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Original article

The Impact of Attitudes on Medication Adherence in Patients with Type 1 and Type 2 Diabetes Mellitus in Serbia

Mina Karaman[1], Mirjana Bogavac[2,3], Dragan Stajić[2,3]

[1]*University of Novi Sad, Faculty of Medicine, Department of Psychology, Novi Sad, Serbia*
[2]*University of Novi Sad, Faculty of Medicine, Department of Gynaecology and Obstetrics, Novi Sad, Serbia*
[3]*Clinical Center of Vojvodina, Clinic for Gynaecology and Obstetrics, Novi Sad, Serbia*

SUMMARY

Introduction. Managing diabetes mellitus requires significant lifestyle changes and medication adherence. It has been shown that varying attitudes towards diabetes treatment can significantly impact self-care and health outcomes. This study investigated attitudes toward diabetes treatment among type 1 and type 2 diabetes mellitus patients in Serbia and its impact on treatment adherence.
Method. An online survey was distributed via social media groups for diabetics in Serbia (June-August 2023), measuring self-care behaviors, treatment adherence attitudes, and patient-reported HbA1c levels.
Results. Overall, participants showed positive attitudes towards medications for diabetes treatment. However, type 2 patients were more likely to believe that feeling well justifies the cessation of treatment. A weak positive correlation was found between HbA1c levels and the belief that the cessation of treatment leads to complications. Self-care activities were weakly linked to the belief that family involvement helps with medication adherence.
Conclusion. These findings highlight the importance of addressing misconceptions about diabetes treatment, particularly among type 2 patients. Open communication between patients and healthcare providers, along with family involvement, could be crucial for improving adherence and health outcomes.

Keywords: **diabetes management, attitudes, beliefs, type 1 diabetes, type 2 diabetes**

Corresponding author:
Mina Karaman
e-mail: mina.karaman@mf.uns.ac.rs

INTRODUCTION

Diabetes mellitus is a serious chronic disease affecting more and more people every year (1). Managing diabetes can be a very challenging process. In addition to taking prescribed medications and administering insulin, patients are required to make significant adjustments to their lifestyle. These changes can range from altering dietary habits and increasing physical activity to quitting smoking and drinking alcohol. Patients must also learn how to monitor their blood sugar levels and adjust their treatment on a daily basis (2). Even if it seems overwhelming, engaging in these self-care activities can significantly slow down the progression of the disease and reduce the risk of developing complications (3). This, in turn, can improve the quality of life for people with diabetes.

Self-care activities are influenced by multiple factors, including attitudes and beliefs about diabetes and its treatment (4). Results have shown that attitudes toward diabetes treatment can directly affect how people with diabetes perceive the need for and importance of diabetes education (5). Findings revealed an association between persons' positive attitudes toward treatment and adherence outcomes (6). Beliefs in the benefits of medications were found to be strongly linked to the intention to regularly take medications among individuals with type 2 diabetes. Other studies have also shown that individuals with positive attitudes toward managing this disease are more likely to change their behavior in order to control their blood glucose levels compared to those with negative attitudes (4).

Insulin therapy is considered the most efficient way of achieving and maintaining glycemic control in individuals with diabetes. However, despite its effectiveness, many people who could benefit from insulin therapy either do not receive it or do not receive it promptly (7). Studies show that about 33% of type 2 diabetes patients hesitate to begin insulin therapy when recommended by their healthcare providers (8). It seems that patients who are on non-insulin therapy for type 2 diabetes, when introduced to insulin therapy, perceive it as evidence of personal failure and punishment for unsuccessful management of their disease (9). These beliefs can be influenced by various factors, such as cultural background, past experiences, and the perceived stigma associated with insulin use (10, 11).

Besides individual factors, different research found that the patient attitudes toward insulin therapy were influenced by clinicians' attitudes, especially when it comes to attitudes about the seriousness of diabetes and subsequent self-management behavior (12, 9). Research done by Larme and associates showed that primary care physicians consider diabetes harder to treat than other serious chronic diseases like hypertension and angina (13). On the other hand, if the physician reacts by downplaying the seriousness of the diagnosis of diabetes, it can be perceived as less serious by the patient (12).

