ORIGINAL ARTICLE

UDC: 61-057.87:613.86
DOI: https://doi.org/10.2298/VSP220209046C

Prevalence and factors associated with depressive symptoms among medical students in their first and final year of study

Rasprostranjenost i faktori povezani sa simptomima depresije kod studenata prve i završne godine studija medicine

Sonja Čanković*†, Vesna Mijatović Jovanović*†, Sanja Harhaji*‡, Sonja Šušnjević†, Snežana Ukropina*§, Svetlana Kvrgić*†, Dušan Čanković*§

***University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia; Institute of Public Health of Vojvodina, †Center for Analysis, Planning and Organization of Health Care, ‡Center for Informatics and Biostatistics, §Center for Health Promotion, Novi Sad, Serbia**

Abstract

Background/Aim. The mental health of medical students worsens during their studies, and research shows that medical students are at high risk of depression. The aim of this study was to evaluate the prevalence of depressive symptoms and to examine the association between various risk factors and depressive symptoms in a sample of first- and sixth-year medical students at the University of Novi Sad. **Methods.** A cross-sectional study was conducted at the Faculty of Medicine of the University of Novi Sad. The sample consisted of 308 students divided into two groups – 213 students in the first year and 95 students in the final (sixth) year of medical studies. The Patient Health Questionnaire-9 (PHQ-9) was used to measure depressive symptoms. Within this instrument, item 9 was used to identify suicidal ideation. Self-esteem was evaluated with the Rosenberg Self-Esteem Scale (RSES). Additional questions were focused on self-assessed material status, lifestyle factors, and mental healthcare-seeking. Univariate and multivariate logistic regression analyses were applied. **Results.** The prevalence of depressive episodes among medical students was 16.6%. Almost 9% had thoughts of committing suicide. First-year students with low self-esteem were almost seven times more likely to suffer from moderate to severe depressive symptoms than those with high self-esteem. Students who had used sleeping pills or sedatives without a prescription were nearly five times more likely to have a PHQ-9 score ≥ 10 than those who had not [odds ratio (OR) = 4.97, 95% confidence interval (CI): 1.83–13.52)]. Sixth-year students with poor or average self-assessed social relationships and low self-esteem had a stronger association with a PHQ-9 score ≥ 10. **Conclusion.** There is a high prevalence of depressive episodes among first and sixth-year medical students, and it is associated with low self-esteem in both groups, use of sleeping or sedative pills without a prescription among first-year students, and poor social health in sixth-year students. We recommend routine screening for depression in medical students and establishing prevention and intervention programs.

Key words:
depression; mental health; patient health questionnaire; signs and symptoms; students, medical; suicidal ideation.

Apstrakt

Uvod/Cilj. Istraživanja pokazuju da se mentalno zdravlje studenata medicine pogoršava tokom studija i da studenti medicine imaju povećan rizik od pojave depresije. Cilj istraživanja bio je da se utvrdi rasprostranjenost simptoma depresije, kao i da se ispita povezanost simptoma depresije i različitih faktora rizika među studentima prve i šeste godine studija medicine na Univerzitetu u Novom Sadu. **Metode.** Istraživanje je sprovedeno kao studija preseka među studentima Medicinskog fakulteta Univerziteta u Novom Sadu. Uzorak je činilo 308 studenata podeljenih na dve grupe – 213 studenata prve i 95 studenata završne (šeste) godine studiranja. Prisustvo depresivnih simptoma je ispitivano primenom Upitnika o zdravstvenom stanju bolesnika – 9 (*Patient Health Questionnaire*-9, PHD-9), a pitanje 9 je upotrebljeno za procenu prisustva ideja o samoubistvu. Samopuzdanje je procenjivano na osnovu Rozenbergovove skale (*Rosenberg Self-Esteem Scale,* RSES). Upitnik je obuhvatio pitanja o materijalnom statusu, stilu života i korišćenju zdravstvene zaštite iz oblasti mentalnog zdravlja. Primenjena je univarijantna i multivarijantna logistička regresija. **Rezultati.** Rasprostranjenost depresivne epizode među studentima medicine bila je 16,6%. Suicidalne

Correspondence to: Dušan Čanković, University of Novi Sad, Faculty of Medicine, Hajduk Veljkova 3, 21 000 Novi Sad, Serbia. E-mail: dusan.cankovic@mf.uns.ac.rs

ideje imalo je skoro 9% studenata. Studenti prve godine sa niskim nivoom samopouzdanja imali su skoro sedam puta veću šansu da imaju umerene do teške simptome depresije od onih sa visokim nivoom samopouzdanja. Oni koji su koristili lekove za smirenje ili lekove za spavanje koji im nisu prepisani od strane lekara imali su skoro pet puta veće šanse za PHQ-9 skor ≥ 10 [*odds ratio* (OR) = 4,97, 95% *confidence interval* (CI): 1,83–13,52]. Loši ili prosečni društveni odnosi i nizak nivo samopouzdanja prediktori su PHQ-9 skora ≥ 10 kod studenata šeste godine. **Zaključak.** Rezultati pokazuju visoku rasprostanjenost depresivne epizode kod studenata prve i šeste godine medicine, koja je povezana sa niskim samopouzdanjem u obe grupe studenata, upotrebom lekova za spavanje ili smirenje koji nisu prepisani od strane lekara među studentima prve godine i nezadovoljavajućom socijalnom komunikacijom kod studenata šeste godine. U cilju prevencije depresije kod studenata medicine potrebno je u svakodnevnu praksu uvesti programe za otkrivanje depresije i uspostaviti preventivne i interventne programe.

