Prevalence of depressive symptoms and association with sociodemographic factors among the general population in Serbia

Prevalencija simptoma depresije i povezanost sa socijalnodemografskim faktorima u opštoj populaciji u Srbiji

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Abstract

Background/Aim. Depression is a growing public health concern associated with disability, decreased quality of life, increased multimorbidity, and premature mortality. The aim of this study was to estimate the prevalence of depressive symptoms (DS) in the general population of Serbia and to analyze its association with sociodemographic factors. **Methods.** Data from the 2019 Serbian National Health Survey was analyzed (a sample of 12,406 respondents). The questionnaires used in this study were in accordance with the methodology of the European Health Interview Survey (EHIS) Wave 3. Patient Health Questionnaire eight-item depression (PHQ-8) scale was used to determine the prevalence of DS among the population aged ≥ 15 years. Multivariate logistic regression analyses (MLRA) were implemented to assess the association of the prevalence of DS with the sociodemographic characteristics of the population. **Results.** The prevalence of both mild (7.5% vs. 4.4%) and moderate/severe DS (2.6% vs. 1.5%) was higher among women than men and increased continuously with age (13.6% of adults aged ≥ 65 years had mild and 5.0% moderate/severe symptoms). The highest rates of moderate/severe DS were present in respondents from Vojvodina (2.7%), among those who lived without a partner (2.7%), the lower educated (4.4%), the poor (3.4%), those with inactive employment status (3.7%), and those with poor social support (6.6%). MLRA showed that the highest odds of DS were present among the respondents aged ≥ 65 years [odds ratio (OR) = 6.53; 95% confidence interval (CI): 6.37–6.69] in the Vojvodina region, particularly males (OR = 1.96; 95% CI: 1.89–2.04), respondents who lived without a partner (OR = 1.49; 95% CI: 1.47–1.51), the lower educated (OR = 2.27; 95% CI: 2.22–2.33), the poor (OR = 2.54; 95% CI: 2.49–2.58), as well as those with poor social support (OR = 3.71; 95% CI: 3.64–3.77). **Conclusion.** The prevalence of DS in the general population of Serbia was relatively low and requires further monitoring. Female gender, older age, living in the region of Vojvodina, life without a partner, socioeconomic disadvantages, as well as the lack of social support were identified as the main factors associated with the occurrence of DS.

Key words:
depression; prevalence; serbia; socioeconomic factors; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Depresija je rastući problem javnog zdravlja povezan sa invalidnošću, sniženim kvalitetom života, povećanim multimorbiditetom i preranom smrtnošću. Cilj rada bio je da se proceni prevalencija simptoma depresije (SD) u opštoj populaciji Srbije i da se analizira njena povezanost sa socijalnodemografskim faktorima. **Metode.** Analizirani su podaci Nacionalne studije istraživanja zdravlja stanovništva Srbije iz 2019. godine (na uzorku od 12 406 ispitanika). Upitnici korišćeni u tom istraživanju kreirani su u skladu sa metodologijom Evropskog istraživanja zdravlja – *European Health Interview Survey* (EHIS) *Wave 3*. Za procenu prevalencije SD među stanovništvom životnog doba ≥ 15 godina, kao instrument istraživanja primenjen je upitnik *Patient Health Questionnaire eight-item depression* (PHQ-8) *scale*. Za procenu povezanosti prevalencije SD sa socijalnodemografskim karakteristikama stanovništva korišćena je multivarijantna logistička regresiona analiza (MLRA). **Rezultati.** Prevalencija kako blagih (7,5% vs. 4,4%) tako i umerenih do teških SD (2,6% vs. 1,5%) bila je viša među ženama nego među muškarcima i kontinurano se povećavala sa godinama života (13,6% osoba starosti ≥ 65 godina imalo je blage, a 5,0% osoba umerene/teške simptome). Najvišu prevalenciju umerenih/teških SD imali su ispitanici iz Vojvodine (2,7%), oni koji žive bez partnera

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(2,7%), oni sa nižim nivoom obrazovanja (4,4%), siromašni ispitanici (3,4%), oni koji nemaju aktivno zaposlenje (3,7%) i oni sa slabom socijalnom podrškom (6,6%). Primenom MLRA pokazano je da su najveću šansu za pojavu SD imali ispitanici starosti ≥ 65 godina [*odds ratio* (OR) = 6,53; 95% *confidence interval* (CI): 6,37–6,69] u regionu Vojvodine, a posebno muškarci (OR = 1,96; 95% CI: 1,89–2,04), ispitanici koji žive bez partnera (OR = 1,49; 95% CI: 1,47–1,51), ispitanici sa nižim obrazovanjem (OR = 2,27; 95% CI: 2,22–2,33), siromašni ispitanici (OR = 2,54; 95% CI: 2,49–2,58), kao i oni sa slabom socijalnom podrškom

(OR = 3,71; 95% CI: 3,64–3,77). **Zaključak.** Prevalencija SD u opštoj populaciji u Srbiji je relativno niska i zahteva dalje praćenje. Kao glavni faktori udruženi sa pojavom SD prepoznati su ženski pol, starije životno doba, prebivalište u regionu Vojvodine, život bez partnera, slabije socijalnooekonomsko stanje, kao i nedostatak socijalne podrške.

Ključne reči:
depresija; prevalenca; srbija; socijalno-ekonomski faktori; ankete i upitnici.

Introduction

Depression is one of the most prevalent mental disorders and an increasingly concerning public health issue [1, 2]. Depression is associated with disability, decreased quality of life, increased multimorbidity, and consequently premature mortality [3–5]. According to the World Health Organization (WHO), depression is also a major contributor to suicide, with more than 700,000 cases annually [6].

Over 300 million people (4.4% of the world's population) worldwide suffer from depression, with the prevalence rising by 18.4% in the past decade [7]. The Global Burden of Disease Study indicated that the number of incident cases of depression worldwide has increased from 172 million in 1990 to 258 million in 2017, which is an increase of 50% [4].

The prevalence of depression shows large variation across countries – from 0.4% in Vietnam to 15.7% in Morocco [8], and across the European countries, it is between 2.6% in the Czech Republic and 10.3% in Iceland, with obvious gender differences for almost all countries [9]. The WHO indicates that depression affects women about 50% more often than men [6].

