

# Quality of life and mental health of volunteers during COVID-19 pandemic: a cross-sectional survey in Serbia

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**Abstract. – OBJECTIVE:** There is a paucity of information on the COVID-19 pandemic's impact on young volunteers. Therefore, the aim of this survey was to examine the QoL and mental health of young volunteers of the Novi Sad Voluntary Service during the COVID-19 pandemic.

**PATIENTS AND METHODS:** This cross-sectional prospective study included 255 members of the Novi Sad Voluntary Service, Serbia. The survey instrument probed into the respondents' demographic characteristics and was followed by the anonymous WHOQOL-BREF questionnaire that measured their quality of life during the COVID-19 pandemic and DASS-21 scale. All statistical analyses were carried out using IBM SPSS Statistics for Windows, vers. 24.0.

**RESULTS:** The study sample consisted of 255 young volunteers (71.4% females, 28.6% males), 62.0% of whom were aged 18-25 years, and 52.2% were students. Lower Physical Capacity scores could be predicted by female gender ( $p < 0.01$ ) and COVID-19 infection among friends ( $p < 0.05$ ). Male gender ( $p < 0.05$ ) and being employed ( $p < 0.05$ ) predicted greater QoL in the Psychological domain. The only predictor of a lower QoL in the Social Relationships domain was the internet as the main COVID-19-related information source ( $p < 0.05$ ). On the other hand, being female ( $p < 0.05$ ) and having COVID-19-positive household members ( $p = 0.01$ ) predicted lower environment domain scores. For the lower over-

all DASS-21 score, having COVID-19-positive household members was the only significant predictor ( $p < 0.01$ ).

**CONCLUSIONS:** Mental health support should pursue strategies to improve all domains of QoL, especially for vulnerable sub-groups of the population, such as young females and the unemployed. Bearing in mind the importance of public engagement and community support in pandemic circumstances, as well as generally in public health, these results are relevant for interventions far beyond the current pandemic.

*Key Words:*

Quality of life, Mental health, Volunteers, Serbia, COVID-19.

## Introduction

The ongoing coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has posed a serious threat to public health with millions of people at risk worldwide<sup>1,2</sup>. Around the globe, the main strategies national governments adopted to protect their citizens from the risk of infection from COVID-19 involved isolation and social distancing<sup>3</sup>. Follow-

ing the declaration of COVID-19 pandemic by the World Health Organization (WHO), various countries started implementing regional and national containment measures or lockdowns, including closures of schools, educational institutions, and all activity areas. These unprecedented restrictions to mobility and social functioning have greatly impaired the quality of life (QoL) of many individuals and have increased stress and anxiety in the general population due to the high infection rate, fears of being infected or losing loved ones, and financial uncertainties<sup>3,4</sup>. These issues were further exacerbated by the concerns about the long-lasting secondary impacts of prolonged isolation on the health of various population groups<sup>5</sup>. Most people also found social media exposure extremely stressful, which further increased their anxiety and reduced their QoL<sup>6</sup>. All these factors contributed to the growing apprehension regarding the future, with detrimental consequences on mental health. Although efforts to defeat the virus have understandably been prioritized, adequate resources must also be designated for mental health protection both during the pandemic and in the subsequent period<sup>7</sup>. Most experts concur that at least 70% of the global population will likely need treatment for either physical or mental health problems related to COVID-19 infection<sup>8</sup>.

An extensive body of research already exists on QoL and mental health during the pandemic. However, these studies differ in the demographic composition of their participants and the adopted methodology. Nonetheless, available evidence indicates that the QoL declined during the COVID-19 pandemic relative to the pre-pandemic levels<sup>4,6,9</sup>. Likewise, findings related to mental health suggest that it has declined in the general population,<sup>10,11</sup> but the adverse effects of the COVID-19 pandemic have been particularly evident among healthcare workers<sup>12,13</sup>, elderly<sup>14,15</sup>, children and adolescents<sup>16,17</sup>, and students<sup>18-20</sup>. On the other hand, there is a paucity of information on its impact on young volunteers. This gap in extant literature has motivated the present study, the aim of which was to examine the QoL and mental health of young volunteers of the Novi Sad Voluntary Service during the COVID-19 pandemic.