Ključne reči:
depresija; mentalno zdravlje; upitnik o zdravstvenom stanju bolesnika; znaci i simptomi; studenti medicine; samoubistvo, ideje.

Introduction

Adolescence is often considered the healthiest time of life. Yet, there are many challenges during this life period, such as mental health problems that typically begin in late childhood and adolescence [1, 2].

The transition to university corresponds with this high-risk period for maladaptive coping, the onset of psychopathology, and academic failure [3]. Previous studies reported that at the start of medical school, the proportion of medical students suffering from psychological distress is similar to that of the general population [4, 5]. Still, many studies suggest that the mental health of students worsens during medical training, which affects their quality of life [6–9] due to an unknown environment, demanding medical curriculum, excessive workload, examination pressures, difficulties with studying and time management, fear of failure, sleep deprivation, difficult patients, poor learning environments, financial concerns, information overload, and career planning [10, 11].

Therefore, medical education is viewed as stressful, as it is characterized by many psychological, social, and cultural changes in the life of students [12].

Undesirable coping mechanisms such as substance abuse, alcohol consumption, smoking, and harm to self and others may be observed in mentally and emotionally distressed medical students [13].

Medical students are suffering from various mental health problems. These include psychological stress, anxiety, depression, sleep pattern disorders, burnout, eating disorders, and potentially hazardous alcohol use [14]. Depression is documented as one of the risk factors most likely to lead to suicidal thinking [15, 16].

Rotenstein and colleagues [17] reported that the prevalence of current depression or depressive symptoms in medical students was 27.2%, and the prevalence of suicidal ideation was 11.1%. Results showed that the prevalence did not significantly differ between studies of either preclinical or clinical students. On the other hand, Dyrbye et al. [18] suggest that the prevalence of depression varies depending on the age of medical students and the stage of medical training.

The survey conducted in Serbia among medical students revealed a high rate of moderate to severe depression (22.1%), but without information concerning different levels of education [19]. Another study in Serbia obtained results of medical students' testing that lasted for ten years, and it showed that the greatest portion of the examined sample (77.24%) had no depressive symptoms [20].

Royal College of Psychiatrists concluded that demographic and social changes greatly influence students' mental health; therefore, it is hard to generalize earlier epidemiological studies to the present population of students [21].

To get novel information, the objectives of this study were to examine and compare, among a sample of first- and sixth-year medical students at the University of Novi Sad, Serbia, the prevalence of depressive symptoms and suicidal ideation and examine the association between various risk factors and depressive symptoms.

Methods

The research represents a cross-sectional study conducted at the Faculty of Medicine of the University of Novi Sad, Serbia, in 2019. The Ethics Committee of the Institute of the Public Health of Vojvodina, Novi Sad, approved the study (No.01-340/2). All of the respondents agreed to participate in the study. Students completed the questionnaire via anonymous online distribution with electronic consent. The sample consisted of two groups – 213 students in the first year of medical studies (response rate 96.4%) and 95 in the final (sixth) year of medical studies (response rate 47.1%).

The survey questionnaire consisted of the following parts: questions on demographics (gender, age, and year of study), socioeconomic conditions (self-assessed material status), the Patient Health Questionnaire-9 (PHQ-9) [22], self-assessed social health, the Rosenberg Self-Esteem Scale (RSES) [23], lifestyle factors (smoking, alcohol use, marijuana use, ecstasy use, sedative or sleeping pills use without a prescription), and mental healthcare-seeking (visit to psychiatrist/psychologist in the last 12 months).

Symptoms of depression in the previous two weeks were evaluated using the PHQ-9, which consists of nine items. Each item has a four-point severity scale ranging from "0 = not at all" to "3 = nearly every day". A total score can range from 0 to 27. A score from 0 to 4 represents no significant depressive symptoms; a score from 5 to 9 represents mild depressive symptoms; a score from 10 to 27 represents a depressive episode: moderate (10–14), moderately severe

(15–19), and severe (20–27) [22]. A cut-off score of 10 or above can be used regardless of age [24]. The PHQ-9 has been found to have good psychometric properties amongst university students because of its validity, reliability, brevity, and ease of administration [25, 26]. Within this instrument, item 9 is sometimes referred to as the PHQ-9 suicide question because it specifically evaluates the frequency of passive thoughts of death or self-harm within the last two weeks. Participants were asked about suicidal thoughts and behaviors ("thoughts that you would be better off dead, or thoughts of hurting yourself in some way"). The presence of suicidal ideation in the past two weeks was confirmed if the respondent answered at least 'on several days'. It is used as a single scale to assess the prevalence of suicidal ideation in research [27], and the response to this item identifies outpatients at increased risk of suicide attempt or death [28].

This study evaluated self-esteem with the RSES, a self-rating scale consisting of 10 items, five positively worded and five negatively worded items, using a 4-point Likert scale to rate, with options ranging from "1 = strongly disagree" to "4 = strongly agree". Negative statements, which measure a person's negative feelings about themselves, were reverse-scored. The total score ranged from 10 points to 40 points. Higher scores indicated higher self-esteem [23], and a score lower than 30 shows low self-esteem [29]. This scale has good internal consistency, and it has been proven helpful in studying self-esteem among students [30].

