



Chronic diseases among university students: prevalence, patterns and impact on health-related quality of life

Hronične bolesti među studentima: prevalenca, obrazac i uticaj na kvalitet života u vezi sa zdravljem

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Abstract

Background/Aim. Around 30% of university students have chronic diseases and/or special care needs. As future taskforce in various job sectors will be drawn from current university student population, it is essential that their health-related problems are recognized and properly managed. The aims of this study were to estimate the prevalence and patterns of chronic diseases in the university student population and to assess their health-related quality of life (HRQoL). **Methods.** A total of 1,624 Belgrade University students were recruited from April to June 2009 at the Student Public Health Center. The students filled in sociodemographic and behavioral questionnaire, the Beck Depression Inventory (BDI) and the SF-36 questionnaire. Data on chronic diseases were self-reported and thereafter validated in medical records. The impact of chronic diseases on HRQoL was evaluated through series of linear regression models. **Results.** The prevalence of chronic diseases was 16.5%. The most common chronic diseases were asthma and chronic bronchitis (4.2% and 3.1%, respectively). All SF-36 domains, both composite and total scores were lower compared to healthy students ($p < 0.001$). Females with chronic diseases reported all eight HRQoL domains as worse, whilst males with chronic diseases reported some HRQoL domains as worse. After adjustment, having chronic diseases remained significantly associated with worse HRQoL [beta (β) -5.69; 95% confidence interval (CI) -8.09, -3.28]. **Conclusion.** To meet the needs of university students, the health care service should provide support in prevention and treatment of chronic diseases.

Key words:

chronic disease; prevalence; students; quality of life; surveys and questionnaires.

Apstrakt

Uvod/Cilj. Oko 30% studenata ima hronične bolesti i/ili potrebu za posebnom negom. Imajući u vidu da će ova populacija činiti značajni deo radnog sektora, neophodno je da zdravstveni problemi studenata budu prepoznati i adekvatno tretirani. Ciljevi ovog istraživanja bili su procena prevalencije i distribucije hroničnih bolesti u populaciji studenata, kao i procena njihovog kvaliteta života povezanog sa zdravljem (KŽPZ). **Metode.** Ukupno 1,624 studenta Beogradskog Univerziteta je bilo uključeno u studiju u Studentskoj poliklinici. Studenti su popunjavali sociodemografski upitnik i upitnik o navikama, kao i Bekovu skalu depresije (BSD) i upitnik SF-36 za procenu KŽPZ. Podaci o hroničnim bolestima dobijeni su od ispitanika, a zatim su potvrđeni u istoriji bolesti. Uticaj hroničnih bolesti na KŽPZ procenjen je kroz seriju linearnih regresionih modela. **Rezultati.** Učestalost hroničnih bolesti u populaciji studenata bila je 16,5%. Najčešće hronične bolesti su bile astma i hronični bronhitis (4,2% i 3,1%). Svi SF-36 domeni, oba kompozitna i ukupan skor bili su niži kod studenata sa hroničnim bolestima u odnosu sa zdrave studente ($p < 0.001$). Studentkinje sa hroničnim bolestima imale su lošiji KŽPZ u svih osam domena, dok su studenti sa hroničnim bolestima naveli neke domene KŽPZ kao lošije u odnosu na zdrave studente. Nakon uključivanja više varijabli u konačan regresioni model, prisustvo hroničnih bolesti ostalo je značajan prediktor lošijeg KŽPZ [Beta (β) -5,69; 95% interval pouzdanosti (CI): -8,09, -3,28]. **Zaključak.** Da bi zdravstvene potrebe studenata bile zadovoljene, potrebno je da služba zdravstvene zaštite pruži podršku u prevenciji i lečenju hroničnih bolesti.

Ključne reči:

hronična bolest; prevalenca; studenti; kvalitet života; ankete i upitnici.

Introduction

The university student population has been generally thought to be in good health. However, the estimates suggest that around 30% of students have chronic diseases and/or special care needs¹. In the process of transition from high school to university, aside from undertaking responsibility for their own education, students are also expected to take care of their own health. Because of global ageing and an increase in life expectancy worldwide, efforts were made to address the importance and value of years spent in good health². Since future leaders and taskforce in various job sectors will be drawn from current university student population, it is essential that their health-related problems are recognized and properly managed.