Numerous studies have shown that the prevalence of depression increases with age and is particularly high among middle-aged and elderly people [10–12]. The main factors associated with depressive disorders are female gender, poverty, unemployment, lack or loss of close social support, physical illness as well as problems caused by alcohol and drug use [1, 2, 7, 13]. The risk factors for depression include low self-esteem, conduct disorder, stressful life events such as childhood sexual abuse, work-related problems, financial problems, domestic violence, or unhappy relationships within a family [14, 15].

The strong association between socioeconomic factors and depressive disorders has been reported in many studies [16–18]. Lower socioeconomic status increases the risk of developing depressive symptoms (DS) and reduces the ability to manage stress; in addition, prolonged exposure to social stressors may result in higher DS [10]. The prevalence of depression varies over time, especially during extreme socioeconomic crises [19].

Depression manifests as a feeling of sadness, emptiness, or irritability, accompanied by physical and cognitive changes lasting at least two weeks, which significantly affects the individual's ability to function [20]. Symptoms of depression are recognized by the SIGECAPS mnemonic: Sleep disorders (increased or decreased sleep); Interest deficit (anhe-

donia); Guilt (hopelessness, worthlessness, regret); Energy deficit; Concentration deficit; Appetite disorder (decreased or increased); Psychomotor retardation or agitation; Suicidality [15]. Symptoms of depression can differ between men and women. Women are more likely to report physical illnesses such as headaches and gastrointestinal problems or to show emotional reactions such as feeling stressed and crying [15, 21]. Symptoms of depression in men may include aggression, anger, substance abuse, or risky behavior [21].

The WHO emphasizes the importance of including depressive disorders as a public health priority [7]. People who experience depression are often not correctly diagnosed. Although there are effective treatments for mental disorders, over 75% of people suffering from mental disorders do not receive adequate health care in low- and middle-income countries [6, 22]. Barriers to effective treatments for mental disorders include resource limitations, a lack of trained healthcare providers, and social stigma [6, 23]. Therefore, the implementation of screening for depression using a questionnaire is very important for early recognition, diagnosis, and effective treatment [15]. The aim of this study was to estimate the prevalence of DS in the general population of Serbia and to analyze its association with socio-demographic factors.

Methods

Study design and sampling

Data were obtained from the 2019 Serbian National Health Survey, carried out by the Statistical Office of the Republic of Serbia in collaboration with the Institute of Public Health of Serbia "Dr. Milan Jovanović Batut" and the Ministry of Health of the Republic of Serbia, with financial support from the Government of the Republic of Serbia and the European Union. The National Health Survey was carried out with the recommendations and guidelines of the European Health Interview Survey (EHIS) Wave 3 [24].

In order to ensure the representativeness of the data according to the national level, the type of settlements, and the region level (Belgrade, Vojvodina, Šumadija and Western Serbia, South and Eastern Serbia), a two-stage sample stratification was performed. For the first sampling stage, 600 census circles were included, while in the second stage, 10 households were randomly selected within each census circle. Out of 6,335 selected households, 5,114 gave

consent to participate in the research, resulting in a response rate of 80.7%. Within the selected households, 13,589 members aged 15 years and above were registered, of which 13,178 were interviewed (response rate of 97.0%) [25]. This study included a final sample of 12,406 respondents who completed the questionnaires (6,024 males and 6,382 females) (Figure 1).

The survey protocol included the following questionnaires: self-administered, face-to-face, and one related to households, which collected a large number of data on the health and healthcare use of the population of Serbia. The ethical aspect of the survey protocol was in accordance with the international ethical principles, i.e., the Declaration of Helsinki of the World Medical Association, which is the ethical principle for medical research involving human subjects, and with the General Data Protection Regulation, the Law on Official Statistics, and the Law on Personal Data Protection, along with other relevant legislation in this field in the Republic of Serbia. The research respondents were given written information about the purpose of the study, voluntary participation, secrecy and confidentiality of the information obtained, the researcher's contact details, etc., after which they gave written consent to participate. To ensure the anonymity of the respondents, all personal data were replaced with a code. All data used in this study were presented in aggregate form. The use of data was approved by the Institute for Public Health of Serbia "Dr. Milan Jovanović Batut" following the Agreement on the Exchange of Data and Indicators in the field of Demography and Public Health, as well as by the Ethics Committee of the Institute for Public Health of Serbia (No 7703/2, from June, 2023).

Study variables

An internationally established tool, the Patient Health Questionnaire eight-item (PHQ-8) depression scale, was applied for the assessment of DS in the general population. The PHQ-8 is a validated screening and severity measure of symptoms of depressive disorders [20, 26] based on the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) criteria [15, 17, 20, 26], which consists of eight ques-

tions referring to different symptoms: a decrease of interest or pleasure in activities; feeling downhearted or without hope; sleep problems; fatigue or loss of energy; reduced or increased appetite; feelings of worthlessness or sense of failure; troubles or impossibility of concentration in various activities and psychomotor agitation or retardation [26]. Participants were asked to rate the frequency of their health symptoms over the past two weeks on a scale from 0 – "not at all" to 3 – "nearly every day". A total score of 0 to 4 represents no significant DS. A total score of 5 to 9 represents mild DS, 10 to 14 moderate, 15 to 19 moderately severe, and 20 to 24 severe DS [26]. Following recommendations, a cut-off value (score ≥ 10) was applied to determine current depression [20, 26].

The following sociodemographic variables were analyzed in the study: gender, age, geographic region, marital status, education level, Demographic and Health Survey Wealth Index [27], and employment status (students, housewives, residents in retirement, and those unable to work were included within the inactive category). The Wealth Index included many variables related to examinees' assets that could give a picture of the socioeconomic status, such as the size and characteristics of housing, type of water supply, sanitation, heating, household appliances, owning a car, a computer, access to the internet, etc. Through a further statistical procedure, each household asset was assigned a weight, or factor score, generated through factor analysis. After standardizing the scores in relation to the normal distribution, each household received its total score (quintiles). According to the Wealth Index, respondents were divided into five socioeconomic categories or quintiles (from the poorest – the first quintile, to the richest – the fifth quintile). In the final analysis, respondents were classified into three socioeconomic groups or terciles: rich (richer and the richest class), middle, and poor (poorer and the poorest).