Participants were asked to evaluate alcohol use and frequency of binge drinking (defined as having six or more drinks on one occasion) [31]. A "smoker" was considered someone currently using cigarettes (daily, a few days a week, or less). Ever tobacco smokers were respondents who smoked cigarettes during their lifetime but not during the survey time.

Statistical analysis

The categorical variables (gender, socioeconomic condition, lifestyle factors, mental health care seeking, depressive symptoms, and self-esteem) were presented with numbers and percentages. The continuous variable (age) was presented as means and standard deviation (SD). Kolmogorov–Smirnov test was conducted to indicate whether the data followed a normal distribution, and differences in the investigated variables were assessed using the Chi-squared test. To determine the possible predictive variables for medical students' depressive symptoms, univariate and multivariate logistic regression models were implemented. PHQ-9 score as a dependent variable was transformed into a dichotomous variable. Only variables found to be statistically significantly associated with a PHQ-9 score ≥ 10 in univariate analysis were included in multivariate models. The following variables were tested in the multivariate models: self-assessed material status, self-assessed social health, self-esteem scale, and sleeping pills/sedative use without a prescription for first-year students and self-assessed social health, self-esteem scale, and sleeping pills/sedative use without a prescription for sixth-year students. We calculated the association through odds ratio (OR) with 95% confidence intervals (95% CI). The probability, $p < 0.05$, was taken as the minimum level of significance. All the statistical analyses were performed with the SPSS 21.0 statistical package.

Results

The study included 308 students from the Faculty of Medicine University of Novi Sad, Serbia. The average age of participants was 20.95 years. In both observed groups, females were more prevalent. There were more sixth-year than first-year students with a low level of self-esteem. Compared with the first-year students, sixth-year students of medicine reported more frequently that they are current smokers, used cannabis at least once in their lifetime, and used tranquilizers or sedatives without a doctor's prescription. The results indicated a significant difference in alcohol use between first and sixth-year students. There were significantly fewer sixth-year students who had never consumed alcohol (6.3% vs. 17.4%) and had never been excessively drunk (36.8% vs. 53.5%) compared to first-year students. One in ten students visited a psychiatrist or psychologist in the previous 12 months. The characteristics of the sample are summarized in Table 1.

No statistically significant differences in the prevalence of depressive symptoms were noted between the two groups of medical students. Overall, 16.6% of respondents had depressive episodes, 16.0% among first-year and 17.9% among sixth-year students. About 9% of all students had thought of committing suicide (Table 2).

Univariate and multivariate logistic regression analyses were used to determine the association of a PHQ-9 score ≥ 10 with different risk factors among medical students. Univariate analysis showed a statistically significant association between depressive episodes and self-assessed material status, social health, self-esteem, and use of sleeping pills or sedatives without prescription among first-year students. Among sixth-year students, the association of depressive episodes was significant with social health, self-esteem, and the use of sleeping pills or sedatives without prescription (Table 3). Based on the univariate logistic regression analyses, factors that showed a level of significance of less than 0.05 were selected to be included in the multivariate model. The multivariate logistic regression analysis of PHQ-9 score ≥ 10 is presented separately for the first-year students (Table 4) and sixth-year students (Table 5). As shown in Table 4, first-year students with low self-esteem were almost seven times more likely to suffer from moderate to severe depressive symptoms than those with high self-esteem (OR = 6.93, 95% CI: 2.81–17.10). Those who had used sleeping pills or sedatives without a prescription were more than four times more likely to have a PHQ-9 score ≥ 10 than those who had not (OR = 4.97, 95% CI: 1.83–13.52). Sixth-year students with self-assessed social relationships as poor or average had increased odds of having a PHQ-9 score ≥ 10 (OR = 5.34, 95% CI: 1.26–22.40). Compared with those with high self-esteem, those with low self-esteem were more likely to suffer from moderate to severe depressive symptoms (OR = 10.12, 95% CI: 2.46–41.60) (Table 5).

Table 1

The demographic and socioeconomic characteristics of medical students in the 1st and 6th year of medical studies