Overall, university students reported lower health-related quality of life (HRQoL) compared with community-based adult population of the same age³. Furthermore, female students seem to report more health problems, sustain greater psychological burden⁴ and use more health care services due to both physical and psychological problems compared with males⁵. Beside challenges in the academic setting, there is evidence to suggest that presence of chronic diseases has influence on lower school achievements, regardless of ethnicity or socioeconomic status⁶. Despite some evidence in the available body of literature, chronic diseases among university students and their impact on overall well-being remain understudied. To gain deeper insight, measuring well-being, health and disease by means of HRQoL instruments, could offer valuable information to health-care providers and policy makers as to how current services could be revisited, redesigned or adjusted.

The aims of this paper were to estimate the prevalence and patterns of chronic diseases in a university student population, and to assess the HRQoL and comparatively analyze it in relation to their healthy peers.

Methods

Participants and setting

The study participants were undergraduate students registered at the University of Belgrade, Serbia. Belgrade is the capital of the Republic of Serbia with population of 1.6 million inhabitants. The University of Belgrade is the biggest and the oldest public institution offering higher education in the Republic of Serbia, with around 89,500 students. It consists of 31 faculties divided in four branches: social sciences and humanities, medical sciences, nature sciences and mathematics, and technology and engineering sciences. The participants were recruited between April and June 2009 at the only Student Public Health Center in Belgrade. As regular annual health check-ups are mandatory for all students at the university, this primary-health care facility was suitable for selection of the study sample. The sampling was based on convenience. Taking into consideration the expected prevalence of chronic diseases among university students of 30%, size of the Belgrade university population (roughly 89,000),

confidence level of 95% and confidence interval (CI) of 2, the calculated sample size was 1,645 persons⁷. A total of 1,669 consecutive students who attended regular check-ups were invited to participate in the study, whilst 1,624 consented (response rate 97.3%). This sample represented approximately 1.8% of all Belgrade University students.

In the Republic of Serbia, the health care system is mainly financed by mandatory contributions to a social health insurance scheme. Delivery of health care is set according to three levels: primary, secondary and tertiary. The Student Public Health Center is the principal primary health care institution for the Belgrade University students, comprising outpatient and inpatient departments. Moreover, specialist consultations in all clinical fields are provided.

Ethical approval for the study was obtained from the Ethics Committee of the Faculty of Medicine University of Belgrade on April 24, 2009 (file No. 440/IV-1). Signed informed consent was received from all study participants.

Instruments

Data were collected by questionnaires. The general questionnaire was related to demographic data: age, gender, place of birth (rural/urban), type of faculty (social sciences and humanities/medical sciences/nature sciences and mathematics/technology and engineering sciences), type of current residence (with parents student dormitory rented apartment other), household monthly income; behavior and habits: alcohol use (yes/no), cigarette smoking (yes/no); ever illicit drug use (yes/no); physical activity (yes/no) – defined as moderate activities for at least 10 min at a time, such as brisk walking, cycling, swimming, or any other activity that causes some increase in breathing or heart rate. Data on chronic diseases were self-reported and thereafter validated in the Student Public Health Center's medical records by two independent physicians.

The Beck Depression Inventory (BDI)⁸ was used to explore feelings and attitudes related to general depressive status. It is a one-dimensional scale consisting of 21 items. Answers were graded on a four-point scale from 0 to 3. The total BDI score was obtained as the sum of ratings for each item. The total BDI score ranged from 0 to 63, with higher values denoting presence of more severe depression symptoms. The BDI was approved for use in Serbian language by the publisher (Pearson, San Antonio)⁹. The Serbian version of BDI showed sufficient internal consistency (Cronbach alpha coefficient 0.87; test-retest reliability 0.63)⁹.

The HRQoL was assessed by using the generic 36-item Short Form Healthy Survey (SF-36) questionnaire^{10,11}. This questionnaire is consisted of 36 questions divided in eight domains/dimensions: Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional and Mental Health. Based on these eight domains two summary scores are made: the Physical Composite Score (comprising the former four domains) and Mental Composite Score (comprising the latter four domains). The total quality of life score represented the mean value of the two composite scores. The score ranged from 0 to 100, with higher values denoting better HRQoL^{10,11}. The SF-36 questionnaire has been approved

for use in Serbian language¹². Serbian version of the SF-36 questionnaire showed good internal consistency as measured by the Cronbach's alpha coefficient of 0.73¹².

