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PREVALENCE OF DEPRESSION SYPTOMS IN THE STUDENT POPULATION AND THE POSSIBILITY OF PREVENTION

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Introduction: Mental illness is the most common cause of disability and a major public health issue worldwide due to its increasing prevalence, the difficulty of therapeutic treatment and the possible progression of the disease.
Objectives: To determine the prevalence of depressive symptoms in the student population over a 5-year period and the connection between sociodemographic characteristics and lifestyle habits of students and the occurrence of depressive symptoms.
Methods: A retrospective study was conducted in the period 2018-2022 at the Institute for Health Protection of Students in Belgrade. Data was obtained by analyzing the questionnaire completed by student including the PHQ-9 questionnaire. The difference between students' socio-demographic characteristics and lifestyle habits and the presence of depression was examined using the X2 test. Variables that were significant in the X2 test were included in a binary logistic regression. The data were analyzed with SPSS 20.
Results: 34047 students participated, 17.53% of whom were identified as individuals with high risk for depression. In the study first graders showed more symptoms of depression than third graders. The students who showed symptoms of depression were typically female, lived with their parents, did not consume alcohol or smoke and exercised 2-3 times per week. In the logistical regression model, alcohol consumption was positively and significantly associated with the presence of depressive symptoms.
Conclusion: The preventive measures should focus on lower alcohol consumption and frequent physical activity. Regular systematic examinations and referral to a specialist for the individuals identified as high-risk for depression should be mandatory.
Keywords: students, symptoms of depression, prevention

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Uvod: Mentalna bolest je najčešći uzrok invaliditeta i veliki javnozdravstveni problem širom sveta zbog svoje sve veće prevalencije, teškoće terapijskog lečenja i moguće progresije bolesti.
Ciljevi: Utvrditi prevalenciju depresivnih simptoma u studentskoj populaciji tokom perioda od 5 godina i vezu između sociodemografskih karakteristika i životnih navika studenata i pojave depresivnih simptoma.
Metode: Retrospektivna studija je sprovedena u periodu 2018-2022. u Zavodu za zdravstvenu zaštitu studenata u Beogradu. Podaci su dobijeni analizom upitnika koji su popunili studenti, uključujući i upitnik PHQ-9. Razlika između sociodemografskih karakteristika i životnih navika studenata i prisustva depresije ispitana je pomoću X2 testa. Promenljive koje su bile značajne u X2 testu uključene su u binarnu logističku regresiju. Podaci su analizirani pomoću SPSS 20.
Rezultati: Učestvovalo je 34047 studenata, od kojih je 17,53% identifikovano kao osobe sa visokim rizikom od depresije. U studiji su studenti prve godine pokazali više simptoma depresije nego studenti treće. Studenti koji su pokazivali simptome depresije bili su tipično ženskog pola, živeli su sa roditeljima, nisu konzumirali alkohol niti pušili i vežbali su 2-3 puta nedeljno. U modelu logističke regresije, konzumiranje alkohola je bilo pozitivno i značajno povezano sa prisustvom depresivnih simptoma.
Zaključak: Preventivne mere treba da se fokusiraju na manju konzumaciju alkohola i čestu fizičku aktivnost. Redovni sistematski pregledi i upućivanje kod specijaliste za osobe identifikovane kao osobe sa visokim rizikom od depresije trebalo bi da budu obavezni.
Ključne reči: studenti, simptomi depresije, prevencija