## Patients and Methods

This cross-sectional prospective study included 255 members of the Novi Sad Voluntary Service, Serbia, aged 18 to 30 years. According

to the CAF World Giving Index Report of 2019, only 6% of the Serbian population contributes to their own communities and the broader society through volunteering<sup>21</sup>. Therefore, this figure was considered when determining the required sample size, aiming to achieve a 95% confidence level and 6.5% margin of error. Based on these criteria, while 228 participants were sufficient to account for attrition, as well as any missing data or unintended errors<sup>22</sup>, the sample was increased by 10%. Therefore, the target sample size for this study was 255 volunteers, as determined by an online calculator<sup>23</sup>.

Prior to taking part in the study, all volunteers were informed about its aims and procedures and gave their consent. The participation was anonymous as all gathered data was obtained *via* Google Forms surveys that were accessible for five days (from October 4<sup>th</sup> to 8<sup>th</sup>, 2021). The study was approved by the Assembly of the Youth Association of the “Novi Sad Youth Capital of Europe – OPENS” initiative as the highest body for the distribution of questionnaires among volunteers, the Department of Medical Rehabilitation of the Faculty of Medicine in Novi Sad, and the Ethics Committee of the Faculty of Medicine of the University of Novi Sad, Serbia (01-39/162/1). All survey items required participants to select one of the offered options that most closely applies to their views and circumstances.

The survey instrument probed into the respondents’ demographic characteristics, such as gender, age, and duration of Novi Sad Voluntary Service membership, and was followed by the anonymous WHOQOL-BREF questionnaire that measured their quality of life during the COVID-19 pandemic and was retrieved from the WHO website after obtaining written permission (permission authorization ID: 385965, date: 02.10.2022)<sup>24</sup>.

In addition, the respondents completed the DASS-21 scale, which is a short version of the Depression, Anxiety and Stress Scale (DASS) comprising 21 questions answered on a four-point scale ranging from 0 (does not apply to me at all) to 3 (applies to me very much or most of the time)<sup>25</sup>.

## Survey Tools

As indicated above, all respondents completed a general demographic questionnaire, as well as the WHOQOL-BREF and DASS-21 scales. The general questionnaire was utilized to obtain pertinent sociodemographic information, name-

ly gender (male/female), age (18-25 years /26-30 years), employment status (student/employed/unemployed), volunteering service duration (< 6 months/6-12 months/>12 months), history of COVID-19 infection among household members (yes/no), history of COVID-19 infection among friends and relatives (yes/no), personal history of COVID-19 infection (yes/no), and most frequently used sources for obtaining pandemic-related information (TV/internet/a family member/other).

As noted earlier, respondents' quality of life was assessed *via* the WHOQOL-BREF scale. Its 26 items are separated into physical, psychological, social, and environmental domains, which are scored separately, and can be combined into a total score. In this study, the reliability of these four subscales was 0.72, 0.78, 0.72, and 0.83, respectively.

The WHOQOL-100 produces a quality-of-life profile based on respondents' self-reported perceptions. It is possible to derive six domain scores (pertaining to physical, psychological, level of independence, social relationships, environment, and spirituality domains), 24 specific facet scores, and one general facet score that reflects the overall quality of life and general health. While most domain and facet scores are scaled in a positive direction (whereby higher scores denote a higher quality of life), reverse scoring is applied for facets related to aspects that would undermine health and wellbeing (such as pain and discomfort, negative feelings, and dependence on medication). Thus, these differences need to be taken into account when deriving the total QoL score. On the other hand, scores pertaining to the overall quality of life and general health can be summed and presented as a part of a respondent's profile<sup>24</sup>.

The third component of the survey consisted of the DASS-21 instrument, whereby the respondents were instructed to focus on their mental health during the COVID-19 pandemic. DASS-21 was chosen, as it has demonstrated excellent metric properties in studies during the COVID-19 pandemic<sup>25</sup>. As indicated earlier, each of its three subscales – depression, anxiety, and stress – requires a response on a four-point Likert scale ranging from 0 (never) to 3 (almost always). In this study, the reliability of these subscales was 0.88, 0.86, and 0.88, respectively.