Data analysis

Prevalence of chronic diseases in the study sample was expressed as percentage (in the total sample as well as according to gender). After testing for normality of distribution by means of Kolmogorov-Smirnov test, we determined that the age of students was normally distributed, while household monthly income and the BDI score were not. Difference in normally distributed variable was assessed by using *t*-test for two independent samples. Difference in not-normally distributed variables was assessed by using the Mann-Whitney test for two independent samples. The Chi-Square test was used to assess differences in categorical variables. To evaluate difference in the SF-36 scores, we applied ANOVA. We also tested the interaction terms between presence of chronic diseases and the BDI score. Because probability level was not statistically significant, we did not stratify according to the BDI scores. The Spearman's correlation coefficient (ρ) was used to examine a correlation between selected variables.

To examine the impact of having chronic diseases on HRQoL we performed a series of linear regression models, based on potential confounding effects of the other observed variables. In all models the dependent variable was the total HRQoL score as measured by the SF-36. The independent variable in crude model was a presence of chronic diseases only. In the "Basic model" age and gender were added as co-variables. Next, in the "Socio-demographic model", we added the corresponding socio-demographic variables: place of birth, type of current residence, household monthly income, type of faculty and grade point average. In the "Behavior model" following habits were taken into consideration: smoking, alcohol use, ever drug use and physical activity. In the final "Full model", we additionally included the BDI score. The effect estimates were presented as beta coefficients, with corresponding 95% CI. Probability level of $p \leq 0.05$ was considered statistically significant. The SPSS 17.0 statistical software package (SPSS Inc, Chicago, IL, U.S.A.) was used to perform the statistical analysis.

Results

Basic demographic characteristics according to health status are presented in Table 1.

Table 1

Characteristics of the Belgrade University students according to health status

Variable	Students with chronic diseases (n = 201)	Healthy students (n = 1,423)	<i>p</i> -value
Age, mean \pm SD	20.6 \pm 1.6	20.8 \pm 1.9	0.129
Gender			
male	72 (35.8)	633 (46.2)	0.849
female	129 (64.2)	737 (53.8)	
Place of birth			
urban	160 (79.6)	1,194 (83.8)	0.271
rural	41 (20.4)	229 (16.2)	
Type of current residence			
home (with parents)	96 (47.8)	665 (46.6)	0.580
students' dormitory	17 (8.5)	163 (11.5)	
alone (in rented apartment)	75 (37.3)	493 (34.7)	
other	13 (6.5)	102 (7.2)	
Family monthly income (in Euros)	600 (460)	600 (400)	0.870
Type of faculty			
social science and humanities	122 (60.7)	848 (59.6)	0.114
medical sciences	18 (9.0)	177 (12.4)	
natural sciences and mathematics	16 (8.0)	65 (4.6)	
technology and engineering science	45 (22.4)	333 (23.4)	
Grade point average*, mean \pm SD	8.2 \pm 0.8	8.1 \pm 0.8	0.088
Smoking			
yes	50 (24.9)	288 (20.3)	0.440
no	151 (75.1)	1,131 (79.7)	
Alcohol use			
yes	163 (83.2)	1,151 (82.4)	0.836
no	33 (16.8)	246 (17.6)	
Ever drug use			
yes	43 (21.4)	200 (14.1)	0.008
no	158 (78.6)	1,223 (85.9)	
Physical activity			
yes	170 (85.0)	1,194 (84.3)	0.836
no	30 (15.0)	223 (15.7)	
BDI score	7.0 (10.0)	5.0 (8.0)	0.001

BDI – Beck Depression Inventory; *p* – probability level; values are presented as medians (interquartile ranges) unless otherwise marked; numbers in brackets for categorical variables denote percentages; SD – standard deviation; *grading system from 6 as minimum (lowest passing grade) to 10 as maximum (highest passing grade).