Characteristics	Total	Year of study		χ^2	*p*-value
		1st	6th		
	n (%)	n (%)	n (%)		
Gender					
male	100 (32.5)	64 (30.0)	36 (37.9)	1.845	0.174
female	208 (67.5)	149 (70.0)	59 (62.1)		
Age (years), mean ± SD	20.95 (2.82)	19.23 (0.88)	24.79 (1.66)		
Self-assessed material status					
low	12 (3.9)	3 (1.4)	9 (9.5)		
middle	156 (50.6)	112 (52.69	44 (46.3)	11.525	**0.003**
high	140 (45.5)	98 (46.0)	42 (44.2)		
Self-assessed social health (social relationships)					
poor	13 (4.2)	9 (4.2)	4 (4.2)		
average	110 (35.7)	71 (33.3)	39 (41.1)	1.745	0.418
good	185 (60.1)	133 (62.4)	52 (54.7)		
Self-esteem scale (RSES)					
low self-esteem < 30	82 (26.6)	49 (23.0)	33 (34.7)	4.629	**0.031**
high self-esteem ≥ 30	226 (73.4)	164 (77.0)	62 (65.3)		
Visit to the psychiatrist/psychologist in the last 12 months					
never	277 (89.9)	195 (91.5)	82 (86.3)		
1–5 times	25 (8.1)	14 (6.6)	11 (11.6)	2.246	0.325
> 5 times	6 (1.9)	4 (1.9)	2 (2.1)		
Alcohol use					
2 or more times per week	23 (7.5)	14 (6.6)	9 (9.5)		
2–4 times per month	121 (39.3)	76 (35.7)	45 (47.4)	8.985	**0.029**
once per month	121 (39.3)	86 (40.4)	35 (36.8)		
never	43 (13.9)	37 (17.4)	6 (6.3)		
Binge drinking					
1 or more times per week	9 (2.9)	6 (2.8)	3 (3.2)		
once per month	34 (11.0)	24 (11.3)	10 (10.5)	8.925	**0.030**
less than 1 time per month	116 (37.7)	69 (32.4)	47 (49.5)		
never	149 (48.4)	114 (53.5)	35 (36.8)		
Smoking					
current tobacco smoker	60 (19.5)	34 (16.0)	26 (27.4)		
ever tobacco smoker	31 (10.1)	19 (8.9)	12 (12.6)	7.418	**0.025**
never tobacco smoker	217 (70.5)	160 (75.1)	57 (60.0)		
Lifetime marijuana use					
yes	70 (22.7)	32 (15.0)	38 (40.0)	23.337	< **0.001**
no	238 (77.3)	181 (85.0)	57 (60.0)		
Lifetime ecstasy use					
yes	15 (4.9)	8 (3.8)	7 (7.4)	1.851	0.174
no	293 (95.1)	205 (96.2)	88 (92.6)		
Lifetime use of sleeping pills/sedatives without a prescription					
yes	60 (19.5)	30 (14.1)	30 (31.6)	12.819	< **0.001**
no	248 (80.5)	183 (85.9)	65 (68.4)		

SD – standard deviation; RSES – Rosenberg self-esteem scale.
Bolded values are statistically significant.

Table 2

Prevalence of depressive symptoms and suicidal ideation among medical students in the 1st and 6th year

Parameter	Year of study			χ^2	*p*-value
	Total (n = 308)	1st (n = 213)	6th (n = 95)		
	n (%)	n (%)	n (%)		
PHQ-9 score					
0–4 (no significant depressive symptoms)	139 (45.1)	102 (47.9)	37 (38.9)		
5–9 (mild depressive symptoms)	118 (38.3)	77 (36.1)	41 (43.2)	2.154	0.341
≥ 10 (depressive episode)	51 (16.6)	34 (16.0)	17 (17.9)		
Suicidal ideation in the past 2 weeks	27 (8.8)	17 (8.0)	10 (10.5)	0.532	0.466

PHQ-9 – patient health questionnaire-9.

Table 3

Association of PHQ-9 score ≥ 10 with potential risk factors among medical students in the 1st and 6th year

Risk factors	Univariate logistic regression			
	1st year		6th year	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Gender				
male	1.00*		1.00*	
female	1.23 (0.54–2.81)	0.620	0.47 (0.16–1.36)	0.164
Self-assessed material status				
high	1.00*		1.00*	
low/middle	2.32 (1.04–5.13)	**0.038**	0.49 (0.17–1.41)	0.186
Self-assessed social health (social relationships)				
good	1.00*		1.00*	
poor/average	3.82 (1.77–8.26)	**0.001**	7.88(2.09– 9.78)	**0.002**
Self-esteem scale (RSES)				
high self-esteem ≥ 30	1.00*		1.00*	
low self-esteem < 30	7.39 (3.35–16.29)	< **0.001**	14.49(3.76–55.89)	< **0.001**
Alcohol use				
never	1.00*		1.00*	
1 time per month	0.63 (0.22–1.77)	0.381	1.03 (0.10–10.53)	0.977
2–4 times per month	0.88 (0.32–2.44)	0.813	1.25 (0.13–12.07)	0.847
2 or more times per week	1.17 (0.26–5.34)	0.840	0.62 (0.03–12.41)	0.758
Binge drinking				
never	1.00*		1.00*	
less than 1 time per month	0.89 (0.40–1.99)	0.780	3.26 (0.83–12.73)	0.089
1 time per month	0.43 (0.09–1.96)	0.275	2.67 (0.38–18.74)	0.324
1 or more times per week	0.94 (0.10–8.49)	0.956	5.33 (0.37–77.50)	0.220
Smoking				
never tobacco smoker	1.00*		1.00*	
ever tobacco smoker	1.06 (0.29–3.93)	0.928	1.57 (0.36–6.84)	0.551
current tobacco smoker	1.47 (0.57–3.75)	0.421	0.85 (0.24–3.03)	0.808
Lifetime marijuana use				
no	1.00*		1.00*	
yes	1.99 (0.29–3.87)	0.135	1.42 (0.49–4.09)	0.513
Lifetime ecstasy use				
no	1.00*		1.00*	
yes	1.80 (0.35–9.33)	0.483	0.75 (0.08–6.67)	0.796
Lifetime use of sleeping pills/sedatives without a prescription				
no	1.00*		1.00*	
yes	4.03 (1.70–9.53)	**0.002**	3.05 (1.01–8.95)	**0.042**

PHQ-9 – patient health questionnaire-9; RSES – Rosenberg self-esteem scale; * – referent value; OR – odds ratio; CI – confidence interval.
Bolded values are statistically significant.