### Statistical Analysis

For the numerical data, mean (M) and standard deviation (SD) were reported, while count (N) and frequency (%) were used for categorical data.

Independent samples *t*-test and ANOVA were conducted to evaluate the differences between the mean scores in the four QoL health domains, overall QoL, and three DASS-21 domains, as well as overall DASS-21 with respect to participants' general characteristics. For assessing the correlations among the domain scales, the Pearson correlation coefficient was calculated, while stepwise linear regression analysis was conducted to assess the associations between the QoL predictors and DASS-21 domains. The effect estimates were presented as beta ( $\beta$ ) coefficients, along with the corresponding 95% confidence intervals. Thus, prior to employing multiple regression models, the collinearity of the independent variables was examined. The findings confirmed the absence of multicollinearity, as the Tolerance value was considerably higher than the 0.10 threshold and the VIF (as the reciprocal of Tolerance) exceeded 10. Finally, the internal consistency of domains and scales as a whole was assessed *via* the Cronbach  $\alpha$  coefficient and  $p \leq 0.05$  was considered statistically significant. All statistical analyses were carried out using IBM SPSS Statistics for Windows, ver. 24.0 (IBM Corp., Armonk, NY, USA).

## Results

The study sample consisted of 255 young volunteers (71.4% females, 28.6% males), 62.0% of whom were aged 18-25 years, and 52.2% were students. A large percentage (39.6%) of these young individuals had volunteered for more than 12 months at the time of completing the survey. Analyses further revealed that 31.0% of the sample previously had COVID-19 infection, while 75.3% (98.0%) reported having a household member (friend) that was COVID-19 positive at some point during the pandemic. For the majority of the volunteers, internet (56.9%) was the main source of information on the COVID-19 pandemic, followed by television (27.8%), and a family member (9.8%).

Bivariate analysis revealed a significant difference in the means in respondents' scores in all four domains, as well as overall QoL and mental health, with respect to several demographic variables. As shown in Table I, when the sample was segregated by gender, significantly higher values were noted for males in the mean scores obtained for physical capacity ( $p < 0.01$ ), psychological ( $p < 0.05$ ), and environment ( $p < 0.05$ ) domains, as well as overall QoL ( $p < 0.05$ ). Employed participants also had significantly higher mean scores