The level of social support was assessed using the Oslo 3-item Social Support Scale (OSS-3) with three questions: "How many people are so close to you that you can count on them when you have serious personal problems?" points ranging from 1 ("none") to 4 ("6 or more"); "How many people are really interested in you, in what you are doing, or
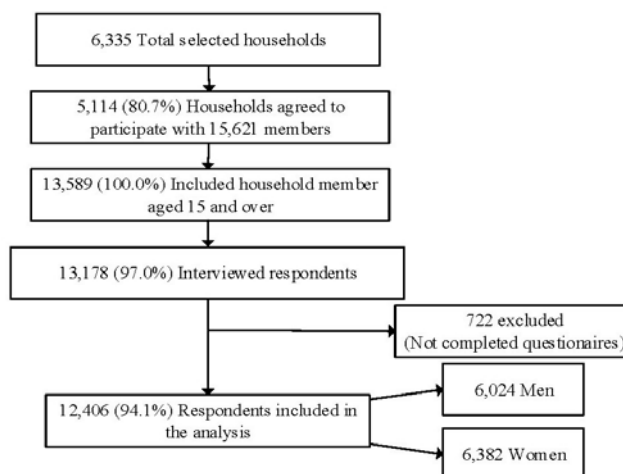

Fig. 1 – Study sample and response rate flow diagram.

in what is going on in your life?" ranging from 1 ("not interested at all") to 5 ("very interested"); "How easy is it to get practical help from neighbors if you have a need for it?" points range from 1 ("very difficult") to 5 ("very easy"). According to the total score, support was ranked on three levels: poor social support (3–8 points), moderate social support (9–11 points), and strong social support (12–14 points) [28].

Statistical analysis

Data from the study were analyzed using descriptive statistics, the Chi-square test for testing differences in proportions between population groups, and multiple logistic regressions. Analyses were performed on the entire sample of respondents and stratified by gender.

A multivariate logistic regression was implemented to assess the association of current DS with sociodemographic factors by calculating the odds ratio (OR) and 95% confidence intervals (CI). The dependent variable (DS) was transformed into dichotomous variables (0 – no DS; 1 – DS, the PHQ-8 score ≥ 10). All independent variables that were significantly associated with dependent variable in univariate

analysis were included in multivariate analysis. The final multivariate logistic regression model included the following independent variables: age, region, marital status, education level, Wealth Index, employment status, and social support. The Hosmer-Lemeshow goodness-of-fit test and Nagelkerke R-Square test were used to assess the fit of the logistic regression model. Multicollinearity among independent variables was examined using the Tolerance and Variance Inflation Factor test.

In order to achieve significant statistical reliability of the data in relation to the number of inhabitants of the Republic of Serbia, the research data were weighted. The significance level of $p < 0.05$ was considered as the minimum probability. All analyses were conducted using the SPSS 22.0 statistical software package.

Results

Table 1 shows the sociodemographic characteristics of the study sample and the prevalence of DS assessed by the PHQ-8. The prevalence of both mild (7.5% vs. 4.4%) and moderate/severe DS (2.6% vs. 1.5%) was higher among

Table 1

Sociodemographic characteristics of the respondents and prevalence of depressive symptoms (DS) according to the severity of symptoms

Variable	Total	No DS	Mild DS (PHQ-8 score 5–9)	Moderate to severe DS (PHQ-8 score ≥ 10)	p-value*
Gender					
men	6,024	5,642 (94.1)	288 (4.4)	94 (1.5)	< 0.001
women	6,382	5,690 (89.9)	516 (7.5)	176 (2.6)	
total	12,406	11,332 (91.9)	804 (6.0)	270 (2.1)	
Age group (years)					
15–39	3,753	3,670 (97.7)	68 (1.9)	15 (0.5)	< 0.001
40–64	5,160	4,797 (93.3)	271 (5.0)	92 (1.7)	
65+	3,493	2,865 (81.5)	465 (13.6)	163 (5.0)	
Regions					
Belgrade	2,915	2,753 (94.8)	122 (3.9)	40 (1.3)	< 0.001
Vojvodina	2,733	2,453 (90.8)	197 (6.5)	83 (2.7)	
Šumadija and West Serbia	4,052	3,724 (92.4)	255 (5.9)	73 (1.7)	
South and East Serbia	2,706	2,402 (89.7)	230 (7.8)	74 (2.5)	
Marital status					
married/living with a partner	7,528	6,962 (93.3)	426 (5.1)	140 (1.6)	< 0.001
unmarried/divorced/ separated/widowed	4,856	4,349 (90.1)	378 (7.3)	129 (2.7)	
Education					
university degree	2,363	2,266 (96.2)	78 (3.1)	19 (0.7)	< 0.001
secondary school	6,779	6,363 (94.2)	307 (4.3)	109 (1.5)	
primary school	3,261	2,701 (83.4)	419 (12.2)	141 (4.4)	
Wealth index					
rich	4,816	4,563 (95.2)	203 (3.8)	50 (1.0)	< 0.001
middle	2,530	2,330 (92.8)	154 (5.6)	46 (1.6)	
poor	5,060	4,439 (88.2)	447 (8.4)	174 (3.4)	
Employment status					
employed	4,449	4,323 (97.2)	101 (2.3)	25 (0.5)	< 0.001
unemployed	2,237	2,089 (93.7)	111 (4.7)	37 (1.6)	
inactive	5,702	4,904 (86.3)	591 (10.0)	207 (3.7)	
Social support (OSS-3)					
strong support	3,730	3,530 (95.0)	151 (3.7)	49 (1.3)	< 0.001
moderate support	7,114	6,521 (92.3)	469 (6.1)	124 (1.6)	
poor support	1,289	1,039 (81.9)	162 (11.5)	88 (6.6)	

* – Chi-squared test; PHQ-8 – Patient Health Questionnaire eight-item depression scale; OSS-3 – Oslo 3 item Social Support Scale; $p < 0.05$ was considered as a minimum probability. Values are given as numbers (weighted percentages).