Table 4

Association of PHQ-9 score ≥ 10 with potential risk factors among medical students in the 1st year

Risk factors	Multivariate logistic regression	
	OR (95% CI)	*p*-value
Self-assessed material status		
high	1.00*	
low/middle	1.04 (0.43–2.69)	0.934
Self-assessed social health (social relationships)		
good	1.00*	
poor/average	2.26 (0.93–5.46)	0.071
Self-esteem scale (RSES)		
high self-esteem ≥ 30	1.00*	
low self-esteem < 30	6.93 (2.81–17.10)	< **0.001**
Lifetime use of sleeping pills/sedatives without a prescription		
no	1.00*	
yes	4.97 (1.83–13.52)	**0.002**

PHQ-9 – patient health questionnaire-9; RSES – Rosenberg self-esteem scale; * – referent value; OR – odds ratio; CI – confidence interval.
Bolded values are statistically significant.

Table 5

Association of PHQ-9 score ≥ 10 with potential risk factors among medical students in the 6th year

Risk factors	Multivariate logistic regression	
	OR (95% CI)	*p*-value
Self-assessed social health		
good	1.00*	
poor/average	5.34 (1.26–22.40)	**0.022**
Self-esteem scale (RSES)		
high self-esteem ≥ 30	1.00*	
low self-esteem < 30	10.12 (2.46–41.60)	**0.001**
Sleeping pills/sedatives used without a prescription		
no	1.00*	
yes	1.84 (0.51–6.70)	0.352

PHQ-9 – patient health questionnaire-9; RSES – Rosenberg self-esteem scale; * – referent value; OR – odds ratio; CI – confidence interval.
Bolded values are statistically significant.

Discussion

This study investigated the prevalence of depressive symptoms and their association with various risk factors in medical students. Forty years ago, a study conducted in 1979 showed that the prevalence rates of all mental disorders among medical students were 16.1% one month after enrolment and 17.5% two years after the first examination [32]. Now, only for depressive symptoms (moderate, moderately severe, and severe), the prevalence was 16.0% in first-year and 17.9% in sixth-year students. However, the prevalence of moderate to severe depressive symptoms in our study was lower than those reported in the previous studies. A recent overview of the literature reported that the prevalence of depressive symptoms among medical students varied across continents, ranging from the lowest in the Western Pacific Region (18.9%) to the highest in Africa (40.9%), and among European medical students was 20.1% [33]. There is significant variation in the prevalence of depressive symptoms between various countries. A very high prevalence of depressive symptoms (60.2%) was found among medical and nursing students in Croatia [34]. The mean prevalence of depression among medical students in China was 32.74% [35], while in India, it was even higher – 48.4% of the medical students had depressive symptoms [36]. Depressive symptoms prevalence among Italian medical students was 29.5% [37], which is higher than that among German medical students (20.7%) [38]. Differences in prevalence could be explained by the sociodemographic and cultural differences and the use of different instruments to measure depressive symptoms.

In this study, the prevalence of moderate to severe depressive symptoms among medical students was significantly higher than reported in the general population aged 15–39 years in Vojvodina (1.7%) [39]. The other studies confirmed a higher prevalence of depression in students in clinical and preclinical training groups than in the general public [17, 40–42]. It was also confirmed that the prevalence of depression among medical students is higher than among other students [43].

The difference in the prevalence of depressive episodes between the first and sixth-year medical students in our study was not statistically significant. In line with our findings, the difference was not found in other research [44, 45]. However, Silva et al. [46] reported that depression scores decreased during medical school, while the other literature suggests that depression worsens with academic training and that prevalence was higher in clinical students than pre-clinical students [47]. We did not find any association between a PHQ-9 score ≥ 10 and gender, supporting the findings from meta-analysis [48]. In contrast to our results, literature has shown that female students report more depressive symptoms than males [49–51].

The previous study conducted among medical students in Serbia showed that 23% of respondents had some suicidal thoughts throughout their lifetime, even only passing ideas [19]. In our study, the prevalence of suicidal ideation in the past two weeks was 8.8%, and it was lower than the prevalence of recent suicidal ideation among medical students in Spain (15.8%) [49] and Germany (14.7%) [38] but higher than in Brazil (7.2%) [52], China (7.5%) [53], and the United States (5.7%) [54].

The worrying fact is that a previous study indicated that most students with high depression scores or thoughts about suicide did not report a current or past diagnosis or treatment of depression [55]. Unfortunately, depression, anxiety, and stress among medical students are often unrecognized and untreated [56, 57]. Furthermore, the prevalence of substance use is quite alarming. Within this sample of sixth-year medical students, 63.2% acknowledged binge drinking, and 40% reported a lifetime history of marijuana use. First-year students who had used sleeping pills or sedatives without a prescription were more likely to have moderate to severe depressive symptoms. The negative impact of mental health problems on students continues after graduation. The existence of a mental disorder may lead to a risk for patients during medical school and even more when the student graduates and enters his or her chosen profession [21]. A review of the literature showed that it adversely affects the quality of patient care, patient safety, and professionalism [18].