Table 2
Prevalence of chronic diseases among the Belgrade University students (n = 1,624)

Chronic diseases	n (%)
Asthma	66 (4.2)
Chronic bronchitis	50 (3.1)
Heart failure	39 (2.4)
Hypertension	33 (2.2)
Diseases of the digestive system*	14 (0.9)
Diabetes mellitus	10 (0.6)
Mental and behavioral disorders†	10 (0.6)
Diseases of the nervous system‡	8 (0.5)
Diseases of the urinary system§	8 (0.5)
Diseases of the skin**	4 (0.2)
Diseases of the circulatory system including diseases of the blood¶	5 (0.2)
Neoplasms***	5 (0.2)
Other††	16 (1.0)
Total	268 (16.5)

*peptic ulcers, gastritis, hiatus hernia, ulcerative colitis; †anorexia, insomnia, depression; ‡migraine, spinal disc herniation; §renal calculi, nephritic syndrome, nephritis; **psoriasis, eczema; ¶anemia, thrombocytopenia, haemorrhoids, venous varices; ***thyroid cancer, fibroadenomas; ††allergies.

The students with chronic diseases more frequently reported ever drug use and higher BDI score. We observed the presence of 268 chronic diseases in 254 students. Of 254 stu-

dents, 14 students (5.5%) had comorbidities. Prevalence of chronic diseases in the total sample was 16.5%. In addition, 15.6% of the students were diagnosed with one or more chronic diseases. Prevalence of chronic diseases is shown in Table 2.

The most frequent chronic diseases were asthma (4.2%) and chronic bronchitis (3.1%). Table 3 displays prevalence of chronic diseases according to gender. The pattern of chronic disease occurrence was, for the most part, similar in both genders. We did not find a correlation between having chronic diseases and grade point average during studies ($\rho = 0.059$, $p = 0.054$) nor with repeated years at the University ($\rho = -0.031$, $p = 0.627$).

The HRQoL scores according to the health status are given in Table 4. The scores in all domains, both composite and total scores were significantly worse when compared with the healthy students. The females with chronic diseases reported all eight domains, both composite score and the total score as significantly worse when compared with females without chronic diseases. Among the males, however, most scores were significantly worse in comparison with their healthy counterparts, except for the Physical Functioning, Vitality, Role Emotional and Mental Health (data not shown).

Table 5 summarizes linear regression models. In all models, the presence of chronic diseases was significantly associated with worse HRQoL. After adjustment for multiple confounding factors (Full model), the presence of chronic diseases among the University students remained associated with worse HRQoL (beta [β] -5.69; 95% CI: -8.09, -3.28; $p < 0.01$).

Table 3
Prevalence of chronic diseases among Belgrade University students according to gender

Chronic diseases	Males (752)	Females (872)
	n (%)	n (%)
Asthma	33 (4.4)	33 (3.8)
Chronic bronchitis	27 (3.6)	23 (2.6)
Heart failure	17 (2.2)	22 (2.5)
Hypertension	14 (2.0)	19 (2.2)
Mental and behavioral disorders*	6 (0.8)	4 (0.5)
Diabetes mellitus	5 (0.7)	5 (0.6)
Diseases of the digestive system†	4 (0.5)	10 (1.1)
Diseases of the circulatory system including diseases of the blood¶	4 (0.5)	1 (0.1)
Diseases of the nervous system‡	3 (0.4)	5 (0.6)
Diseases of the urinary system§	3 (0.4)	5 (0.6)
Diseases of the skin**	2 (0.2)	2 (0.2)
Neoplasms***	2 (0.2)	3 (0.3)
Other††	5 (0.7)	11 (1.2)
Total	125 (16.6)	143 (16.4)

*anorexia, insomnia, depression; †peptic ulcers, gastritis, hiatus hernia, ulcerative colitis; ‡migraine, spinal disc herniation; §renal calculi, nephritic syndrome, nephritis; **psoriasis, eczema; ¶anemia, thrombocytopenia, haemorrhoids, venous varices; ***thyroid cancer, fibroadenomas; ††allergies.

