



ORIGINAL ARTICLE / ОРИГИНАЛНИ РАД

Quality of life in patients with diabetes – limited activity hinders women more

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SUMMARY

Introduction/Objective Diabetes mellitus and its chronic complications impair quality of life (QoL) when compared to the one of the general population.

The objective of this study was to determine the prevalence of > 14 unhealthy days per month among the patients with diabetes in Serbia and to determine the association of the socio-demographic characteristics and health characteristics with the total of > 14 unhealthy days.

Methods Serbian version of a generic self-administered questionnaire from Centers for Disease Control and Prevention (CDC-HRQOL-4) was used for data collection in all three levels of care.

Results The study involved 4898 patients with diabetes, 2283 (46.6%) men and 2611 (53.4%) women. Overall mean age was 57.3 ± 12.2 years with over one fifth (23.2 %) were younger than 50 years. Multivariate logistic regression analyses indicated that age > 65 (OR: 1.575, 95%CI 1.100–2.256), being a woman (OR: 1.287, 95% CI 1.042–1.588), lower education (OR: 1.383, 95%CI 1.091–1.754), felt depressed ≥ 14 days (OR: 3.689, 95% CI 2.221–6.128), felt anxious ≥ 14 days (OR: 1.749, 95% CI 1.113–2.749), poor sleep ≥ 14 days (OR: 2.161, 95%CI 1.569–2.988), fair or poor self-rated health ≥ 14 days (OR: 4.322, 95%CI 3.474–5.376) were associated with unhealthy days ≥ 14 days. The strongest negative association was observed between limited physical activity ≥ 14 days and a decrease in the QoL of people with diabetes (OR: 22.176, 95%CI 10.971–44.824).

Conclusion This study highlights association between impaired QoL in patients with diabetes and physical activity limitations. Limited physical activity is the factor with the greatest negative impact on the QoL particularly in older, less educated, and women with diabetes.

Keywords: diabetes mellitus; health-related quality of life; unhealthy days; sex differences

INTRODUCTION

Diabetes mellitus (DM) is a chronic, non-communicable disease associated with micro and macrovascular complications with a notable impact on health-related quality of life (HRQoL). Diabetes affects general health and wellbeing from various aspects including functional disability and mortality. The epidemic of obesity in the world contributes to the increase in the number of patients with diabetes mellitus which becomes an increasing global health burden. According to 2021 International Diabetes Federation atlas [1], the burden of the disease keeps growing with some 537 million people suffering from diabetes worldwide, and the highest increase expected to be seen in Africa (134%), followed by Middle East and North Africa (87%) and South-East Asia (68%), where currently 24 million, 73 million, and 90

million of inhabitants have diabetes, respectively. Europe with its mere 61 million in 2021 and the estimated 13% increase to 69 million in 2045 seems tolerable; however, the long-term complications and the unrecognized burden of women with gestational diabetes and their offspring is still unknown, since comprehensive data are lacking. According to the latest Institute of Public Health of Serbia “Dr Milan Jovanović Batut” report [2], 12.4% of people in Serbia have diabetes with 8.1% being aware of it and receiving treatment, while others who are unaware remain untreated. Diabetes is the fifth leading cause of morbidity and mortality in Serbia, with 90% of the patients having Type 2 diabetes (T2DM) and the majority are aged 40–59 years. Quality of life (QoL) and HRQoL could be used to assess the impact of medical conditions on patients’ life and as a useful measure for policy-making and economic setting

Received • Примљено:

December 30, 2021

Accepted • Прихваћено:

August 29, 2023

Online first: September 1, 2023

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[3, 4, 5]. Diabetes mellitus impairs the patients' QoL. Socio-demographic factors also have physical, and mental health influence on HRQoL in patients with diabetes mellitus. Being a woman has been associated with lower QoL, as women report a higher impact of diabetes on their daily lives and are also influenced by lower educational level, duration of symptoms, adherence with prescribed treatment [4, 6–10]. Although global data might seem conflicting [11], the consensus are needed on which aspects of HRQoL should be measured in people with T2DM [11–14], while depression is gaining traction [5, 9, 15, 16, 17].

The aim of this study was to determine the prevalence of > 14 unhealthy days per month among the patients with diabetes in Serbia treated in outpatient care in the health care institutions in the public health care system. We also aimed to determine the association of the socio-demographic characteristics and health characteristics with a total of > 14 unhealthy days.