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INTRODUCTION

According to the World Health Organization (WHO), mental health is "a state of well-being in which a person recognizes their own abilities, is able to cope with normal life stresses, work productively and fulfillingly and contribute to themselves and their community". [1]
Mental illness is the most common cause of disability and is a major public health problem worldwide due to its increasing prevalence, the difficulty of therapeutic treatment and the possible progression of the illness. [2,3] Stress, anxiety and depression are considered important indicators of mental health which, if left untreated, can have a negative impact on the individual. [4] Depression is characterized by a range of symptoms, including lack of interest in daily activities, lack of energy, poor concentration, feelings of worthlessness or guilt, altered sleep patterns, significant weight loss or gain, and even recurrent thoughts of death or suicide. [5]
Most mental health problems occur in early adulthood (college years) but often go unrecognized. [6] Mental health problems in this population group are associated with a higher frequency of physical and emotional problems, poorer sleep quality, dysfunctional relationships with the environment and marginalization in the labor market in the medium and long term. [7-10] Students are at risk of stress, anxiety and depression, which can affect their academic performance. Globally, it is estimated that 12–50% of students have at least one diagnostic criterion for one or more mental disorders. [11] Differently organized educational processes, alienation and impersonal relationships with teachers, competition, more time available and the ability to plan and organize it, relaxation or complete absence of parental control and often physical distance from them, encountering a new environment ... these are all challenges which are easier for some people to adapt to and more difficult for others. The health of young people during this period depends on the health potential they have brought with them from their school years, such as the accommodation and conditions they find after graduation, diet, physical activity, sexual behavior, smoking, alcohol consumption, psychoactive substances and leisure activities. Biological factors such as age and gender, especially female gender and socioeconomic status, also play a role. [12] Studies conducted on various samples of students have found a moderate to high prevalence of stress, anxiety and depression in this population. [13-15] Early diagnosis and treatment of mental health problems leads to better outcomes for patients. Therefore, it is necessary to identify those students who are at higher risk of developing mental health problems during their studies.

To determine the prevalence of depressive symptoms in the student population over a 5-year period and to determine the relationship between sociodemographic characteristics and lifestyle habits of students and the occurrence of depressive symptoms.

Methods

Study Design and Participants

A retrospective study was conducted in the period 2018-2022. in the Institute for Health Protection of Students in Belgrade. The data were obtained by analyzing the "Preventive Health Records", which are completed as part of the regular systematic examinations.

Data Collection

Regular systematic examinations of students at the University of Belgrade are conducted in the first and third year of study. Before the medical examination, students complete a questionnaire containing basic demographic and socioeconomic data, data on lifestyle habits, the presence of chronic diseases and previous significant illnesses, and the PHQ-9 questionnaire, which was also a research instrument. [16] A score of less than 5 indicates no depression, 5 to 9 indicates mild depression, 10 to 14 indicates moderate depression, 15 to 19 indicates moderate depression, and 20 or more indicates severe depression. The relationship between socio-demographic characteristics (gender, place of residence, diet and finances), the students' lifestyle habits (alcohol and tobacco consumption and physical activity) and their mental health was investigated. Lifestyle habits, do you use alcohol: no (does not drink alcoholic beverages), sometimes (involves consumption of two alcoholic beverages per day), regularly (daily drinks alcoholic beverages). Smoking (no and yes), and for physical activity three variables: no, 2-3 times a week, every day means train some sport. Follow-up meant that the student was sent for additional examinations based on the opinion of the physician who was conducting a systematic examination at the time.

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Data Analysis

Data are presented as absolute values (N) and frequencies (%) for categorical variables. The difference between students' sociodemographic characteristics and lifestyle habits and the presence of depression in the first and third years of study were examined using the X2 test. Variables that were significant in the X2 test in all five calendar years of student follow-up were included in a binary logistic regression performed to assess the association with the presence of depression as a dependent variable.

Data were analyzed using SPSS 20, results were considered statistically significant if $p<0.05$.

Results

In the study took part 34047 students of whom 17.53% stated that they were suffering from depression. The majority of respondents were female, 67.4%. The representation of different levels of depression symptoms in first and third year students is shown in Table 1.

Year of study	2018		2019		2020		2021		2022	
Level of depression N(%)	first	third	first	third	first	third	first	Third	first	third
Minimal depression	4860 (80.8)	3356 (84.7)	5554 (79.2)	3321 (85.6)	2946 (81.2)	1597 (84.5)	630 (81.4)	604 (90.0)	1849 (81.7)	3362 (84.6)
Mild depression	934 (15.5)	485 (12.2)	1107 (15.8)	462 (11.9)	521 (14.4)	236 (12.5)	116 (15.0)	57 (8.5)	303 (13.4)	488 (12.3)
Moderate depression	165 (2.7)	89 (2.2)	249 (3.6)	73 (1.9)	121 (3.3)	41 (2.2)	20 (2.6)	6 (0.9)	72 (3.2)	89 (2.2)
Moderately severe depression	44 (0.7)	25 (0.6)	72 (1.0)	17 (0.4)	29 (0.8)	5 (0.3)	6 (0.8)	0 (0)	26 (1.1)	26 (0.7)
Severe depression	15 (0.2)	5 (0.1)	27 (0.4)	4 (0.1)	8 (0.2)	9 (0.5)	2 (0.3)	1 (0.1)	7 (0.3)	5 (0.1)

In all school years studied, first-graders show more symptoms of depression than third-graders.