Zeng et al. [45], in their meta-analysis, argued that excessive academic pressure is a major cause of suicidal ideation and is closely related to other mental health disorders, such as depression. We analyzed different depression-related individual factors. The students in their first year of study who assessed their material status as low or middle had more than two times higher odds for depression than one who was considered high. However, material status was not found to be significantly associated with a PHQ-9 score ≥ 10 in multivariable models. In the literature, authors find that socioeconomic factors and medical student characteristics such as low monthly income per capita and low socioeconomic standard were associated with a higher prevalence of depressive symptoms [58, 59]. Moreover, Pham et al. [42] reported that perceived financial burden was found to be a significant factor associated with self-reported depression.

Final-year medical students with poor or average social relationships had more than five times higher odds of having moderate to severe depressive symptoms. Association was not found to be significant among first-year students. A possible explanation for such results could be that sixth-year students, due to excessive academic overload, have lost their social ties resulting in poor social relationships, and do not use this crucial resource for mental well-being. Increased satisfaction with social activities is a well-known protective factor for depression in medical students [46]. Mahroon et al. [60] found a statistically significant relationship between the quality of relationships with peers and the prevalence of depressive symptoms.

Multivariate analysis showed a significant association between low self-esteem and a PHQ-9 score ≥ 10 in both first and final-year students. Self-esteem refers to a person's positive or negative attitude toward themselves [28]. The literature demonstrates that adolescents with high self-esteem suffer fewer symptoms of depression over time [61]. As implied by Mann et al. [62], it is a bidirectional process. A pessimistic view of themselves can lead to depressive feelings, but depression or lack of efficient functioning could lead to feeling bad, which might decrease self-esteem. High self-esteem can act as a resilience factor against depression [28] because high self-esteem people appear to use better self-regulation strategies than low self-esteem people [63].

Limitations of the study

This study has several limitations. All responses were self-reported, making our results susceptible to recall bias. Additionally, other variables, such as previous psychiatric illnesses that might influence the findings, were not included. The limitations include the cross-sectional structure, making it impossible to draw any conclusions about cause and effect.

Conclusion

There is a high prevalence of depressive episodes among first- and sixth-year medical students in the Medical Faculty of Novi Sad, and it is associated with low self-esteem in both groups, use of sleeping or sedative pills without a prescription among first-year students, and poor social health in sixth-year students. We recommend routine screening for depression in medical students and establishing prevention and intervention programs.

Acknowledgment

This work was supported by the Provincial Secretariat for Higher Education and Scientific Research, Provincial Government, Autonomous Province of Vojvodina, the Republic of Serbia, under Grant No. 401-7380/2018.

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

1. *Patton GC, Sawyer SM, Santelli JS, Ross DA, Afifi R, Allen NB*, et al. Our future: a Lancet commission on adolescent health and wellbeing. Lancet 2016; 387(10036): 2423–78.
2. *Patton GC, Coffey C, Romaniuk H, Mackinnon A, Carlin JB, Degenhardt L*, et al. The prognosis of common mental disorders in adolescents: a 14-year prospective cohort study. Lancet 2014; 383(9926): 1404–11.
3. *Duffy A, Saunders KEA, Malhi GS, Patten S, Cipriani A, McNevin SH*, et al. Mental health care for university students: a way forward? Lancet Psychiatry 2019; 6(11): 885-87.
4. *Yusoff MSB, Mat Pa MN, Esa AR, Abdul Rahim AF*. Mental health of medical students before and during medical education: A prospective study. J Taibah Univ Med Sci 2013; 8(2): 86–92.
5. *Smith CK, Peterson DF, Degenhardt BF, Johnson JC*. Depression, anxiety, and perceived hassles among entering medical students. Psychol Health Med 2007; 12(1): 31–9.
6. *AlFaris E, Irfan F, Qureshi R, Naeem N, Alshomrani A, Ponnamperuma G*, et al. Health professions' students have an alarming prevalence of depressive symptoms: exploration of the associated factors. BMC Med Educ 2016; 16(1): 279.
7. *Heinen I, Bullinger M, Kocalevent RD*. Perceived stress in first year medical students - associations with personal resources and emotional distress. BMC Med Educ 2017; 17(1): 4.
8. *Gan GG, Yuen Ling H*. Anxiety, depression and quality of life of medical students in Malaysia. Med J Malaysia 2019; 74(1): 57–61.
9. *Pagnin D, de Queiroz V*. Comparison of quality of life between medical students and young general populations. Educ Health (Abingdon) 2015; 28(3): 209–12.
10. *Hill MR, Goicochea S, Merlo LJ*. In their own words: stressors facing medical students in the millennial generation. Med Educ Online 2018; 23(1): 1530558.
11. *Oura MJ, Moreira AR, Santos P*. Stress among Portuguese Medical Students: A National Cross-Sectional Study. J Environ Public Health 2020; 2020: 6183757
12. *Liranso GS, Mohan SS, Prakash M, Vicky VD*. Mental Health Distress and Wellness among Medical Students. J Neurol Neurol Disord 2018; 4(1): 102.
13. *Cuttilan AN, Sayampanathan AA, Ho RC*. Mental health issues amongst medical students in Asia: a systematic review [2000-2015]. Ann Transl Med 2016; 4(4): 72.