Table 4
Mean T scores of the SF-36 scales among the healthy and students with chronic diseases (n = 1,624)

Scales of SF-36	Students		F value	p-value
	With chronic dis- eases mean ± SD	Healthy mean ± SD		
Physical functioning	89.7 ± 16.6	94.3 ± 11.8	23.9	0.001
Role physical	76.4 ± 31.8	84.4 ± 26.7	15.4	0.001
Pain	76.5 ± 21.8	84.3 ± 18.6	29.3	0.001
General Health	66.1 ± 18.5	75.9 ± 16.7	58.9	0.001
Vitality	60.2 ± 22.9	65.3 ± 20.6	10.1	0.002
Social Functioning	70.9 ± 24.4	79.1 ± 21.4	25.2	0.001
Role Emotional	57.9 ± 42.7	68.6 ± 39.5	12.4	0.001
Mental Health	65.6 ± 23.3	71.2 ± 19.6	19.5	0.001
Physical Composite Score	73.8 ± 15.0	80.8 ± 12.9	50.3	0.001
Mental Composite Score	63.9 ± 19.8	72.0 ± 18.1	34.3	0.001
Total Score	70.3 ± 17.1	77.9 ± 14.9	43.9	0.001

SF-36 – the 36-item Short Form Health Survey questionnaire.

SD – standard deviation; p – value for interaction presence of chronic diseases x Beck Depression Inventory score: 0.347.

Table 5
Linear regression models describing factors associated with health-related quality of life among Belgrade University students (n = 1,624)

Variable	Crude model	Basic model	Socio-demographic model	Behavior model	Full model
Presence of chronic diseases yes vs. no	-7.60 (-9.85, -5.35)*	-7.44 (-9.66, -5.21)**	-9.29 (-12.16, -6.42)**	-8.95 (-11.85, -6.04)**	-5.69 (-8.09, -3.28)**
Age		0.49 (0.01, 0.89)*	0.46 (-0.08, 1.01)	0.47 (-0.08, 1.03)	0.13 (-0.32, 0.59)
Gender females vs. males		-4.88 (-6.40, -3.36)**	-4.78 (-6.77, -2.78)**	-4.00 (-6.10, -1.90)**	-2.35 (-4.08, -0.62)**
Place of birth urban vs. rural			0.96 (1.67, 3.59)	0.81 (-1.82, 3.44)	1.01 (-1.15, 3.18)
Type of current residence with parents vs. other			-0.58 (-1.55, 0.39)	-0.31 (-1.29, 0.68)	-0.22 (-1.03, 0.59)
Household monthly in- come			2.76 (0.12, 4.85)**	2.03 (0.04, 4.21)**	1.39 (-0.48, 2.93)
Type of faculty social science vs. other			1.13 (0.10, 2.15)*	1.38 (0.34, 2.42)**	0.99 (0.14, 1.85)*
Grade point average			-0.64 (-2.21, 0.84)	-1.01 (-2.50, 0.47)	-1.19 (-2.42, 0.05)
Smoking yes vs. no				-3.47 (-6.02, -0.92)**	-0.50 (-2.61, 1.62)
Alcohol use yes vs. no				-2.79 (-5.60, 0.03)	-1.26 (-3.57, 1.06)
Ever drug use yes vs. no				-0.77 (-3.63, 2.08)	0.40 (-1.94, 2.75)
Physical activity yes vs. no				4.03 (1.20, 6.86)**	2.39 (0.06, 4.72)*
BDI score					-1.32 (-1.45, -1.19)**

BDI – Beck Depression Inventory; Values represent beta coefficients with corresponding 95% confidence intervals from linear regression models. *p < 0.05; **p < 0.01.

Discussion

In this cross-sectional study we sought to estimate the prevalence of chronic diseases in the University student population. The observed prevalence of chronic diseases was 16.5%. This prevalence was lower than the one observed among Slovenian (26.1%)¹³ or British (33.5%)⁴ University students. Castren et al.¹⁴ reported that 72% of undergraduate students in Finland had one or more chronic diseases. However, their analysis included conditions such as refractive errors of the eye, dental caries and infection of wisdom teeth¹⁴, which we did not take into consideration. Nevertheless, prevalence of asthma among the Belgrade and Finnish students seem to be quite similar (4.2% vs. 5.0%, respectively). Variations in chronic disease prevalence could be explained by different criteria for inclusion. Still, these variations could be attributed to other factors as well. For example, lower prevalence of chronic diseases among the Belgrade University students may have resulted from differences in perception on education and employment. It is possible that adolescents who suffer from chronic diseases decided to enter the job market, or opted to enroll in higher education institutions that offer programs of shorter duration (such as 4 or 5 semesters as opposed to at least 8 semesters at the University, depending on a type of faculty) to reduce academic stress, and yet develop certain professional skills.