Table 2

Prevalence of depressive symptoms (DS) according to sociodemographic characteristics and gender

Variable	Men		Women		p-value*
	total	DS, PHQ-8 score ≥ 10	total	DS, PHQ-8 score ≥ 10	
	n (%)	n (weighted %)	n (%)	n (weighted %)	
Age group (years)					
15–39	1,940 (36.5)	7 (0.3)	1,813 (32.8)	8 (0.6)	< 0.001
40–64	2,506 (41.7)	40 (1.5)	2,654 (40.8)	52 (1.9)	
65+	1,578 (21.8)	47 (3.2)	1,915 (26.4)	116 (6.4)	
Regions					
Belgrade	1,369 (23.9)	9 (0.6)	1,546 (25.1)	31 (2.0)	< 0.001
Vojvodina	1,315 (25.9)	30 (2.0)	1,418 (26.1)	53 (3.4)	
Šumadija and West Serbia	2,013 (28.4)	27 (1.3)	2,039 (27.7)	46 (2.2)	
South and East Serbia	1,327 (21.8)	28 (1.9)	1,379 (21.1)	46 (3.1)	
Marital status					
married/living with a partner	3,757 (61.0)	59 (1.4)	3,771 (56.8)	81 (1.9)	< 0.001
unmarried/divorced/ separated/widowed	2,261 (39.0)	36 (1.6)	2,596 (43.2)	94 (3.5)	
Education					
university degree	1,151 (20.9)	8 (0.6)	1,212 (21.4)	11 (0.8)	< 0.001
secondary school	3,571 (59.0)	42 (1.1)	3,208 (50.5)	67 (2.0)	
primary school	1,300 (20.1)	44 (3.3)	1,961 (28.2)	97 (5.1)	
Wealth index					
rich	2,370 (41.2)	11 (0.4)	2,446 (40.1)	39 (1.5)	< 0.001
middle	1,220 (17.9)	14 (1.1)	1310 (19.9)	32 (2.2)	
poor	2,434 (39.0)	69 (2.8)	2,626 (39.9)	105 (4.0)	
Employment status					
employed	2,457 (44.8)	12 (0.4)	1,992 (34.9)	13 (0.7)	< 0.001
unemployed	1,149 (19.6)	21 (1.9)	1,088 (17.3)	16 (1.3)	
inactive	2,411 (35.5)	61 (2.5)	3,291 (47.7)	146 (4.5)	
Social support (OSS-3)					
strong support	1,840 (31.0)	13 (0.6)	1,890 (30.0)	36 (1.9)	< 0.001
moderate support	3,454 (58.4)	43 (1.1)	3,660 (59.1)	81 (2.1)	
poor support	605 (10.6)	34 (5.5)	684 (10.9)	54 (7.7)	

* – Chi-squared test; *p* < 0.05 was considered as a minimum probability. For abbreviations, see Table 1.

women than men. The frequency of DS continuously increased with age; 13.6% of adults aged ≥ 65 years had mild DS, and 5.0% had moderate/severe DS. Observed by region, respondents from South and East Serbia and Vojvodina had the highest percentage of depressed persons. Respondents who lived without a partner (unmarried/separated/divorced or widowed) had higher rates of both severity levels of DS than those married/living with a partner (mild 7.3% vs. 5.1%; moderate/severe 2.7% vs. 1.6%). The prevalence of DS significantly increases with a decrease in socioeconomic status and social support. The highest rate of DS is seen among those with the lowest level of education (12.2% mild and 4.4% moderate/severe) and Wealth Index (8.4% mild and 3.4% moderate/severe), as well as in the category of inactive employment status (10.0% mild and 3.7% moderate/severe) and those with poor social support (11.5% mild and 6.6% moderate/severe DS).

Table 2 shows gender differences in the prevalence of moderate/severe DS (PHQ-8 score ≥ 10) in relation to sociodemographic characteristics of respondents. Among women, the prevalence of DS ranged from 0.6% in the age group 15–39 to 6.4% in the age group ≥ 65 years. The same pattern was in males, but the highest value was 3.2% in the oldest group. According to marital status, the highest rate of DS was among the category of unmarried/separated/divorced

or widowed, in both men and women, with the fact that it is higher among women (3.5% vs. 1.6%). In relation to socioeconomic status, the prevalence of DS showed the same distribution in both genders, and it was the highest among the lowest educated, the poor, and those who belong to the inactive category of employment status. Women with poor social support had a four times higher prevalence (7.7% vs. 1.9%), and men had a nine times higher prevalence of DS (5.5% vs. 0.6%) than those with strong social support.

Multivariate analyses showed that age emerged as a significant factor associated with DS (PHQ-8 score≥10). The odds of DS increased with age; the highest was in the category of patients aged ≥ 65 years (women – OR = 7.31; 95% CI: 7.13–7.51; men – OR = 6.16; 95% CI: 5.89–6.44). Respondents in the Vojvodina region had the highest odds of having DS (OR = 1.51; 95% CI: 1.48–1.54), particularly males (OR = 1.96; 95% CI: 1.89–2.04), compared to those in the capital region. Marital status is significantly associated with DS (OR = 1.49; 95% CI: 1.47–1.51). In both genders, respondents who lived without a partner were more likely to have DS compared to married/living with a partner. Respondents with primary education had higher odds of having DS compared to highly educated (women – OR = 2.35; 95% CI: 2.28–2.43; men – OR = 1.73; 95% CI: 1.66–1.80), as well as poor compared to the rich (women – OR = 1.89; 95%

Table 3

Association between sociodemographic factors and depressive symptoms (PHQ-8 score ≥ 10)