The investigation of the relationship between socio-demographic characteristics and the lifestyle habits of first graders and the presence of depressive symptoms is shown in Table 2.

	2018		2019		2020		2021		2022	
	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression
Gendre										
Male	1912 (39.4)	336 (29.0)	1975(35.6)	321(22.1)	1107(37.6)	165(24.4)	80 (27.1)	73(21.9)	481(26.0)	62(15.2)
Female	2944(60.6)	**822(71.0)****	3571(64.4)	**1132(77.9)****	1836(62.4)	**512(75.6)****	215(72.9)	261(78.1)	1366(74.0)	**346(84.8)****
Living arrangement										
At parent's house	2465 (51.6)	**657(57.3)****	2770(50.4)	**745(51.6)****	1531(53.0)	**364(54.3)****	150 (52.4)	158(49.7)	867(49.4)	189(50.9)
Rented flat	484 (10.1)	66 (5.8)	664(12.1)	131(9.1)	351(12.1)	54(8.1)	38(13.8)	25(7.9)	180(10.3)	31(8.4)
Student,s dorm	1831 (38.3)	423 (36.9)	2065(37.6)	568(39.3)	1008(34.9)	252(37.6)	98(34.3)	135(42.5)	708(40.3)	151(40.7)
Do you use alcohol ?										
No	3827 (79.2)	**794(68.9)****	4587(82.8)	**1079(74.5)****	2428(83.4)	**470(70.1)****	262(90.3)	**266(82.1)****	1580(88.8)	**309(82.4)****
Sometimes	997 (20.6)	355 (30.8)	932(16.8)	359(24.8)	477(16.4)	197(29.4)	27(9.3)	58(17.9)	195(11.0)	65(17.3)
Regularly	7 (0.1)	4 (0.3)	20(0.4)	11(0.8)	6(0.2)	3(0.4)	1(0.3)	0(0)	4(0.2)	1(0.3)
Do you smoke?										
No	4253 (87.9)	**965(83.8)****	4905(88.5)	**1217(83.9)****	2571(88.2)	**541(80.5)****	262(90.3)	280(86.4)	1607(90.3)	**317(84.3)****
Yes	587 (12.1)	187 (16.2)	637(11.5)	234(16.1)	344(11.8)	131(19.5)	28(9.7)	44(13.6)	173(9.7)	59(15.7)
Do you excersise?										
No	1255 (25.9)	414 (36.0)	1317(23.8)	466(32.1)	517(17.7)	182(27.1)	22(7.6)	46(14.2)	200(11.2)	65(17.3)
2-3 times a week	3119 (64.5)	**653(56.7)****	3656(66.0)	**894(61.6)****	2022(69.4)	**445(66.3)****	241(83.1)	**242(74.7)***	1412(79.3)	**290(77.1)****
Every day	464 (9.6)	84 (7.3)	567(10.2)	91(6.3)	376(12.9)	44(6.6)	27(9.3)	36(11.1)	168(9.4)	21(5.6)
Referred to specialist										
No	4552 (93.7)	**844(72.9)****	5239(94.3)	**1033(71.0)****	2850(96.7)	**498(73.3)****	289(98.0)	329(98.2)	1808(98.0)	**292(71.7)****
Yes	308 (6.3)	314 (27.1)	315 (5.7)	422(29.0)	96(3.3)	181(26.7)	6(2.0)	6(1.8)	37(2.0)	115(28.3)
Where do you eat ?										
At home	4027 (78.6)	1098(21.4)	2783(50.4)	**748(51.6)****	1530(53.0)	**364(54.3)****	493(80.0)	109(79.0)	663(47.1)	**102(56.0)****
In student' s restaurant	1348(81.3)	310 (18.7)	665(12.1)	131(9.0)	351(12.1)	54(8.1)	94(15.3)	19(13.8)	182(12.9)	9(4.9)
Other	178 (78.4)	**49 (21.6) ***	2069(37.5)	571(39.4)	1008(34.9)	252(37.6)	29(4.7)	10(7.2)	563(40.0)	71(39.0)
Source of income										
Parents	5326 (79.3)	1393 (20.7)	5326(95.8)	1393(95.7)	2878(95.7)	636(94.6)	557(90.4)	128(92.8)	1945(80.4)	155(84.2)
Student loan/scolarship	96 (78.0)	27 (22.0)	96(1.7)	27(1.9)	51(1.8)	16(2.4)	7(1.1)	1(0.7)	107(7.5)	9(4.9)
I work	85 (81.7)	19 (18.3)	85(1.5)	19(1.3)	43(1.5)	12(1.8)	41(6.7)	7(5.1)	136(9.5)	13(7.1)
Other	51 (75.0)	17 (25.0)	51(0.9)	17(1.2)	31(1.1)	8(1.2)	11(1.8)	2(1.4)	37(2.6)	7(3.8)