14. *Pacheco JP, Giacomin HT, Tam WW, Ribeiro TB, Arab C, Bezerra IM*, et al. Mental health problems among medical students in Brazil: a systematic review and meta-analysis. Braz J Psychiatry 2017; 39(4): 369–78.
15. *Lew B, Huen J, Yu P, Yuan L, Wang DF, Ping F*, et al. Associations between depression, anxiety, stress, hopelessness, subjective well-being, coping styles and suicide in Chinese university students. PLoS One 2019; 14(7): e0217372.
16. *Bauer RL, Chesin MS, Jeglic EL*. Depression, delinquency, and suicidal behaviors among college students. Crisis 2014; 35(1): 36–41.
17. *Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C*, et al. Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. JAMA 2016; 316(21): 2214–36.
18. *Dyrbye LN, Thomas MR, Shanafelt T*D. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med 2006; 81(4): 354–73.
19. *Miletic V, Lukovic JA, Ratkovic N, Aleksic D, Grgurevic A*. Demographic risk factors for suicide and depression among Serbian medical school students. Soc Psychiatry Psychiatr Epidemiol 2015; 50(4): 633–8.
20. *Ristić-Ignjatović D, Hinić D, Jakovljević M, Fountoulakis K, Siepera M, Rancić* N. A ten-year study of depressive symptoms in Serbian medical students. Acta Clin Croat 2013; 52(2): 157–63.
21. *Royal College of Psychiatrists*. Mental health of students in higher education. September, 2011. [cited 2021 Aug 21.] Available from: https://www.rcpsych.ac.uk/docs/defaultsource/improving-care/better-mh-policy/college-reports/college-reportcr166.pdf?sfvrsn=d5fa2c24_2
22. *Kroenke K, Spitzer RL, Williams JB*. The PHQ-9: Validity of a Brief Depression Severity Measure. J Gen Intern Med 2001; 16(9): 606–13.
23. *Rosenberg M*. Society and the adolescent self-image. Princeton, NJ: Princeton University Press; 1965.
24. *Levis B, Benedetti A, Thombs BD*. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: individual participant data meta-analysis. BMJ 2019; 365: l1476.
25. *Adewuya AO, Ola BA, Afolabi OO*. Validity of the Patient Health Questionnaire (PHQ-9) as a Screening Tool for Depression Amongst Nigerian University Students. J Affect Disord 2006; 96(1–2): 89–93.
26. *Kim YE, Lee B*. The Psychometric Properties of the Patient Health Questionnaire-9 in a Sample of Korean University Students. Psychiatry Investig 2019; 16(12): 904–10.
27. *Bauer AM, Chan YF, Huang H, Vannoy S, Unützer J*. Characteristics, management, and depression outcomes of primary care patients who endorse thoughts of death or suicide on the PHQ-9. J Gen Intern Med 2013; 28(3): 363–9.
28. *Simon GE, Rutter CM, Peterson D, Oliver M, Whiteside U, Operskalski B,* et al. Does response on the PHQ-9 Depression Questionnaire predict subsequent suicide attempt or suicide death? Psychiatr Serv 2013; 64(12): 1195-202.
29. *Saleh D. Camart N, Romo L*. Predictors of Stress in College Students. Front Psychol 2017; 8: 19.
30. *Tagarroa M, Galinhaa S*. Adaptation of Rosenberg´s Self-esteem scale and EBEPS-A Self-esteem Subscale on Portuguese students. Eur J Behav Sci 2017; 17(3): 188–97.
31. *Desai A*. Governments confront drunken violence. Bull World Health Organ 2010; 88(9): 644–5.
32. *Erić L, Radovanović Z, Jevremović I*. Mental disorders among Yugoslav medical students. Br J Psychiatry 1988; 152: 127–9.
33. *Tam W, Lo K, Pacheco J*. Prevalence of depressive symptoms among medical students: overview of systematic reviews. Med Educ 2019; 53(4): 345–54.
34. *Milić J, Škrlec I, Milić Vranješ I, Podgornjak M, Heffer M*. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. Int Rev Psychiatry 2019; 31(7–8): 653–60.
35. *Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X*. A systematic review of depression and anxiety in medical students in China. BMC Med Educ 2019; 19(1): 327.
36. *Kumar SG, Kattimani S, Sarkar S, Kar SS*. Prevalence of depression and its relation to stress level among medical students in Puducherry, India. Ind Psychiatry J 2017; 26(1): 86–90.
37. *Bert F, Lo Moro G, Corradi A, Acampora A, Agodi A, Brunelli L,* et al.; *Collaborating Group*. Prevalence of depressive symptoms among Italian medical students: The multicentre cross-sectional "PRIMES" study. PLoS One 2020; 15(4): e0231845.
38. *Chow WS, Schmidtke J, Loerbroks A, Muth T, Angerer P*. The Relationship between Personality Traits with Depressive Symptoms and Suicidal Ideation among Medical Students: A Cross-Sectional Study at One Medical School in Germany. Int J Environ Res Public Health 2018; 15(7): 1462.
39. *Harhaji S*. Socio-medical aspects of depressive disorders in Vojvodina [dissertation]. Novi Sad: Faculty of Medicine, University of Novi Sad; 2016. (Serbian)
40. *Steiner-Hofbauer V, Holzinger A*. How to Cope with the Challenges of Medical Education? Stress, Depression, and Coping in Undergraduate Medical Students. Acad Psychiatry 2020; 44(4): 380–7.
41. *Ediz, B, Ozcakir, A, Bilgel, N*. Depression and anxiety among medical students: Examining scores of the Beck depression and anxiety inventory and the depression anxiety and stress scale with student characteristics. Cogent Psychology 2017; 4(1): 283829.
42. *Pham T, Bui L, Nguyen A, Nguyen B, Tran P, Vu P*, et al. The prevalence of depression and associated risk factors among medical students: An untold story in Vietnam. PLoS One 2019; 14(8): e0221432.
43. *Lei XY, Xiao LM, Liu YN, Li YM*. Prevalence of Depression among Chinese University Students: A Meta-Analysis. PLoS One 2016; 11(4): e0153454.
44. *Bassols AM, Okabayashi LS, Silva AB, Carneiro BB, Feijó F, Guimarães GC*, et al. First- and last-year medical students: is there a difference in the prevalence and intensity of anxiety and depressive symptoms? Braz J Psychiatry 2014; 36(3): 233-40.
45. *Zeng W, Chen R, Wang X, Zhang Q, Deng W*. Prevalence of mental health problems among medical students in China: A meta-analysis. Medicine (Baltimore) 2019; 98(18): e15337.
46. *Silva V, Costa P, Pereira I, Faria R, Salgueira AP, Costa MJ*, et al. Depression in medical students: insights from a longitudinal study. BMC Med Educ 2017; 17(1): 184.
47. *Ngasa SN, Sama CB, Dzekem BS, Nforchu KN, Tindong M, Aroke D*, et al. Prevalence and factors associated with depression among medical students in Cameroon: a cross-sectional study. BMC Psychiatry 2017; 17(1): 216.
48. *Puthran R, Zhang MW, Tam WW, Ho RC*. Prevalence of depression amongst medical students: a meta-analysis. Med Educ 2016; 50(4): 456–68.
49. *Atienza-Carbonell B, Balanzá-Martínez V*. Prevalence of depressive symptoms and suicidal ideation among Spanish medical students. Actas Esp Psiquiatr 2020; 48(4): 154–62.
50. *Brenneisen Mayer F, Souza Santos I, Silveira PS, Itaqui Lopes MH, de Souza AR, Campos EP*, et al. Factors associated to depression and anxiety in medical students: a multicenter study. BMC Med Educ 2016; 16(1): 282.
51. *Burger PHM, Scholz M*. Gender as an underestimated factor in mental health of medical students. Ann Anat 2018; 218: 1–6.