METHODS

The cross-sectional survey was conducted between January 2011 and December 2011. The 5500 questionnaires were offered to patients with diabetes who reported in outpatient healthcare settings in Serbia, during the investigated period. Of the total number, 602 respondents did not want or were unable to complete the questionnaire. The study included 4898 patients with diabetes mellitus from the urban and rural areas. Data was collected by Centers for Disease Control and Prevention questionnaire (CDC-HRQoL-4). The questionnaire was modified and translated into Serbian following the standard World Health Organization method translated to Serbian and previously published [18]. Participation in the research was voluntary. Research aims were introduced to participants both verbally and in written form. Anonymity, confidentiality, and privacy of data were also explained in verbal and written form, and all data were guaranteed to be used only for research purposes. We considered that all of the participants who filled out and returned the questionnaires after receiving all needed information gave their consent for the research. The willing participants filled out the questionnaire in the waiting room. All patients who visited their physician in the outpatient healthcare setting in Serbia were asked to participate in the study. The participants who were illiterate, did not speak Serbian fluently, or had mental or physical inability to understand or fill in the questionnaire were excluded from the study. The study was approved by the Ethical Committee of the Clinical Center of Serbia (Nr 1856/21, December 16, 2010). Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patients to publish this paper.

The outcome variable in our study was “having ≥ 14 unhealthy days in the past month”. The CDC-HRQoL-4 questionnaire examines the total number of physically unhealthy days, mentally unhealthy days, and days with limitation in physical activity in the past 30 days. These

numbers are added together in order to obtain the “unhealthy days index” (UHD). UHD is commonly presented as a binary variable (< 14 unhealthy days and ≥ 14 unhealthy days) [19, 20].

Categorical data were expressed as numbers (%). Numerical variables (mentally, physically, activity limitations, total unhealthy, pain limitation, feelings of depression, anxiety, poor sleep, and healthy days) were tested for normality and were presented as mean, median (25th and 75th percentile). Univariate logistic regression was used, with ≥ 14 total unhealthy days during the previous 30 days as dependent variables as previously suggested [21]. Socio-demographic independent variables in logistic regression were: age (three categories: < 45 years, 45–65 years, and > 65 years), education (lower – elementary, high school, and higher – college), and place of residence (big town, small town, and rural area). Among QoL independent variables: self-rated health (fair and poor), mentally, physically, activity limitations, total unhealthy days, pain limitation, felt depressed, anxious, poor sleep, and healthy days were used. Variables with $p < 0.05$ were included in multivariate logistic regression. The level of significance was set at 0.05. Statistical analysis was performed using the IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA).

RESULTS

Among 4898 patients with diabetes mellitus, 2283 (46.6%) were men and 2611 (53.4%) were women. The mean age was 57.3 ± 12.2 years. More than a fifth of participants (23.2 %) were younger than 50 years. Most of them, (71.5%) had lower education level and 28.5% had higher, college or university education.

Among all the patients with diabetes, 2756 (56.8%) self-reported their health as fair or poor. More than 14 unhealthy days, during the previous 30 days, reported 44.9% of patients (Table 1).

Table 1. Self-rated health and unhealthy days

Variables	n (%)
Self-rated health (fair or poor)	2756 (56.8%)
≥ 14 mentally unhealthy days	751 (19)
≥ 14 physically unhealthy days	932 (23.7)
≥ 14 total unhealthy days	1620 (44.9)
≥ 14 activity limitation days	726 (18.4)
≥ 14 days limited by pain	632 (15.8)
≥ 14 days felt depressed	776 (20.1)
≥ 14 days felt anxious	865 (22.6)
≥ 14 days had difficulty with sleep	1003 (26.2)
≥ 14 days felt healthy	1016 (29)

Means and medians of mentally, physically, activity limitations days and ≥ 14 total unhealthy days were higher for women older than 50 years and patients with lower educations. There were 6.2 activity limitations days in men vs. 6.7 in women. Days of activity limitations were doubled in the group of 50 and more years of age (3.9 vs. 7.3). The

Table 2. Mentally, physically, activity limitation and total unhealthy days by socio-demographic characteristics

