobert et al., 2000) scale was used as a measure of self-care behaviour in diabetes. For this study, the scale was translated into Serbian language using the double-blind method. The scale consists of 11 questions that measure the frequency of diabetes self-care activities in the past 7 days in the 6 following domains: general diet, specific diet, foot care, blood sugar measurement, physical activity, and smoking. A higher score on each of the dimensions indicates better self-care behaviours, except for the scale of smoking where a higher score indicates a higher number of cigarettes consumed in a day for smokers. In this research, the dimension of a specific diet was divided into fruit and vegetable consumption dimensions where a higher score indicates better self-care behaviour, and high-fat food intake where a higher score indicates worse self-care behaviour.

Respondents were asked to report the last *level of HbA1c* they measured, and this was used as a measurement of good glycaemic control and an indicator of health outcomes in diabetes.

Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 20. T-test was used to identify intergroup differences and linear regression for creating prediction models. The correlations were tested using Pearson's correlation coefficient.

Results

Descriptive statistics and reliability for dimensions of the SDSCA scale are shown in Table 1. Based on the values of Skewness and Kurtosis we can conclude the normal distribution of the variables (Curran et al., 1996). All dimensions of SDSCA showed good reliability, measured by Chronbach alpha, except for dimension-specific diet. Based on recommendations by the original authors of the SDSCA scale, this dimension was divided into two singular-item questions, and each of them was treated as a separate dimension of the scale.

The average HbA1c level in the sample was 7.11%, which is slightly above the average recommended level for optimal control of diabetes of 7% (ADA, 2013). The years of life with diabetes

in the sample ranged from 1 to 48 years, with an average of 12.35 years. After checking for differences in age and correlations with gender across all analyzed dimensions, no significant results were found prior to further analysis.

Mean values of the SDSCA dimension varied between 2.75 and 4.99. A generally healthy diet was followed 4.35 days in a week on average, fruits and vegetables were consumed 3.78 days a week, high-fat food consumption occurred 3.51 days a week, and physical activity and exercise were performed 4.35 days per week. With blood glucose testing done 4.99 days a week on average and foot care-related activities carried out 2.54 days a week on average, we can conclude that activities related to blood glucose monitoring were followed for most of the days on average and foot care for least of the days on average out of all self-care related activities in diabetes.

Table 1. Descriptive statistics

	N	Min	Max	M	SD	Skewness	Kurtosis	α
HbA1c	260	3	14	7.11	1.43	1.41	4.32	/
Diabetes duration	282	1	48	12.35	10.43	1.16	1.01	/
General diet	285	0	7	4.35	2.10	-.61	-.64	.88
Specific diet								
Fruits and vegetables	285	0	7	3.78	2.43	-.26	-1.18	/
High-fat food	285	0	7	3.51	1.99	.08	-.84	/
Exercise	285	0	7	4.35	2.10	-.61	-.64	.84
Blood glucose testing	285	0	7	4.99	2.54	-.86	-.80	.85
Foot care	285	0	7	2.75	2.54	.46	-1.19	.74
Cigarettes per day	142	0	70	17.47	14.49	1.46	2.58	/

* N = sample size; M = mean; SD = standard deviation; α = Cronbach alpha

Table 2. Pearson´s correlations

	1	2	3	4	5	6	7	8	9
HbA1c (1)	1	.163**	-.172**	-.187**	.037	-.069	-.037	-.035	-.006
Diabetes YoL (2)	.163**	1	-.041	-.066	-.066	-.082	.115	.174**	-.062
General diet (3)	-.172**	-.041	1	.385**	-.057	.380**	.430**	.224**	-.077
Fruits and vegetables (4)	-.187**	-.066	.385**	1	.119*	.311**	.159**	.066	.004
High-fat food (5)	.037	-.066	-.057	.119*	1	.078	.020	-.022	.052
Exercise (6)	-.069	-.082	.380**	.311**	.078	1	.161**	.165**	.112
Blood glucose testing (7)	-.037	.115	.430**	.159**	.020	.161**	1	.247**	-.051
Foot care (8)	-.035	.174**	.224**	.066	-.022	.165**	.247**	1	-.058
Cigarettes per day (9)	-.006	-.062	-.077	.004	.052	.112	-.051	-.058	1