Studies have shown that people who have been diagnosed with type 1 diabetes tend to have a higher level of knowledge about their health condition compared to those with type 2 diabetes. They are known to be more diligent when it comes to monitoring various aspects of their health, such as frequent blood glucose measurements and keeping a record of their physical activity (14), which can lead to better management of the disease, resulting in improved overall health outcomes.

The aim of this study was to investigate the differences in attitudes toward diabetes treatment between type 1 and type 2 diabetes patients in Serbia, as well as the relation of these attitudes with treatment adherence and health outcomes.

One of the most widely used measures of treatment adherence i.e. self-care activities for people with diabetes is "The Summary of Diabetes Self-Care Activities" (SDSCA). It is a brief self-report questionnaire, developed by Toolber, Hampson and Glasgow (2), designed to measure diabetes self-management behaviors. It assesses six key aspects of the diabetes regimen:

- General diet: Overall adherence to a prescribed diet.
- Specific diet: Adherence to specific dietary recommendations, such as limiting sugar intake or avoiding certain foods.
- Exercise: Regular physical activity.
- Blood-glucose testing: Frequency of blood glucose monitoring.
- Foot care: Proper foot inspection and care.
- Smoking: Smoking cessation status.

Its revised and final version, based on the results of seven previous studies, was published in 2000 (2). Since different populations of diabetes patients require different therapies, specific forms of SDSCA were developed. Its original form is mainly

used for type 1 and type 2 diabetes population of all ages. The measure has also been successfully adapted for adolescents with type 1 diabetes (15).

METHODOLOGY

This research was conducted online, using the Google Forms platform, between June and August of 2023. The questionnaire was distributed on Facebook groups, such as "Dijabetes Revolucija" Facebook group, and was designed for the population 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 participation and data processing before accessing the questionnaire.

MATERIAL

Summary of Diabetes Self-Care Activities (SDSCA)

Summary of Diabetes Self-Care Activities Scale (2) was used as a measure of self-care behavior in diabetes. For the needs of 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 seven days in the six 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 behaviors, except for the scale of smoking where a higher score indicates a higher number of cigarettes consumed in a day for smokers. For the purpose of this research, the composite score of self-care activities was used as a measure of self-care activities. The internal consistency of the scale in this research was $\alpha = .742$.

Attitude toward treatment adherence questionnaire

As a measure of individual motivation, a questionnaire on attitudes toward medication adherence (16) was used. The questionnaire consists of 11 questions divided into six domains: discomfort, beliefs about harmful effects of drugs, complications of diabetes and the possibility of their prevention with therapy, obstacles/facilitators in taking therapy, availability of health care and medical therapy, consent, and satisfaction with treatment. Responses were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). For the purpose of this research, every item was analyzed individually.

HbA1c report

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

SAMPLE

The research sample included 285 participants, out of which 52 (18.2%) were men and 233 (81.8%) were women. Out of the total respondents, 163 (57.2%) reported that they suffered from type 1 diabetes, 114 (40%) suffered from type 2 diabetes, and 8 (2.8%) suffered from other types of diabetes.

Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 20. Skewness and Kurtosis tests were conducted to test normality of variable distributions. T-test was used to identify intergroup differences. The correlations were tested using Pearson's correlation coefficient.

RESULTS

Before conducting the main analyses, descriptive statistics for the sample and variables were calculated. The participants' age in the sample ranged from 17 to 73 years with an average age of 43.35 years. The majority of the respondents, i.e. 235 (82.5%) subjects, reported that they lived in a 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% 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.

Descriptive statistics for all variables used in research are shown in Table 1. Based on the values of Skewness and Kurtosis, we can conclude that there is the normality of distribution for the variables (17).