Variable	Total		Men		Women	
	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*-value
Age group (years)						
15–39	1 (ref.)		1 (ref.)		1 (ref.)	
40–64	4.54 (4.43–4.65)	< 0.001	3.70 (4.90–5.31)	< 0.001	5.10 (4.90–5.31)	< 0.001
65+	6.53 (6.37–6.69)	< 0.001	6.16 (5.89–6.44)	< 0.001	7.31 (7.13–7.51)	< 0.001
Regions						
Belgrade	1 (ref.)		1 (ref.)		1 (ref.)	
Vojvodina	1.51 (1.48–1.54)	< 0.001	1.96 (1.89–2.04)	< 0.001	1.37 (1.34–1.41)	< 0.001
Šumadija and West Serbia	0.88 (0.87–0.90)	< 0.001	1.04 (1.00–1.08)	0.078	0.88 (0.85–0.90)	< 0.061
South and East Serbia	1.04 (1.02–1.06)	< 0.001	1.05 (1.01–1.09)	0.016	1.13 (1.10–1.16)	< 0.001
Marital status						
married/living with a partner	1 (ref.)		1 (ref.)		1 (ref.)	
unmarried/divorced/ separated/widowed	1.49 (1.47–1.51)	< 0.001	1.29 (1.26–1.32)	< 0.001	1.38 (1.35–1.40)	< 0.001
Education						
university degree	1 (ref.)		1 (ref.)		1 (ref.)	
secondary school	1.47 (1.44–1.51)	< 0.001	1.05 (1.01–1.10)	0.006	1.72 (1.67–1.78)	< 0.001
primary school	2.27 (2.22–2.33)	< 0.001	1.73 (1.66–1.80)	< 0.001	2.35 (2.28–2.43)	< 0.001
Wealth index						
rich	1 (ref.)		1 (ref.)		1 (ref.)	
middle	1.35 (1.33–1.38)	< 0.001	1.14 (1.12–1.16)	< 0.001	1.08 (1.05–1.10)	<0.001
poor	2.54 (2.49–2.58)	< 0.001	1.73 (1.51–1.95)	< 0.001	1.89 (1.85–1.93)	<0.001
Employment status						
employed	1 (ref.)		1 (ref.)		1 (ref.)	
unemployed	1.52 (1.48–1.56)	< 0.001	1.75 (1.68–1.81)	< 0.001	1.14 (1.10–1.18)	< 0.001
inactive	2.63 (2.57–2.69)	< 0.001	2.53 (2.44–2.63)	< 0.001	2.37 (2.31–2.44)	< 0.001
Social support (OSS-3)						
strong support	1 (ref.)		1 (ref.)		1 (ref.)	
moderate support	1.09 (1.07–1.11)	< 0.001	1.65 (1.60–1.71)	< 0.001	0.98 (0.91–0.99)	< 0.001
poor support	3.71 (3.64–3.77)	< 0.001	3.37 (3.15–3.59)	< 0.001	2.97 (2.91–3.03)	< 0.001

ref. – reference category; Odds ratio (OR) with 95% confidence interval (CI) were calculated using a multivariate logistic regression model stratified by gender. *p* < 0.05 was considered as a minimum probability. For other abbreviations, see Table 1.

CI: 1.85–1.93; men – OR = 1.73; 95% CI: 1.51–1.95). For both genders, the inactive category of employment status had a more than two times higher chance of having DS than the employed, while being unemployed had a more significant impact on men (OR=1.75; 95% CI: 1.68–1.81) than on women (OR = 1.14; 95% CI: 1.10–1.18). The multivariate analyses suggested that poor social support was significantly associated with DS, with the fact that the odds were higher in men (OR = 3.37; 95% CI: 3.15–3.59) than in women (OR = 2.97; 95% CI: 2.91–3.03) (Table 3).

Discussion

Numerous population-based studies conducted worldwide have shown that the prevalence of depression varies across countries from 0.4 to 15.7%, even when estimated using comparable methods. The prevalence of DS oscillates even within the same countries and populations depending on the time and circumstances in which the research was conducted [8, 12, 19]. A study that included data from 27 European countries showed that the overall prevalence of the current depressive disorder among the general population aged 15 and above in Europe is high (PHQ-8 ≥10; 6.38%), and it varies widely between European countries, from 2.6% in the Czech Republic and Slovakia to 10.3% in Iceland. The high-

est prevalences have also been seen in countries with high economic development (e.g., Luxemburg 10.0%, Germany 9.2%, and Sweden 8.8%) [9]. The National Health Interview Survey of the United States reported that the prevalence of DS in adults aged 18 and above was 7.0% (PHQ-8 ≥ 10) [20]. According to the results of our study, which are consistent with the report of the Statistical Office of the Republic of Serbia [25], 2.1% of the general population in Serbia had DS, which is a lower value compared to the previous Health Survey from 2013, when the same questionnaire was used, and the prevalence was 4.1% [29]. The study conducted in 2021 in Serbia on COVID-19-related stressors, mental disorders, and depressive and anxiety symptoms in a representative sample of the adult population did not show a significant increase in mental disorders compared to data before the pandemic. The prevalence value in this research for mood disorders (major depressive episodes and suicidality measured by PHQ-9) was 4.6% [30].

These large variations in prevalence might be explained by methodology and the diagnostic instruments used [17, 31], or by differences in demographic (e.g., variability in the population's age structure) and cultural characteristics within the populations as well as socioeconomic factors (e.g., the standard of living, provision of health-care, etc.) [8, 16, 32, 33]. Another possible explanation refers to differences in mental health

literacy [12, 23]. Various levels of mental health knowledge are associated with differences in willingness to express mental health problems, which can influence the answers given by the respondents [34, 35]. Improved knowledge and understanding of the symptoms of mental disorders may also lead to increased sensitivity to DS [12]. Mental health literacy plays two major roles. Firstly, it aids the ability of the person affected to recognize a mental disorder and seek appropriate help. Secondly, it enables family members and close friends to spot signs of a disorder and get an affected person the professional help they need [23]. Therefore, examining mental health literacy would contribute to clarifying the circumstances of the existing prevalence in Serbia and may provide guidelines for improving mental health knowledge [23].

Failure to recognize depression and lack of treatment can lead to suicide [36]. Although the suicide rate in Serbia has continued to decrease in the last decade (13.0 *per* 100,000 inhabitants in 2020), nearly 1,000 people still die by suicide annually, with male fatalities being three times higher than female [37].