* **p > 0.01; * p > 0.05

Intercorrelation coefficients for all variables are shown in Table 2. HbA1c level was positively correlated with years of life with diabetes, and negatively correlated with general diet and fruit and vegetable consumption, as dimensions of SDSCA. Dimensions of SDSCA were correlated positively with each other, specifically general diet with fruit and vegetable consumption, exercise, blood glucose testing and foot care, fruit and vegetable consumption with high-fat food intake, exercise, and blood glucose testing, exercise with blood glucose testing and foot care and foot care with blood glucose testing and years of life with diabetes.

To examine differences in self-care activities and health outcomes between type 1 and type 2 diabetes, t-test for each dimension of SDSCA and HbA1c was done. Results are shown in Table 3. There was a significant difference between Type 1 and Type 2 diabetes in levels of HbA1c, with Type 2 (M = 6.82; SD = 1.43) diabetes scoring lower levels of HbA1c on average compared to Type 1

(M = 7.25; SD = 1.34). There was a significant difference between Type 1 and Type 2 diabetes regarding blood glucose testing, with Type 1 diabetes patients (M = 6.09; SD = 1.71) measuring blood glucose daily more times on average compared to Type 2 (M = 3.60; SD = 2.69). To test whether HbA1c level can be predicted by SDSCA dimensions for Type 1 and Type 2 diabetes individually, linear regression analysis for each subsample was conducted (Table 4). For Type 1 diabetes, a regression model was borderline significant (R = .28, F (6.149) = 2.12, p = .054), explaining 7.9% variance of HbA1c, with general diet (β = -.20, p = .04) and blood glucose testing being (β = -.19, p = .02) significantly associated with lower levels of HbA1c. For Type 2 diabetes, regression model was significant (R = .40, F (6.90) = 2.93, p = .012), explaining 16.3% variance of HbA1c, with fruit and vegetable consumption (β = -.37, p = .00) being significantly associated with lower levels of HbA1c.

Table 3. T-test

	Type 1 M (SD)	Type 2 M (SD)	t	p
HbA1c	7.25 (1.34)	6.82 (1.43)	**2.42**	**.02**
General diet	4.51 (2.07)	4.17 (2.1)	1.36	.18
Fruits and vegetables	3.88 (2.4)	3.61 (2.49)	.88	.38
High-fat food	3.58 (1.99)	3.41 (2.01)	.67	.50
Exercise	4.04 (2.28)	3.7 (2.37)	1.18	.24
Blood glucose testing	6.09 (1.71)	3.6 (2.69)	**8.74**	**.00**
Foot care	2.86 (2.48)	2.64 (2.63)	.71	.48
Cigarettes per day	17.66 (14.88)	17.39 (14.38)	.11	.92

*M = mean; SD = standard deviation; p = p level

Table 4. Determinants of HbA1c for Type 1 and Type 2 diabetes

Type 1	B	β	p	Type 2	B	β	p
General diet	-.13	-.20	**.04**	General diet	-.01	-.01	.92
Fruits and vegetables	.03	.06	.52	Fruits and vegetables	-.21	-.37	**.00**
High-fat food	.02	.03	.75	High-fat food	.07	.10	.31
Exercise	.03	.05	.54	Exercise	-.05	-.08	.49
Blood glucose testing	-.16	-.19	**.02**	Blood glucose testing	.04	.07	.55
Foot care	.02	.03	.71	Foot care	.00	.00	.98

Discussion

The aim of this study was to examine the differences in self-care activities between patients with Type 1 and Type 2 diabetes as well as the role of these activities in predicting good glycaemic control.