The variables that were statistically significant in all five years were the students' alcohol consumption and physical activity. The students who showed symptoms of depression were female, lived with their parents, did not consume alcohol, did not smoke, were not referred for follow-up and exercised 2-3 times per week.

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The study of the relationship between third-year students' lifestyle habits and the presence of depressive symptoms is shown in Table 3.

	2018		2019		2020		2021		2022	
	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression	No signs of depression	Shows signs of depression
Gendre										
Male	1146 (34.2)	150 (24.8)	1138(34.3)	120(21.6)	484(30.4)	61(21.0)	141 (23.4)	12(18.8)	1149(34.2)	151(24.8)
Female	2209(65.8)	**454(75.2)****	2181(65.7)	**436(78.4)****	1110(69.6)	**230(79.0)***	462(76.6)	52(81.2)	2212(65.8)	**457(75.2)****
Living arrangement										
At parent's house	1526 (46.0)	**309(51.8)****	1568(47.9)	**283(51.5)****	763(48.6)	**158(54.5)***	275(47.5)	**37(58.7)***	1527(46.0)	**310(51.6)****
Rented flat	658 (19.8)	55 (9.2)	581(17.7)	59(10.7)	219(13.9)	23(7.9)	71(12.3)	0(0)	659(19.8)	55(9.2)
Student,s dorm	1132 (34.1)	233 (39.0)	1126(34.4)	207(37.7)	588(37.5)	109(37.6)	233(40.2)	26(41.3)	1134(34.2)	236(39.3)
Do you use alcohol?										
No	2576 (77.1)	**391(64.8)****	2734(82.7)	**388(70.2)****	1249(78.6)	**195(67.0)***	504(85.1)	49(76.6)	2578(77.1)	**394(64.9)****
Sometimes	756 (22.6)	208 (34.5)	569(17.2)	161(29.1)	336(21.1)	92(31.6)	88(14.9)	15(23.4)	758(22.7)	209(34.4)
Regularly	9 (0.3)	4 (0.7)	4(0.1)	4(0.7)	4(0.3)	4(1.4)	0(0)	0(0)	9(0.3)	4(0.7)
Do you smoke?					1388(87.4)					
No	2883 (86.3)	**477(79.1)****	2917(88.1)	**454(82.1)****	201(12.6)	**238(81.8)***	509(86.3)	54(84.4)	2886(86.3)	**481(79.2)****
Yes	456 (13.7)	126 (20.9)	393(11.9)	99(17.9)		53(18.2)	81(13.7)	10(15.6)	457(13.7)	126(20.8)
Do you excersise?										
No	808 (24.2)	225 (37.4)	626(18.9)	154(27.8)	275(17.3)	84(28.9)	90(15.2)	7(11.1)	808(24.2)	226(37.3)
2-3 times a week	2238 (67.0)	**345(57.3)****	2450(74.1)	**377(68.2)****	1192(74.9)	**201(69.1)***	459(77.5)	53(84.1)	2242(67.0)	**348(57.4)****
Every day	294 (8.8)	32 (5.3)	231(7.0)	22(4.0)	125(7.9)	6(2.1)	43(7.3)	3(4.8)	294(8.8)	32(5.3)
Referred to specialist										
No	3069 (91.4)	**445(73.7)****	3097(93.3)	**436(78.4)****	1533(96.0)	**234(80.4)***	596(98.8)	**56(87.5)****	3122(92.9)	**492(80.9)****
Yes	287 (8.6)	159 (26.3)	224 (6.7)	120(21.6)	64(4.0)	57(19.6)	7(1.2)	8(12.5)	240(7.1)	116(19.1)
Where do you eat?					1199(75.6)					
At home	2369 (70.8)	**396(65.6)****	2361(71.3)	**426(77.0)****		223(76.6)	447(75.5)	**59(92.2)***	1419(79.2)	**295(79.1)***
In student's restaurant	852(25.5)	172 (28.5)	818(24.7)	98(17.7)	326(20.5) 62(3.9)	53(18.2)	95(16.0)	1(1.6)	300(16.8)	52(13.9)
Other	126 (3.8)	36 (6.0)	132(4.0)	29(5.2)		15(5.2)	50(8.4)	4(6.2)	72(4.0)	26(7.0)
Source of income										
Parents	3040 (90.7)	553 (91.6)	2970(89.7)	491(88.8)	1381(87.0)	257(88.3)	471(79.4)	55(85.9)	1646(91.9)	344(92.2)
Student loan/scolarship	204 (6.1)	34 (5.6)	239(7.2)	40(7.2)	114(7.2) 63(3.8)	21(7.2)	48(8.1)	1(1.6)	22(1.2)	5(1.3)
I work	52 (1.6)	6 (1.0)	62(1.9)	17(3.1)	31(2.0)	6(2.1)	61(10.3)	6(9.4)	95(5.3)	20(5.4)
Other	56 (1.7)	11 (1.8)	40(1.2)	5(0.9)		7(2.4)	13(2.2)	2(3.1)	28(1.6)	4(1.1)