The prevalence of DS in our research increases continuously with age, which is confirmed by other studies [13, 38]. Reports indicated that the incidence of depression was particularly high among middle-aged and elderly people and became a serious public health issue [10, 11, 39]. Numerous factors are associated with a higher prevalence of DS among older people, such as the reduction of cognitive functions, multimorbidity, limited mobility, and decline in function in the activity of daily living and sensory function, as well as material deprivation, loss of independence, isolation, loss of social support, widowhood, and living alone [11, 38, 40, 41]. Regions of Vojvodina and South and East Serbia had the highest percentage of depressed persons. However, according to multivariate analysis, respondents in the Vojvodina region had the highest odds of DS, particularly males (OR = 1.96; 95% CI: 1.89–2.04). The 2013 Health Survey in Serbia also revealed a higher prevalence of depressive episodes among the population of Vojvodina (PHQ-8 ≥ 10; 4.8%) compared to the national average rate (4.1%) [42]. These regional differences, as well as differences between countries, mainly stem from differences in the demographic structure of the population but also from other cultural, social, and economic characteristics, which require a special analysis.

In our study, women more often than men experienced DS of all levels of severity, which is in line with previous research [3, 9, 12, 20]. Various studies have shown obvious gender differences in depressive disorders, showing that women have about twice the chance of experiencing a depressive disorder during their lifetime [13, 19]. Gender-based variations in prevalence were observed in all European countries except Finland and Croatia. The largest gender gap of depressive disorder was found in Iceland (men 6.7% vs. women 14.0%) and Portugal (men 4.5% vs. women 13.2%), where the prevalence in women was twice as high as in men [9]. The courses for these gender differences include biological and psychological vulnerability [12], different life roles, and risk factors on an individual level (adverse events in youth, interpersonal violence) and environmental level (socioeconomic and gender inequities) [3, 42]. On the other hand, women tend to be more open about expressing the symptoms they feel, complain more often about psychosomatic and emotional instability, and use health services more often than men [21, 43]. Research indicates that one of the reasons for the different prevalence is the fact that depression among men often goes unnoticed, undiagnosed, insufficiently registered, and with a lack of treatment [18, 42].

The multivariate regression model confirmed an association between depression and marital status in both genders. These results are consistent with other studies that point out that married people have lower rates of depressive disorders but also numerous other health benefits, as well as emotional, financial, and social support and the possibility of choosing healthy lifestyles compared to those who have never been married or have been divorced/separated or widowed [16–19, 44]. A multilevel study, which included data from 53 countries, has shown that, regardless of the economic development of the country, in all countries, divorced/separated and widowed have a higher risk of depression [8].

This research and numerous other studies indicate that depressive disorders are most common among people with socioeconomic disadvantages [1, 10, 17, 18]. Our study showed that DS is associated with low education and material status, inactive employment status, and unemployment in both genders. A low level of education is linked to poor health literacy, limited use of preventive health care, unhealthy lifestyles leading to chronic diseases, and comorbid depression [18]. In contrast, higher education provides better employment opportunities and social status, which promotes better interpersonal connections and social networks to reduce the incidence of DS [11].

In our research, respondents with poor social support have an almost four times higher chance of DS compared to those with strong support. A longitudinal study conducted for over seven years in China showed that social support positively reduced the risk of developing elevated DS [10]. Support from family and community enables older people better access to information, resources, and knowledge, making it easier for them to deal with everyday stress [10, 13, 45]. A meta-analysis that included 100 studies revealed that spousal support was the most reliable source of social support in protecting adults from depression (100% of studies showed a significant association), followed by support from family (88% of studies), friends (73% of studies) and children (67% of studies) [46].

Many individuals suffer from undiagnosed depressive disorders, indicating problems accessing mental health services either due to stigma against mentally ill people or restrictions in access to health care [6, 16, 23]. Therefore, to target interventions to prevent and recognize these disorders, it is necessary to carry out screening for depression as well as periodic assessments of the prevalence based on population-representative samples [19]. In Serbia, screening for depression is conducted by a primary health care physician for persons aged ≥ 18 years [47], using the PHQ-9 questionnaire, which consists of nine questions, including an additional question about suicide ideation [36]. The PHQ-9 questionnaire is widely

used as a verified tool for screening for depression and suicidality in the primary care setting where, after suspicion of depression and suicidality, patients are referred for further psychiatric examination. Many suicide cases in the previous year have visited health institutions and reported their physical problems without indicating suicidal intentions if they were not asked directly, which is why it is necessary to use a depression test as a suicide risk detection tool [36]. Although screening for depression started in Serbia in 2013, adequate coverage has not yet been achieved. According to the latest published data from 2018, only 2% of the population aged 18 and above was covered by the screening, instead of the planned 8% [47, 48]. Moreover, preventive measures should be aimed at improving mental health literacy.

This study has limitations as it is a cross-sectional analysis, which may reduce the ability to assume direct causal relations, and an instrument, the PHQ-8, is not a clinical tool for diagnosing depression. However, numerous studies indicate that the PHQ-8 questionnaire is a valid and reliable tool for examining the prevalence of DS in population-based studies [9, 12, 17, 20, 26]. For these reasons, this instrument is most commonly used in evaluating the prevalence of DS in the general population in many countries within National Health Surveys following the EHIS Wave 3 methodology and the previous EHIS Wave 2 and was also standardized for use in the United States, enabling data comparability [9]. The PHQ-9 questionnaire contains the same set of questions as the PHQ-8 but with an additional question about suicidal ideation or self-harm. The PHQ-9 is considered less suitable in these studies because it is not conducted by health professionals but by interviewers who are not trained as mental health professionals [49]. Despite this limitation, we were able to analyze the prevalence of DS using data from a nationally representative sample.

Conclusion

The prevalence of DS in the general population in Serbia shows relatively lower values than previous research in other countries but still poses a significant public health challenge and requires further monitoring. The study highlights a significant association of DS with sociodemographic factors, identifying the main associated factors: female gender, older age, region of Vojvodina, life without a partner, educational and socioeconomic disadvantages, and lack of social support. The results of the study emphasize the need for the continuous implementation of screening for depression in primary health care and the development of public health programs focused on the prevention and treatment of depressive disorders, considering the identified associated factors.