Table 1. *Descriptive statistics for all variables in research*

	N	Min	Max	M	SD	Skewness	Kurtosis
HbA1c	260	3.0	14.0	7.11	1.43	1.41	4.32
Duration of diabetes	282	1.0	48.0	12.35	10.43	1.16	1.01
Self-care activities	285	.5	7.0	3.93	1.38	-.19	-.30
Q1: If diabetic patients feel well, they should stop taking their medications.	285	1.0	5.0	1.43	.78	2.29	6.07
Q2: Diabetic patients will get sicker if they stop taking their medications.	285	1.0	5.0	3.84	1.57	-.95	-.79
Q3: In diabetic patients, their medications will cause blindness.	285	1.0	5.0	1.62	1.03	2.01	3.64
Q4: Diabetes is a disease that causes health complications.	285	1.0	5.0	4.11	1.40	-1.34	.25
Q5: Medications for the treatment of diabetes will prevent or delay diabetes complications.	285	1.0	5.0	3.99	1.49	-1.14	-.33
Q6: For diabetic patients, it is difficult to take their medications at work.	285	1.0	5.0	2.32	1.40	.64	-.92
Q7: It is advisable that diabetic patient's family facilitates their intake of medications.	285	1.0	5.0	2.98	1.41	.03	-1.26
Q8: Diabetic patients have problems complying with their treatment if they live far from the clinics.	285	1.0	5.0	1.99	1.25	1.12	.17
Q9: Diabetic patients have problems complying with their treatment due to lack of money.	285	1.0	5.0	3.39	1.52	-.38	-1.35
Q10: Physicians and diabetic patients should agree with the diabetes prescriptions.	285	1.0	5.0	3.80	1.40	-.86	-.62
Q11: Do you agree with your diabetes treatment?	285	1.0	5.0	3.84	1.46	-.90	-.67

* N = sample size; M = mean; SD = standard deviation

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% (18). The years of life with diabetes in the sample ranged from 1 to 48 years, with an average of 12.35 years. The frequency of conducting self-care activities throughout the week in the sample ranged from 0.5 to 7, with an average of 3.93.

Regarding attitudes toward treatment adherence, participants showed positive attitudes toward medication for diabetes treatment. On average, participants agreed that diabetic patients will get sicker if they stop taking their medications (M = 3.84) and that medication for the treatment of diabetes prevents or delays diabetes complications (M = 3.99). The highest agreement related to the statement that diabetes is a disease that causes health complications (M = 4.11). Participants highly disagreed with the statements that if diabetic patients feel well, they should stop taking their medications and that diabetes medication causes blindness (M = 1.62). When it comes to perceived barriers to taking therapy, participants on average disagreed that it is difficult for the patient to take their medication at work (M = 2.32) and that patients have problems complying with their treatment if they live far from the clinics (M = 1.99). On average, participants agreed that diabetic patients have problems complying with their treatment due to lack of money (M = 3.39), while the average answer was neutral regarding seeing family as a facilitator of the intake of the medication (M = 2.98). On average, participants slightly agreed that physicians and diabetic patients should agree with the diabetes prescriptions (M=3.80), and on average, participants slightly agreed with their diabetes treatment (M = 3.84).

To determine if there were differences in attitudes toward medication treatment between type 1 and type 2 diabetes patients, a T-test was conducted for each of the 11 statements. Results are shown in Table 2.

Results suggest that type 2 patients agreed significantly more with the statement that if diabetic patients feel well, they should stop taking their medications, than type 1 patients. Type 2 patients also agreed less with the statement that diabetic patients will get sicker if they stop taking their medications and also agreed less with their diabetes treatment.

To determine whether there is a correlation between attitudes towards medication treatment and self-care activities, HbA1c, and duration of diabetes, Pearson's correlation coefficients were calculated. Results are shown in Table 3.