The average level of HbA1c of 7.11% in this study, suggests that glycaemic control is not so satisfactory among people with diabetes in Serbia. Results also suggest that there is a difference between Type 1 and Type 2 diabetes in achieving good glycaemic control, with Type 2 diabetes patients achieving better levels of HbA1c. This is in accordance with previous studies which suggest that achieving blood sugar control for people with Type 1 diabetes is much more challenging compared to Type 2 (16). We can conclude that people with Type 1 diabetes need more support regarding self-control in diabetes since the burden of the disease is much greater for them. Besides differences in glycaemic control, our results show that people with Type 1 diabetes check their blood glucose much more frequently than people with Type 2. This is in accordance with general guidelines for therapy of Type 1 diabetes, where regular blood glucose measuring is emphasized (7).

Placing importance on this kind of activity proved to be justified once more, based on our results showing that in people with Type 1 diabetes, the higher frequency of measuring sugar as well as a practising more healthy eating plan, in general, are associated with lower levels of HBA1c. The relationship between blood glucose measurement and glycaemic control was not found to be significant in people with Type 2 diabetes, but regular consumption of vegetables and fruits was, which is in line with the general recommendations for diabetes control for this type

of diabetes where emphasis is put on changing lifestyle (18).

In general, our results suggest that the level of HbA1c rises as the number of years living with diabetes increases. This could be explained by the probable development of certain complications among patients, influencing the burden of the disease, quality of life, and self-care activities, in turn reducing the success of glycaemic control.

What was interesting, the consumption of red meat and full dairy products was not associated with glycaemic control outcomes or other self-care activities. It seems that people with diabetes in Serbia may not be familiar with the recommendations to avoid high-fat foods. Additionally, there may be a trend of using the keto diet which mostly consists of meat and vegetable consumption. It's important to investigate how these dietary habits affect the health outcomes of those with diabetes in Serbia.

There are some limitations of the study that need to be addressed. Firstly, the sampling process was biased towards individuals with diabetes who were active on Facebook groups for people with diabetes. This means that the sample may not be representative of the wider population of individuals with diabetes. Additionally, the sample wasn't balanced in terms of the proportion of Type 1 and Type 2 diabetes. There were more people with Type 1 diabetes in the study, which suggests that they are more proactive in seeking advice and information on such groups. Finally, the process of collecting information about the level of HbA1c wasn't reliable enough. Nevertheless, we think that the results of this study can significantly contribute to understanding and creating better practices in the treatment and education of people with diabetes.

Conclusion

Based on our findings, it can be concluded that in Serbia, achieving good glycaemic control is more challenging for people with Type 1 diabetes than for people with Type 2 diabetes, despite no significant difference in their compliance with most self-care activities. Individuals with Type 1 diabetes should receive the education that emphasizes monitoring blood sugar levels and adopting a healthy lifestyle. Meanwhile, for people with Type 2 diabetes, the focus should be on improving their daily habits, particularly by increasing their consumption of fruits and vegetables.