*p<0.05 **p<0.001

For third-year students, place of residence and referral for reexamination are the most important variables. Those who showed symptoms of depression were female, lived and were fed by their parents, did not consume alcohol, did not smoke, were not referred to the specialist, and exercised 2-3 times per week.

Table 4 shows the relationship between the sociodemographic characteristics and lifestyle habits of the students and the presence of depressive symptoms

Independent variables	B	OR (95% CI)	P value
Do you use alcohol	0.49	1.63 (1.21-2.19)	P<0.001
Do you excersise	-0.46	0.63 (0.50-0.80)	P<0.001
Where do you live	0.003	1.00 (0.91-1.11)	0.959
Referred to the specialist	1.12	3.08 (2.42-3.92)	P<0.001

In the logistic regression model, the variables positively and significantly associated with the presence of depressive symptoms were alcohol consumption (OR: 1.63, 95% CI: 1.21-2.19) and referred to the specialist (OR: 3.08, 95% CI: 2.42-3.92). We found an inverse association between the occurrence of depression and physical activity (OR: 0.63, 95% CI: 0.50-0.80).

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DISCUSSION

Adolescents are an extremely heterogeneous group whose upbringing can be peaceful and without major problems, but also stressful, with numerous frustrations, fears, insecurities and suffering that lead to extreme vulnerability. It is a phase of leaving childhood, in which one learns new boundaries and discovers one's self-image, in which one paradoxically wants to become independent from one's parents, but at the same time wants to belong to a group of peers. Therefore, communication with them should be open, intimate and with a lot of appreciation, respect and empathy.

Mental illness can have a negative impact on overall physical health, quality of life and engagement in important life domains and activities, including school, work and social relationships. [17-19] Experience shows that chronic and persistent symptoms of mental illness can contribute to suicide risk. Identification of factors that contribute to mental health recovery in transition-age youth and early intervention are therefore recognized as priority areas within national and global mental health strategies and guidelines. [20,21]

Young people aged 16–29 years are the most at-risk age group for the onset of mental illness, as this is a significant period of psychosocial development, identity formation and many other life changes. [17,18]

This study covered a five-year period (2018-2022), including the first three years of the Covid-19 virus pandemic (2020-2022).