A weak, positive but significant correlation was found between HbA1c levels and attitudes related to potential complications from stopping medications (r = .132*). This correlation suggests that individuals with higher HbA1c levels may be more likely to endorse beliefs that stopping medications will lead to worse health outcomes. However, no statistically significant correlations were found between HbA1c levels and beliefs about medication-induced blindness (Q3) or complications from diabetes itself (Q4).

A significant negative but weak correlation was observed between the duration of diabetes and the perception that feeling well justifies the cessation of therapy (r = -.197**). This suggests that individuals who have had diabetes for a shorter period may be more likely to approve of this belief. No other significant correlations were found between the duration of diabetes and the remaining attitudes or behaviors.

Table 2. *T-test*

	Type 1 M (SD)	Type 2 M (SD)	t	df	p
Q1	**1.28 (0.65)**	**1.62 (0.85)**	**-3.61**	**202.31**	**.000**
Q2	**4.05 (1.55)**	**3.52 (1.55)**	**2.81**	**275.00**	**.005**
Q3	1.6 (1.08)	1.65 (0.99)	-.43	275.00	.671
Q4	4.21 (1.34)	3.96 (1.5)	1.48	226.01	.141
Q5	4.13 (1.45)	3.8 (1.51)	1.82	236.70	.070
Q6	2.41 (1.5)	2.17 (1.2)	1.50	270.30	.134
Q7	3.07 (1.41)	2.86 (1.4)	1.21	275.00	.228
Q8	2.05 (1.34)	1.89 (1.1)	1.05	268.05	.295
Q9	3.52 (1.52)	3.18 (1.54)	1.81	275.00	.072
Q10	3.93 (1.35)	3.61 (1.49)	1.84	228.15	.067
Q11	**4.06 (1.42)**	**3.54 (1.48)**	**2.90**	**275.00**	**.004**

*M = mean; SD = standard deviation; df = degrees of freedom; p = p level

Table 3. *Correlations*

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Hba1c	.081	**.132***	-.014	.039	.070	-.058	-.071	.042	.020	-.117	-.044
Duration of diabetes	-**.197****	.025	.000	.093	.040	-.114	.019	.066	-.031	.027	.011
Self-care activities	.074	.035	.096	-.008	.020	.009	**.140***	-.048	.001	.092	.094

*= p < .05; **= p < .01

A weak, positive correlation was found between self-care activities and the belief that family members should facilitate medication intake (r = .140*). This suggests that individuals who engage in more self-care activities may be more likely to believe that family involvement is helpful for medication adherence. No other significant correlations were found between self-care activities and the listed attitudes or behaviors.

DISCUSSION

This study investigated attitudes toward diabetes treatment among type 1 and type 2 diabetes patients in Serbia, exploring the relationship between these attitudes, treatment adherence, and health outcomes. The findings indicate generally positive attitudes towards medications for diabetes treatment in Serbia, in accordance with previous studies (4). Participants acknowledged the importance of medications in preventing complications and understood the risks of discontinuing medications. However, some concerning beliefs emerged, particularly among type 2 patients.

Type 2 patients were more likely to endorse the idea that feeling well justifies stopping medication This highlights a potential knowledge gap regarding the chronic nature of diabetes and the necessity of continuous treatment regardless of immediate symptoms, shown to be present in all asymptomatic phases in chronic illnesses (18). This belief could negatively impact adherence and ultimately lead to poorer health outcomes. Interestingly, type 2 patients also showed lower agreement with the statement that they agreed with their current treatment plan. This confirms previous findings of communication issues between patients and healthcare providers, specifically regarding their therapeutic compliance (19), which could be another significant factor influencing adherence.

The positive correlation between HbA1c and the belief that stopping medications leads to complications suggests that individuals with poorer glycemic control may hold more accurate beliefs about the consequences of non-adherence. However, the lack of correlation with other beliefs highlights the need for further investigation into the specific knowledge gaps contributing to suboptimal diabetes management. One of the possible explanations for this correlation could be that persons with higher HbA1c have more frequent fluctuations in sugar levels throughout the day, and hence are more prone to experience symptoms of hyperglycemia such as thirst, nausea, and others which are resolved when insulin is administered (1). The weak positive correlation between self-care activities and the belief that family involvement aids adherence suggests a potential benefit of involving family members in diabetes management strategies, as shown in recent systematic review (20).