Socio-demographic characteristics mean		Mentally unhealthy days		Physically unhealthy days		Total unhealthy days		Activity limitation days	
		mean	med (25th–75th)	mean	med (25th–75th)	mean	med (25th–75th)	mean	med (25th–75th)
Sex	Men	6.5	4 (0–10)	7.7	5 (0–10)	12.2	10 (2–20)	6.2	3 (0–10)
	Women	7.6	5 (0–10)	8.8	7 (2–15)	13.9	12 (3–25)	6.7	4 (0–10)
Age	< 50	5.1	3 (0–8)	5.5	3 (0–10)	9.4	6 (0–15)	3.9	0 (0–5)
	50 or more	7.7	5 (0–10)	9.1	7 (2–15)	14.2	12 (4–25)	7.3	5 (0–10)
Education	≤ 8 years	7.9	5 (0–10)	9.3	7 (2–15)	14.3	14 (4–25)	7.5	5 (0–10)
	> 8 years	5.2	2 (0–10)	5.9	4 (0–10)	10.0	7 (0–17)	4.1	0 (0–5)

Table 3. Pain limitation, felt depressed, anxious, had poor sleep and felt healthy days by sex, age, education

Socio-demographic characteristics mean		Pain limitation (days)		Felt depressed (days)		Felt anxious (days)		Had poor sleep (days)		Felt healthy (days)	
		mean	med (25th–75th)	mean	med (25th–75th)	mean	med (25th–75th)	mean	med (25th–75th)	mean	med (25th–75th)
Sex	Men	5.6	2 (0–10)	6.9	5 (0–10)	8.1	5 (2–10)	8.9	7 (3–12)	9.6	7 (0–18)
	Women	6.3	3 (0–10)	8.2	5 (1–10)	8.9	7 (2–10)	9.8	8 (3–15)	8.2	5 (0–15)
Age	< 50	3.4	0 (0–5)	5.6	3 (0–10)	6.7	5 (0–10)	7.5	5 (2–10)	11.8	10 (2–20)
	Over 50	6.7	4 (0–10)	8.2	5 (1–10)	9.1	7 (2–13)	9.9	8 (3–15)	8	5 (0–15)
Education	lower	6.7	4 (0–10)	8.4	5 (1–10)	9.2	7 (2–14)	10	10 (3–15)	7.9	5 (0–15)
	higher	3.9	0 (0–5)	5.7	3 (0–10)	6.8	5 (1–10)	7.7	6 (2–10)	11.2	10 (2–20)

Table 4. Univariate logistic regression with ≥ 14 total unhealthy days as the dependent variable

Variables	p	OR	95% CI for EXP(B)	
			Lower	Upper
Age	< 0.001			
Age category 45–65 years	< 0.001	1.880	1.540	2.295
Age category > 65 years	< 0.001	3.539	2.830	4.425
Women	< 0.001	1.319	1.156	1.505
Education (lower)	< 0.001	2.138	1.837	2.487
Duration of symptoms (months)	< 0.001	1.003	1.002	1.004
Therapy compliance	0.203	1.433	0.824	2.492
Place of residence	0.110			
Small town	0.083	1.138	0.983	1.317
Rural area	0.743	0.965	0.777	1.197
Activity limitation ≥ 14 days	< 0.001	71.374	44.370	114.813
Pain limitation ≥ 14 days	< 0.001	20.237	14.720	27.821
Felt depressed ≥ 14 days	< 0.001	24.395	17.980	33.098
Felt anxious ≥ 14 days	< 0.001	15.438	12.083	19.724
Poor sleep ≥ 14 days	< 0.001	9.963	8.135	12.201
Fair poor self-rated health ≥ 14 days	< 0.001	9.201	7.857	10.776

persons with lower education level have 7.5 activity limitations days, whereas patients with higher education level were limited active 4.1 days (Table 2).

Means and medians of pain limitation, feelings of depression, anxiety, had poor sleep days were higher for women, older than 50 years and patients with lower educations. As much as 10 poor sleep days were in the group with lower education level. The participants in the same group have the greatest number of days that felt anxious (9.2) or depressed (8.4) as well as days with limited activity (6.7) caused by pain. Mean and median for felt healthy days were higher in men, < 50 years, and with higher education (Table 3).

Age, being a woman, being of lower education, duration of symptoms, activity and pain limitation, feelings of

depression, anxiety, poor sleep, and poor self-rated health were associated with ≥ 14 unhealthy days in univariate logistic regression (Table 4). Therapy compliance, place of residence was not statistically significantly associated with ≥ 14 unhealthy days (Table 4).