References

1. Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J. Self-management approaches for people with chronic conditions: a review. Patient Educ Couns 2002;48(2):177–87. [CrossRef] [PubMed]
2. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measures results from 7 studies and a revised scale. Diabetes Care 2000;23(7):943–50. [CrossRef] [PubMed]
3. Reed J, Ashton H, Lawrence J, Hollinghurst S, Higgs E. Diabetes self-management: how are we doing? Pract Diabetes Int. 2003;20(9):318–22. [CrossRef]
4. Rubin RR, Peyrot M. Psychological issues and treatments for people with diabetes. J Clin Psychol 2001;57(4):457–78. [CrossRef] [PubMed]
5. Snoek FJ. Psychological Aspects of Diabetes Management. 2002; [CrossRef]
6. McKnight JA, Wild SH, Lamb MJE, Cooper MN, Jones TW, Davis EA, et al. Glycaemic control of Type 1 diabetes in clinical practice early in the 21st century: an international comparison. Diabet Med 2015;32(8):1036–50. [CrossRef] [PubMed]
7. American Diabetes Association. Standards of Medical Care in Diabetes—2013. Diabetes Care 2013;36(Supplement_1):S11–66. [CrossRef] [PubMed]
8. Ducat L, Philipson LH, Anderson BJ. The Mental Health Comorbidities of Diabetes. JAMA 2014;312(7):691. [CrossRef] [PubMed]
9. Dennick K, Sturt J, Speight J. What is diabetes distress and how can we measure it? A narrative review and conceptual model. J Diabetes Complications 2017;31(5):898–911. [CrossRef] [PubMed]
10. Moura N dos S, Lopes BB, Teixeira JJD, Oriá MOB, Vieira NFC, Guedes MVC. Literacy in health and self-care in people with type 2 diabetes mellitus. Rev Bras Enferm 2019;72(3):700–6. [CrossRef] [PubMed]
11. Hampson SE, Skinner TC, Hart J, Storey L, Gage H, Foxcroft D, et al. Effects of educational and psychosocial interventions for adolescents with diabetes mellitus: a systematic review. In: Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]. Centre for Reviews and Dissemination (UK); 2001; 5(10): 1-79. [CrossRef] [PubMed]
12. Boren SA, Fitzner KA, Panhalkar PS, Specker JE. Costs and benefits associated with diabetes education a review of the literature. Diabetes Educ 2009;35(1):72–96. [CrossRef] [PubMed]
13. Stratton IM, Adler AI, Neil HAW, Matthews DR, Manley SE, Cull CA, et al. Association of glycemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): a prospective observational study. Bmj 2000;321(7258):405–12. [CrossRef] [PubMed]
14. Osborn CY, Egede LE. Validation of an Information–Motivation–Behavioral Skills model of diabetes self-care (IMB-DSC). Patient Educ Couns 2010;79(1):49–54. [CrossRef] [PubMed]
15. Mayberry LS, Osborn CY. Empirical Validation of the Information–Motivation–Behavioral Skills Model of Diabetes Medication Adherence: A Framework for Intervention. Diabetes Care 2014;37(5):1246–53. [CrossRef] [PubMed]
16. Peyrot M. Behavior change in diabetes education. Diabetes Educ 1999;25(6_suppl):62–73. [CrossRef] [PubMed]
17. Magliano D, Boyko EJ. IDF diabetes atlas. 10th edition. Brussels: International Diabetes Federation; 2021.
18. Standards of Medical Care for Patients With Diabetes Mellitus: American Diabetes Association. Diabetes Care. 1994 Jun 1;17(6):616–23. [CrossRef] [PubMed]

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BRIGA O SEBI KAO PREDIKTOR DOBRE GLIKEMIJSKE KONTROLE U DIJABETESU: RAZLIKE IZMEĐU DIJABETESA TIPA 1 I TIPA 2

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Dijabetes melitus je hronična bolest koju danas kontroliše prvenstveno sama obolela osoba. Aktivnosti samokontrole dijabetesa uključuju redovnu kontrolu glukoze u krvi, zdravu ishranu, redovnu fizičku aktivnost, uzimanje preporučenih lekova i redovne konsultacije sa zdravstvenim radnicima. Različite studije su pokazale da edukativne i psihosocijalne intervencije mogu imati značajan uticaj na poboljšanje samokontrole dijabetesa i na smanjenje komplikacija. Cilj ove studije bio je da se ispitaju razlike u aktivnostima u vezi sa brigom o sebi između obolelih od dijabetesa melitusa tipa 1 i obolelih od dijabetesa melitusa tipa 2, kao i da se ispita uloga ovih aktivnosti u predviđanju dobre glikemijske kontrole. Naši rezultati ukazuju na to da u Srbiji osobe sa dijabetesom melitusom tipa 1 imaju mnogo teži zadatak kada je reč o sprovođenju dobre kontrole glikemije nego osobe sa dijabetesom melitusom tipa 2, čak i kada ne postoji razlika između ovih bolesnika u pogledu brige o sebi. U budućim programima edukacije za osobe sa dijabetesom melitusom tipa 1 naglasak treba staviti na kontinuirano praćenje glukoze u krvi. I kod jednog i kod drugog tipa dijabetesa melitusa treba obratiti pažnju na edukovanje o zdravoj ishrani.

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***Ključne reči**: dijabetes, briga o sebi tokom dijabetesa, kontrola glikemije, edukacija o dijabetesu*

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