This study has limitations. The cross-sectional design precludes establishing causality between attitudes and behaviors. Additionally, even though significant, none of the correlations reported were high, indicating that there are many more factors influencing diabetes self-care behavior and health outcomes, besides attitudes. Also, further research on the specifics of self-care activites between type 1 and type 2 diabetes and reliability of SDSCA measure in Serbian population would be beneficial. Future research could benefit from a longitudinal design to explore how attitudes change over time and their impact on adherence and health outcomes. Qualitative research could provide deeper insights into the reasons behind specific beliefs about diabetes treatment.

CONCLUSION

The findings of this study emphasize the importance of addressing patient beliefs about diabetes treatment during consultations. Healthcare providers should tailor communication to address misconceptions, particularly the belief that feeling well justifies stopping medication among type 2 patients as well as addressing reasons for possible disagreement with the prescribed treatment if present. Also, members of the family should be encouraged to get involved in the diabetes management of the patient and to provide support. Further research is needed to develop targeted interventions to improve adherence and optimize diabetes management in Serbia.

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Uticaj stavova osoba sa dijabetesom melitusom tipa 1 i tipa 2 u Srbiji na pridržavanje terapije

Mina Karaman[1], Mirjana Bogavac[2,3], Dragan Stajić[2,3]

[1]Univerzitet u Novom Sadu, Medicinski fakultet, Katedra za psihologiju, Novi Sad, Srbija
[2]Univerzitet u Novom Sadu, Medicinski fakultet, Katedra za ginekologiju i akušerstvo, Novi Sad, Srbija
[3]Klinički centar Vojvodine, Klinika za ginekologiju i akušerstvo, Novi Sad, Srbija

SAŽETAK

Uvod. Kontrola dijabetesa zahteva značajne promene u životnom stilu i pridržavanje prepisane terapije. Ranije studije su pokazale da stavovi prema lečenju dijabetesa mogu značajno uticati na brigu o sebi i na ishode lečenja. Cilj ovog istraživanja bio je da ispita stavove prema lečenju dijabetesa kod osoba sa dijabetesom tipa 1 i tipa 2 u Srbiji, kao i njihov uticaj na pridržavanje terapije.
Metode. Članovi grupa obolelih od dijabetesa u Srbiji koje postoje na društvenim mrežama popunjavali su od juna do avgusta 2023. godine onlajn anketu. Upitnik se odnosio na načine na koji osobe sa dijabetesom brinu o sebi i na njihove stavove prema pridržavanju terapije lekovima. Takođe, meren je nivo HbA1c, koji su sami bolesnici prijavili.
Rezultati. Rezultati ukazuju na to da su u Srbiji stavovi prema terapiji dijabetesa uopšteno pozitivni. Međutim, osobe sa dijabetesom tipa 2 bile su sklonije verovanju da mogu prekinuti terapiju za dijabetes ukoliko se osećaju dobro. Između nivoa HbA1c i verovanja da prekid terapije lekovima vodi do komplikacija uočena je slaba, ali pozitivna korelacija. Briga o sebi tokom dijabetesa povezana je sa verovanjem da podrška porodice pomaže pri pridržavanju terapije lekovima.
Zaključak. Naši rezultati naglašavaju važnost uticaja zdravstvenih radnika na pogrešna shvatanja o lečenju dijabetesa u praksi, posebno kod osoba sa dijabetesom tipa 2. Otvorena komunikacija između bolesnika i zdravstvenih radnika, uz podršku porodice, može biti ključna za poboljšanje pridržavanja terapije i ishoda lečenja.

Ključne reči: **upravljanje dijabetesom, dijabetes tipa 1, dijabetes tipa 2, stavovi, verovanja**