Multivariate logistic regression analyses indicated that age > 65 OR 1.575 (95 CI 1.100–2.256), being a woman OR 1.287 (95%CI 1.042–1.588), lower education 1.383 (95%CI 1.091–1.754), felt depressed ≥ 14 days OR 3.689 (95%CI 2.221–6.128), felt anxious ≥ 14 days OR 1.749 (95%CI 1.113–2.749), poor sleep ≥ 14 days OR 2.161 (95%CI 1.569–2.988), fair poor self-rated health ≥ 14 days OR 4.322 95% (95% CI 3.474–5.376) were associated with unhealthy days ≥ 14 days. The strongest negative association was observed between limited physical activity ≥ 14 days and unhealthy days ≥ 14 days with OR 22.176 (95% CI 10.971–44.824) (Table 5, Figure 1).

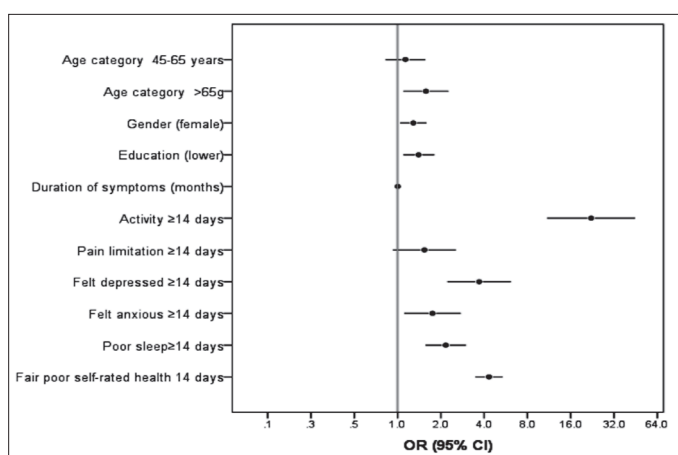
DISCUSSION

There were a large number of studies that evaluated the effect of diabetes on QoL, and most of them have shown that socio-demographic characteristics such as being a woman and being older are associated with lower QoL [4, 6, 7, 8, 11, 17, 22–25]. Our results showed that older age and lower education level were statistically significant with fair and poor self-rated health and mentally, physically, activity limitations, total unhealthy days, pain limitation, felt depressed, anxious, and had poor sleep (≥ 14 days).

In our study women felt more anxious and had poor sleep days. The participants in the group with < eight years of education had 9.2 days in which they felt anxious and 8.4 days felt depressed. Depression, in turn, degrades overall QoL in an interplay of lack of physical exercise, smoking, unhealthy diet, stressful life events and cultural difference in perception of illness [5, 7, 9, 10, 14–17]. Still, at least

Table 5. Multivariate logistic regression with ≥ 14 total unhealthy days as dependent variable.

Variables	p	OR	95% CI for OR	
			Lower	Upper
Age	0.015			
Age category 45–65 years	0.436	1.134	0.826	1.558
Age category > 65 years	0.013	1.575	1.100	2.256
Sex (women)	0.019	1.287	1.042	1.588
Education (lower)	0.007	1.383	1.091	1.754
Duration of symptoms (months)	0.065	1.002	1.000	1.003
Activity ≥ 14 days	< 0.001	22.176	10.971	44.824
Pain limitation ≥ 14 days	0.094	1.537	0.930	2.539
Felt depressed ≥ 14 days	< 0.001	3.689	2.221	6.128
Felt anxious ≥ 14 days	0.015	1.749	1.113	2.749
Poor sleep ≥ 14 days	< 0.001	2.161	1.563	2.988
Fair poor self-rated health 14 days	< 0.001	4.322	3.474	5.376

**Figure 1.** Multivariate logistic regression with ≥ 14 total unhealthy days as depended variable

for women, the solution can be found within the women's heart programs and centers worldwide [26, 27, 28], while the Serbian model [28] is currently the only one offering independent Clinics that actually encompass all four levels of prevention – from primary to quaternary – that can mitigate effects of diabetes in women of all ages and, practically, covering all IDF-defined [1] forms of diabetes.

In our study, 26.2% of participants had more than 14 days with sleep difficulties. The participants in the group with lower education had 10 days of poor sleep, while participants with higher education levels had six days with sleep deprivation. Patients older than 50 years had 10 days with difficulties with sleep, but younger than 50 years had five days with sleep impairment. Sleep deprivation in turn leads to anxiety and consequent depression.

Among all the patients in our study, 23.7% had ≥ 14 physically unhealthy days and 18.4% reported ≥ 14 activity limitation days. Therapy compliance, place of residence, urban or rural, was not statistically significantly associated with total unhealthy days.