R E F E R E N C E S

1. *Domènech-Abella J, Mundó J, Leonardi M, Chatterji S, Tobiasz-Adamczyk B, Koskinen S,* et al. The association between socio-economic status and depression among older adults in Finland, Poland and Spain: A comparative cross-sectional study of distinct measures and pathways. J Affect Disord 2018; 241: 311–8.
2. *Roohafza HR, Afshar H, Keshteli AH, Mohammadi N, Feizi A, Taslimi M,* et al. What's the role of perceived social support and coping styles in depression and anxiety? J Res Med Sci 2014; 19(10): 944–9.
3. *Serrano D, Martí-Lluch R, Cárdenas M, Solanas P, Marrugat J, Vilalta-Franch J,* et al. Gender analysis of the frequency and course of depressive disorders and relationship with personality traits in general population: A prospective cohort study. J Affect Disord 2022; 302: 241–8.
4. *Liu Q, He H, Yang J, Feng X, Zhao F, Lyu J.* Changes in the global burden of depression from 1990 to 2017: findings from the Global Burden of Disease study. J Psychiatr Res 2020; 126: 134–40.
5. *Archer G, Kuh D, Hotopf M, Stafford M, Richards M.* Association between lifetime affective symptoms and premature mortality. JAMA Psychiatry 2020; 77(8): 806–13.
6. *World Health Organization.* Depressive disorder (depression). Depression fact sheet [Internet]. 2023 [cited 2023 Jun; accessed 2024 Jan 24]. Available from: https://www.who.int/news-room/fact-sheets/detail/depression.
7. *World Health Organization.* Depression and other common mental disorders: Global Health Estimates [Internet]. Geneva: World Health Organization; 2017 [cited on 2024 Jan 26] 24 p.

Available from: https://www.afro.who.int/sites/default/files/2017-05/WHO-MSD-MER-2017.2-eng.pdf
8. *Rai D, Zitko P, Jones K, Lynch J, Araya R.* Country- and individual-level socioeconomic determinants of depression: multilevel cross-national comparison. Br J Psychiatry 2013; 202(3): 195–203.
9. *Arias-de la Torre J, Vilagut G, Ronaldson A, Serrano-Blanco A, Martín V, Peters M,* et al. Prevalence and variability of current depressive disorder in 27 European countries: a population-based study. Lancet Public Health 2021; 6(10): e729–38.
10. *Zhou S, Gao L, Liu F, Tian W, Jin Y, Zheng ZJ.* Socioeconomic status and depressive symptoms in older people with the mediation role of social support: A population-based longitudinal study. Int J Methods Psychiatr Res 2021; 30(4): e1894.
11. *Radevic S, Djonovic N, Mihailovic N, Simic Vukomanovic I, Janicijevic K, Sekulic M,* et al. Socio-medical aspects of depression among elderly adults in Serbia. Ser J Exp Clin Res 2019; 20(4): 327–36.
12. *Hapke U, Cohrdes C, Nübel J.* Depressive symptoms in a European comparison - Results from the European Health Interview Survey (EHIS) 2. J Health Monit 2019; 4(4): 57–65.
13. *Handing EP, Strobl C, Jiao Y, Feliciano L, Aichele S.* Predictors of depression among middle-aged and older men and women in Europe: A machine learning approach. Lancet Reg Health Eur 2022; 18: 100391.
14. *Mijatović Jovanović V, Čanković S, Milijašević D, Ukropina S, Jovanović M, Čanković D.* Health consequences of domestic violence against women in Serbia. Vojnosanitet Pregl 2020; 77 (1): 14–21.

15. *Maurer DM, Raymond TJ, Davis BN.* Depression: Screening and Diagnosis. Am Fam Physician 2018; Oct 15; 98(8): 508–15.

16. *Abdullatif M, Farooq S, Altheeb A, Rishmawi F, Jaradat H, Alabady K.* Prevalence of Depressive Disorders and Associated Factors among Adult Population of Dubai 2019. Dubai Med J 2021; 4(4): 291–300.

17. *Arias-de la Torre J, Vilagut G, Serrano-Blanco A, Martín V, Molina AJ, Valderas JM,* et al. Accuracy of Self-Reported Items for the Screening of Depression in the General Population. Int J Environ Res Public Health 2020; 17(21): 7955.

18. *Chae WR, Schienkiewitz A, Du Y, Hapke U, Otte C, Michalski N.* Comorbid depression and obesity among adults in Germany: Effects of age, sex, and socioeconomic status. J Affect Disord 2022; 299: 383–92.

19. *Arias-de la Torre J, Vilagut G, Martín V, Molina AJ, Alonso J.* Prevalence of major depressive disorder and association with personal and socio-economic factors. Results for Spain of the European Health Interview Survey 2014-2015. J Affect Disord 2018; 239: 203–7.

20. *Villarroel MA, Terlizzi EP.* Symptoms of Depression Among Adults: United States, 2019. NCHS Data Brief 2020; (379): 1–8.

21. *Martin LA, Neighbors HW, Griffith DM.* The experience of symptoms of depression in men vs women: Analysis of the National Comorbidity Survey Replication. JAMA Psychiatry 2013; 70(10): 1100–6.

22. *Basualdo-Meléndez GW, Hernández-Vásquez A, Barón-Lozada FA, Vargas-Fernández R.* Prevalence of depression and depressive symptoms at high altitudes: A systematic review and meta-analysis. J Affect Disord 2022; 317: 388–96.

23. *Milačić-Vidojević I, Čolić M, Drašković B.* Knowledge of and attitudes to major depressive disorder and its treatment in a sample of the general population in Serbia. Srp Arh Celok Lek. 2020; 148(1–2): 94–9.

24. *Eurostat.* European Health Interview Survey – EHIS wave 3 - Methodological manual. Precision requirements - Annex 2 [Internet]. Luxembourg: Publications Office of the European Union; 2018 [cited 2024 Jan 26]. Available from: https://ec.europa.eu/eurostat/documents/3859598/8762193/KS-02-18-240-EN-N.pdf/5fa53ed4-4367-41c4-b3f5-260ced9ff2f6

25. *EU for Development of Statistics in Serbia; European Health Interview Survey (EHIS).* The 2019 Serbian National Health Survey [Internet]. Belgrade: OMNIA BGD; 2021 [cited on 2024 Jan 26] 136 p. Available from: https://publikacije.stat.gov.rs/G2021/pdfE/G20216003.pdf

26. *Kroenke K, Strine TW, Spitzer RL, Williams JB, Berry JT, Mokdad AH.* The PHQ-8 as a measure of current depression in the general population. J Affect Disord 2009; 114(1–3): 163–73.