In the study conducted, it was shown that women are more prone to symptoms of depression, which is consistent with numerous studies by other researchers in which the female gender is mentioned as a risk factor for mental disorders. [22]

Students are a group that was already at high risk of mental disorders before the pandemic. It is estimated that up to 20% of students suffer from a mental disorder, which mainly includes anxiety, mood swings, and psychoactive substance use. [23] As young adults, they may have genetic factors that interact with environmental factors during their studies, such as academic workload and demands, financial support, social interaction with peers and faculty (impersonal relationships), and even traumatic experiences and stresses of various kinds. [24] In our study, the prevalence of depressive symptoms was 17.53%.

Undergraduate students have different socioeconomic statuses, which may entail a number of risk factors for mental health. [25]
In their study, Eisenberg et al. demonstrated a positive correlation between depression and financial instability in the student population; the same correlation was also found in the study by Lerman et al. [26]

In our study, we found a correlation between depression symptoms and students' lifestyle habits, which included alcohol consumption, cigarettes and physical activity. The results showed that the incidence of depression symptoms was highest in first-year students who lived and ate with their parents, did not consume alcohol, did not smoke, were not referred for follow-up, and exercised 2-3 times per week. Some studies show a correlation between the occurrence of depression and male gender and smoking. [27] In addition, the socio-demographic characteristics of the population studied were analysed (place of residence, diet and livelihood) and it was found that third-year students were significantly more likely to be depressed if they lived with their parents, which can be explained by the fact that they were under more pressure from their parents in terms of their university commitments, lack of privacy and independence.
The study also showed that students with a higher level of depression were not sent for reexamination. The reasons for this could be the following: that the doctors do not spend enough time and recognize the problem due to the lack of time in their daily work in primary health care; that there are currently no free appointments for specialist examinations or that the offered appointments do not suit the students due to private commitments; that the students reject the doctor's suggestion or are offered to think for a while and come back later; that they do not have health insurance. Studies show that symptoms of depression would be recognized up to three times more often if patients were referred for rehabilitative examinations. [28]
In their work, Keum et al. point to a positive correlation between depression and alcohol consumption. [29] Our results showed that the higher the level of depression symptoms, the more regularly the students consumed 1.63 times more alcohol.
Jiang and Rudenstine showed in their studies the

association between depression and reduced physical activity, first years of study and the impact of the Covid-19 virus pandemic on the mental health of university students. [30] The impact of the Covid-19 pandemic on students' mental health was also noted. This can be explained by the fact that the pandemic itself led to changes in living habits, isolation, a low number of social contacts, online courses and insecurity, that certain strains caused more severe clinical forms, a higher number of hospitalizations and a higher mortality rate, so that people feared for their own health and the health of their roommates... These are all factors that could affect the mental health of students at the time and cause the onset of depressive symptoms.

Our study showed that students' physical activity decreased 0.63-fold the more severe their depression was. People with depression often experience reduced motivation, a lack of energy, and little interest in everyday activities — especially in engaging in additional physical activity. On the other hand, physical activity can be beneficial for students in regulating and reducing depressive symptoms. However, these effects may vary depending on gender. [31] Some studies have found no statistically significant correlation between physical activity and the presence of depression. However, others have shown that more intense physical activity is associated with better mental health status. [32] Further research is needed to better understand the relationship between a sedentary lifestyle, physical activity, and depression in this population.

Cross-sectional study design, facilitates the simultaneous assessment of outcomes and exposures among study participants. The efficiency and cost-effectiveness of cross-sectional strategies make them appealing for preliminary data collection, but hinders establishing causal relationships. This is a cross-sectional study designed to provide information on the prevalence of depression and odds ratios. A questionnaire and retrospective self-reporting by respondents were used in the data collection, so there is a possibility of bias and unrealistic assessment. Secondly, there could be a lack of willingness on the part of respondents to disclose information about their private lives and this could have negative consequences.

CONCLUSION

Students were identified as a risk group for developing symptoms of depression, which is 17.53% in the Serbian student population. The students who showed symptoms of depression were female, lived and were fed by their parents, did not consume alcohol, did not smoke, exercised 2-3 times a week and were not referred for examination after systematic examinations. The importance of preventive measures by physicians should focus on promoting lower alcohol consumption, reducing and quitting smoking, more frequent physical activity and regular systematic examinations, as well as mandatory referral to the specialist to reduce the progression and occurrence of severe forms of depression.

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