52. *Torres AR, Campos LM, Lima MCP, Ramos-Cerqueira ATA.* Suicidal Ideation Among Medical Students: Prevalence and Predictors. J Nerv Ment Dis 2018; 206(3): 160–8.
53. *Sobowale K, Zhou N, Fan J, Liu N, Sherer R.* Depression and suicidal ideation in medical students in China: a call for wellness curricula. Int J Med Educ 2014; 5: 31–6.
54. *Goebert D, Thompson D, Takeshita J, Beach C, Bryson P, Ephgrave K*, et al. Depressive symptoms in medical students and residents: a multischool study. Acad Med 2009; 84(2): 236–41.
55. *Schwenk TL, Davis L, Wimsatt LA.* Depression, stigma, and suicidal ideation in medical students. JAMA 2010; 304(11): 1181–90.
56. *Menon V, Sarkar S, Kumar S.* Barriers to healthcare seeking among medical students: A cross sectional study from South India. Postgrad Med J 2015; 91(1079): 477–82.
57. *Thompson G, McBride RB, Hosford CC, Halaas G.* Resilience Among Medical Students: The Role of Coping Style and Social Support. Teach Learn Med 2016; 28(2): 174–82.
58. *Pan XF, Wen Y, Zhao Y, Hu JM, Li SQ, Zhang SK*, et al. Prevalence of depressive symptoms and its correlates among medical students in China: a national survey in 33 universities. Psychol Health Med 2016; 21(7): 882–9.
59. *Abdel Wahed WY, Hassan SK.* Prevalence and associated factors of stress, anxiety and depression among medical Fayoum University students. Alexandria J Med 2017; 53(1): 77–84.
60. *Mahroon ZA, Borgan SM, Kamel C, Maddison W, Royston M, Donnellan C.* Factors Associated with Depression and Anxiety Symptoms Among Medical Students in Bahrain. Acad Psychiatry 2018; 42(1): 31–40.
61. *Henriksen IO, Ranøyen I, Indredavik MS, Stenseng F.* The role of self-esteem in the development of psychiatric problems: a three-year prospective study in a clinical sample of adolescents. Child Adolesc Psychiatry Ment Health 2017; 11: 68.
62. *Mann M, Hosman CM, Schaalma HP, de Vries NK.* Self-esteem in a broad-spectrum approach for mental health promotion. Health Educ Res 2004; 19(4): 357–72.
63. *Baumeister RF, Campbell JD, Krueger JI, Vohs KD.* Does High Self-Esteem Cause Better Performance, Interpersonal Success, Happiness, or Healthier Lifestyles? Psychol Sci Public Interest 2003; 4(1): 1–44.

Received on February 9, 2022
Revised on April 5, 2022
Accepted on April 14, 2022
Online First April 2022