We observed that students who suffer from chronic diseases did not have lower grade point average compared with healthy students. Crump et al.⁶ reported that children and adolescents with chronic neurodevelopmental and seizure disorders had low school performance. This, however, was not observed among pupils with cardiovascular disorders or diabetes⁶, which is in line with our results. Therefore, it seems that diseases other than neurodevelopmental disorders do not interfere with academic performance. On the other hand, we noted that students with chronic diseases reported ever drug use more frequently than their healthy peers. Ayvasik and Sümer¹⁵ indicated that one of the predictors of drug use among college students is sensation-seeking and risk-taking. It is possible that, due to the presence of chronic diseases, these students have more propensity towards risk-taking. However, this study design limited us from defining whether or not having chronic diseases was associated with the previous use or initiation of illicit drug use at the University. Finally, we observed that the students with chronic diseases also had a higher BDI score when compared with healthy students. Depression was identified as one of the most common health problems in the college students¹⁶. Given this, it was suggested that most college health services in the US are able to manage it on-campus¹. Still, it might be beneficial that the University students with chronic diseases are offered screening for depression as a part of the general health status assessment.

Overall, the HRQoL among the students with chronic diseases was worse than among healthy students and having chronic diseases remained associated with worse HRQoL across all regression models. Still, we observed that all dimensions of HRQoL were worse in the female students,

whilst among the males, certain dimensions, including both physical and mental functioning, were not. Although psychosomatic complaints were strongly associated with self-reported health status across student populations¹⁷, moderate-to-high sense of coherence was linked with lower frequency of health problems¹⁸, indicating that mental health may have strong influence on overall health status. Studies showed that males were more likely to rate their health status as better^{4,5,17,19}, while females “keep an eye” on their health more⁴. Females seem to report more often headaches, back pain or neck/shoulder pain⁴, as well as fatigue, depression and anxiety⁵. In the survey of eleven faculties in Egypt, females reported more burden from studies, exams, assignments as well as from other responsibilities in addition to their academic duties¹⁹. In the Hong Kong study, by contrast, males seem more likely to accomplish effective stress management, particularly by “taking some time for relaxation each day” or by “other specific methods to control stress”²⁰, which may be a result of having more general resistance resources and coping strategies. In line with all previously mentioned, conformity to gender norms may play a role in various health indices²¹.

Information bias should be acknowledged as a limitation in this study, because data on smoking, alcohol and ever drug use and physical activity were self-reported. Also, the sample size was drawn only from the Belgrade University, while students from other major four public Universities in the country were not included. It is possible that our sample included those students who had more health complaints and thus, were more likely to attend the Student Public Health Center. By including several other disorders, such as dental caries or refractory anomalies of the eye could have yielded a different disease prevalence. Although we aimed at reaching a representative sample of the Belgrade University student population, the relative size of our sample might have influenced the findings. Because of this, the study results may not entirely reflect the real-life situations. Finally, the associations based on the cross-sectional study design fail to take the direction of associations into account.

Conclusion

There is a lack of studies exploring HRQoL among University students with chronic diseases. Our study offered an insight into patterns of chronic diseases in the University student population and confirmed that, unlike other aspects, presence of chronic diseases is the consistent factor associated with worse HRQoL. Apart from the expected finding that students with chronic diseases had worse HRQoL compared to their healthy peers, our study identified that the males reported some dimensions of HRQoL as poor while the females perceive all dimensions of HRQoL as worse. The HRQoL measurement could be an informative tool in early recognition of physical and emotional well-being of young adults with chronic diseases in higher education institutions. To meet the needs of University students, the health care service should provide support in prevention, recognition and treatment of chronic dis-

eases. Because female students may be at higher risk of having worse health status, the importance of screening and health-related support could be crucial in providing a safe education environment for this population group.

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