27. *Rutstein SO, Johnson K.* DHS Comparative Reports No. 6. The DHS Wealth Index. Calverton, Maryland: ORC Macro; 2004. [cited 2024 Jan 26]. Available from: https://dhsprogram.com/pubs/pdf/CR6/CR6.pdf

28. *Bøen H, Dalgard OS, Bjertness E.* The importance of social support in the associations between psychological distress and somatic health problems and socio-economic factors among older adults living at home: a cross sectional study. BMC Geriatr 2012; 12: 27.

29. *Institute of Public Health of Serbia "Dr. Milan Jovanović Batut".* Results of the National Health Survey of the Republic of Serbia, 2013. Belgrade; 2014 [cited on 2024 Jan 26]. 104. p. Available from: https://www.batut.org.rs/download/publikacije/2013SerbiaHealthSurvey.pdf

30. *Marić NP, Lazarević LJB, Priebe S, Mihić LJ, Pejović-Milovančević M, Terzić-Šupić Z,* et al. Covid-19-related stressors, mental disorders, depressive and anxiety symptoms: a cross-sectional, nationally-representative, face-to-face survey in Serbia. Epidemiol Psychiatr Sci 2022; 31: e36.

31. *Arias de la Torre J, Vilagut G, Ronaldson A, Dregan A, Ricci-Cabello I, Hatch SL,* et al. Prevalence and age patterns of depression in the United Kingdom. A population-based study. J Affect Disord 2021; 279: 164–72.

32. *Lim GY, Tam WW, Lu Y, Ho CS, Zhang MW, Ho RC.* Prevalence of depression in the community from 30 countries between 1994 and 2014. Sci Rep 2018; 8(1): 2861. Erratum in: Sci Rep 2022; 12(1): 14856.

33. *Buffel V, Van de Velde S, Bracke P.* The mental health consequences of the economic crisis in Europe among the employed, the unemployed, and the non-employed. Soc Sci Res 2015; 54: 263–88.

34. *Tomczyk S, Muehlan H, Freitag S, Stolzenburg S, Schomerus G, Schmidt S.* Is knowledge "half the battle"? The role of depression literacy in help-seeking among a non-clinical sample of adults with currently untreated mental health problems. J Affect Disord 2018; 238: 289–96.

35. *Kim JE, Saw A, Zane N.* The influence of psychological symptoms on mental health literacy of college students. Am J Orthopsychiatry 2015; 85(6): 620–30.

36. *Kim S, Lee HK, Lee K.* Which PHQ-9 Items Can Effectively Screen for Suicide? Machine Learning Approaches. Int J Environ Res Public Health 2021; 18(7): 3339.

37. *Dedić JG, Tepšić Ostojić V.* Gender differences in suicide in Serbia within the period 2016–2020. Vojnosanit Pregl 2023; 80(1): 33–40.

38. *Lee SL, Pearce E, Ajnakina O, Johnson S, Lewis G, Mann F,* et al. The association between loneliness and depressive symptoms among adults aged 50 years and older: a 12-year population-based cohort study. Lancet Psychiatry 2021; 8(1): 48–57.

39. *Li A, Wang D, Lin S, Chu M, Huang S, Lee CY,* et al. Depression and Life Satisfaction Among Middle-Aged and Older Adults: Mediation Effect of Functional Disability. Front Psychol 2021; 12: 755220.

40. *Wiels W, Baeken C, Engelborghs S.* Depressive Symptoms in the Elderly-An Early Symptom of Dementia? A Systematic Review. Front Pharmacol 2020; 11: 34.

41. *Srivastava S, Debnath P, Shri N, Muhammad T.* The association of widowhood and living alone with depression among older adults in India. Sci Rep 2021; 11(1): 21641.

42. *Harhaji S.* Socio-medical aspects of depressive disorders in Vojvodina [Ph.D. thesis]. Novi Sad, SRB: Medical Faculty; 2016. (Serbian)

43. *Nogueira EL, Rubin LL, Giacobbo Sde S, Gomes I, Cataldo Neto A.* Screening for depressive symptoms in older adults in the Family Health Strategy, Porto Alegre, Brazil. Rev Saude Publica 2014; 48(3): 368–77.

44. *Kim H, Kwon S, Hong S, Lee S.* Health behaviors influencing depressive symptoms in older Koreans living alone: secondary data analysis of the 2014 Korean longitudinal study of aging. BMC Geriatr 2018; 18(1): 186.

45. *Wang J, Zou R, Wu N, Fu H, He Y, Crawford P,* et al. Depressive symptoms, social support, and health-related quality of life: A community-based study in Shanghai, China. Compr Psychiatry 2022; 113: 152292.

46. *Gariépy G, Honkaniemi H, Quesnel-Vallée A.* Social support and protection from depression: systematic review of current findings in Western countries. Br J Psychiatry 2016; 209(4): 284–93.

47. *Živković Šulović M, Dukuć D, Ljubičić M, Vukša A, Atanasijević D, Jovanović V,* et al. Instructions for the development of work plans for primary health care institutions financed by the RFZO in 2023. Belgrade: Institute for Public Health of Serbia "Dr. Milan Jovanović Batut"; 2022. p. 36. [cited 2023 Feb 1; accessed on 2024 Jan 30]. Available from: https://oblak.batut.org.rs/index.php/s/YMpo8oCr0w09E77/download?path=%2F&files=Final%20UPUTSTVO%20ZA%20PLANOVE%20USTANOVA%20PZZ%20ZA%202023_FV%20(1).doc (Serbian)

48. *Dukić D, Živković-Šulović M, Ločkić N, Dragutinović G, Brcanski J, Boričić K,* et al. Analysis of the planned and realized scope and content of the rights of insured persons to primary health care in 2017 [Internet]. Belgrade: Institute for Public Health of Serbia "Dr. Milan Jovanović Batut"; 2018. [cited 2023 Feb 1; accessed on 2024 Jan 29]. Available from: https://www.batut.org.rs/download/publikacije/Analiza%20 PPZ%202017.pdf (Serbian)

49. *Shin C, Lee SH, Han KM, Yoon HK, Han C.* Comparison of the Usefulness of the PHQ-8 and PHQ-9 for Screening for Major Depressive Disorder: Analysis of Psychiatric Outpatient Data. Psychiatry Investig 2019; 16(4): 300–5.