Our participants could not have regular activity 6.7 days in the past month due to pain, which is rather in accord with findings of other authors [4, 5, 8, 29] as neuropathy

has a significant negative impact on QoL, the key variable with a negative impact on life quality was activity limitations more than 14 days per month, with OR 22.17 (Figure 1).

In support of our research is the fact that only a few studies have addressed the magnitude of the impact of individual factors on the QoL of patients with diabetes. Previous studies in the Serbian population investigated different aspects, confirm HRQoL lowered in presence of angina, heart failure and retinopathy [6, 30], however, global consensus is required on HRQoL [13, 14, 16, 17]. Harnessing power of new technologies in mitigating effects of T2DM and motivating patients is sorely needed to improve long-term outcomes of the most underserved, as women are [16, 28], taking in consideration their well-described low inclusion in clinical trials and registries, requiring more detailed sex-specific research [28] which will elucidate better both the burden of disease and optimal prevention management strategies both nationally in Serbia, as well as internationally with targeted research agenda with alike-patient populations.

The limitations of this study were the use of the general instrument for assessing the QoL of the patients with diabetes, lack of information regarding the type of diabetes, duration of diabetes, and the presence of complications. Another limitation is the cross-sectional design as it does not allow the establishment of the causal relationship between the variables. The strength of the study is the number of participants, and the place of recruitment, as it allowed us to include the diverse population of patients with diabetes, and not only patients treated in hospitals.

CONCLUSION

For many years, the reason for the impaired QoL of patients with diabetes has been insulin therapy and chronic complications of diabetes. Thanks to the improved insulin formulations and almost painless application, lower incidence of macro- and micro-vascular complications due to significantly improved glycemic control, limited physical activity has become the factor with the greatest negative impact on the QoL of patients with diabetes. In addition, older age, lower educational level, particularly in women, with a significant restriction on their daily activities contributes to feelings of dissatisfaction and poor QoL in the diabetic population. Health promotion and therapeutic strategies including physical activity to increase independence, self-esteem, and better QoL for the patient with diabetes are needed.

This work was supported by the Ministry of Education and Science and Technology, Republic of Serbia (Grant No. 41004, Contract No. 175042 (2011–2014).

Conflicts of interest: None declared.

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Квалитет живота болесника са дијабетесом – ограничење покретљивости штети највише женама

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САЖЕТАК

Увод/Циљ Дијабетес мелитус и његове хроничне компликации нарушавају квалитет живота болесницима.

Циљ овог истраживања је било одређивање преваленце > 14 нездравих дана месечно код болесника са дијабетесом у Србији и одређивање социодемографских карактеристика и здравствених карактеристика са укупно > 14 нездравих дана.

Методе За прикупљање података на сва три нивоа здравствене заштите коришћена је српска верзија упитника Центра за контролу и превенцију болести (*CDC-HRQOL-4*).

Резултати Студија је обухватила 4898 болесника са дијабетесом, од чега 2283 (46,6%) мушкараца и 2611 (53,4%) жена. Просечна старост је била 57,3 ± 12,2 године са више од једне петине (23,2%) млађих од 50 година. Мултиваријантном логистичком регресијом показано је да су узраст > 65 (*OR*: 1,575, 95% *CI* 1,100–2,256), женски пол (*OR*: 1,287, 95% *CI* 1,042–1,588), ниже образовање (*OR*: 1,383, 95%

CI 1,091–1,754), осећај депресије ≥ 14 дана (*OR*: 3,689, 95% *CI* 2,221–6,128), осећај анксиозности ≥ 14 дана (*OR*: 1,749, 95% *CI* 1,113–2,749), лош сан ≥ 14 дана (*OR*: 2,161, 95% *CI* 1,569–2,988), субјективни осећај осредњег или лошег здравља ≥ 14 дана (*OR*: 4,322, 95% *CI* 3,474–5,376) били фактори који су удружени са нездравим данима у трајању од ≥ 14 дана. Најјача негативна удруженост показана је између ограничене физичке активности ≥ 14 дана и смањења квалитета живота код болесника са дијабетесом (*OR*: 22,176, 95% *CI* 10,971–44,824).

Закључак Наше истраживање указује на везу између сниженог квалитета живота код болесника са дијабетесом и ограничене физичке активности. Ограничена физичка активност је фактор највећег негативног утицаја на квалитет живота, посебно код старијих, оних нижег образовања и жена са дијабетесом.

Кључне речи: дијабетес мелитус; квалитет живота, нездрави дани, полне разлике