**Table I.** General characteristic of sample and bivariate analysis.

	n (%)	WHOQOL domains					DASS-21 domains			
		1 Mean (SD)	2 Mean (SD)	3 Mean (SD)	4 Mean (SD)	5 Mean (SD)	1 Mean (SD)	2 Mean (SD)	3 Mean (SD)	4 Mean (SD)
<b>Gender (<i>p</i>-value)</b>		0.008	0.026	0.881	0.006	0.036	0.103	0.020	0.056	0.037
Male	73 (28.6%)	16.67 (1.98)	15.38 (2.85)	15.82 (3.37)	14.89 (2.82)	15.69 (2.37)	9.33 (5.45)	4.30 (4.10)	4.36 (4.32)	6.00 (4.33)
Female	182 (71.4%)	16.00 (1.78)	14.59 (2.40)	15.75 (3.15)	13.88 (2.56)	15.05 (2.07)	10.51 (5.09)	5.80 (4.78)	5.60 (4.82)	7.30 (4.56)
<b>Age (<i>p</i>-value)</b>		0.262	0.858	0.884	0.728	0.811	0.369	0.151	0.075	0.146
18 - 25	158 (62.0%)	16.29 (1.79)	14.79 (2.43)	15.75 (3.12)	14.22 (2.56)	15.26 (2.05)	10.40 (4.92)	5.70 (4.58)	5.66 (4.68)	7.25 (4.40)
26 - 30	97 (38.0%)	16.02 (1.96)	14.85 (2.76)	15.81 (3.34)	14.10 (2.86)	15.19 (2.38)	9.79 (5.65)	4.84 (4.71)	4.58 (4.72)	6.40 (4.69)
<b>Employment status (<i>p</i>-value)</b>		0.635	0.049	0.828	0.412	0.606	0.078	0.591	0.120	0.183
Student	133 (52.2%)	16.21 (1.86)	14.72 (2.44)	15.70 (3.13)	13.96 (2.44)	15.16 (2.06)	10.51 (4.96)	5.62 (4.43)	5.77 (4.58)	7.30 (4.34)
Employed	65 (25.5%)	16.32 (1.98)	15.44 (2.80)	15.71 (3.02)	14.42 (2.90)	15.47 (2.31)	8.92 (5.99)	4.91 (5.02)	4.32 (5.00)	6.05 (4.99)
Unemployed	57 (22.4%)	16.00 (1.72)	14.34 (2.44)	16.00 (3.60)	14.39 (2.92)	15.18 (2.30)	10.79 (4.65)	5.30 (4.71)	5.07 (4.59)	7.05 (4.32)
<b>Volunteering duration (<i>p</i>-value)</b>		0.532	0.569	0.073	0.166	0.854	0.007	0.772	0.730	0.439
< 6 months	68 (26.7%)	16.39 (1.90)	15.10 (2.73)	15.02 (3.38)	14.60 (2.81)	15.27 (2.26)	8.59 (5.49)	5.41 (5.09)	5.49 (5.57)	6.50 (5.04)
6 - 12 months	86 (33.7%)	16.06 (1.73)	14.72 (2.31)	15.95 (3.04)	13.78 (2.33)	15.13 (2.01)	11.21 (4.79)	5.62 (4.61)	5.40 (4.55)	7.41 (4.36)
>12 months	101 (39.6%)	16.16 (1.94)	14.71 (2.64)	16.12 (3.16)	14.21 (2.82)	15.30 (2.28)	10.35 (5.15)	5.13 (4.37)	4.96 (4.24)	6.81 (4.30)
<b>COVID-19 among household members (<i>p</i>-value)</b>		0.040	0.076	0.465	0.005	0.124	<0.001	0.051	0.081	0.002
Yes	192 (75.3%)	16.05 (1.86)	14.65 (2.46)	15.85 (3.11)	13.91 (2.60)	15.11 (2.13)	11.02 (4.89)	5.69 (4.51)	5.54 (4.52)	7.42 (4.29)
No	63 (24.7%)	16.61 (1.79)	15.31 (2.79)	15.51 (3.48)	14.98 (2.76)	15.60 (2.29)	7.59 (5.35)	4.38 (4.93)	4.35 (5.18)	5.44 (4.92)
<b>COVID-19 among friends (<i>p</i>-value)</b>		0.033	0.200	0.872	0.032	0.123	0.047	0.212	0.282	0.119
Yes	250 (98.0%)	16.16 (1.85)	14.79 (2.53)	15.77 (3.20)	14.12 (2.66)	15.20 (2.16)	10.26 (5.18)	5.42 (4.66)	5.29 (4.73)	6.99 (4.52)
No	5 (2.0%)	17.94 (1.32)	16.27 (3.85)	16.00 (4.00)	16.70 (2.11)	16.72 (2.55)	5.60 (5.03)	2.80 (2.95)	3.00 (3.74)	3.80 (3.69)
<b>COVID-19 among participants (<i>p</i>-value)</b>		0.059	0.329	0.068	0.155	0.073	0.009	0.023	0.155	0.023
Yes	79 (31.0%)	15.86 (1.94)	14.58 (2.59)	15.22 (3.13)	13.82 (2.81)	14.87 (2.27)	11.43 (4.87)	6.35 (4.35)	5.87 (4.70)	7.89 (4.27)
No	176 (69.0%)	16.34 (1.81)	14.92 (2.54)	16.02 (3.22)	14.33 (2.60)	15.40 (2.12)	9.60 (5.27)	4.93 (4.71)	4.97 (4.70)	6.50 (4.58)
<b>The most common source about COVID-19 pandemic (<i>p</i>-value)</b>		0.223	0.169	0.112	0.142	0.104	0.033	0.052	0.035	0.024
TV	71 (27.8%)	16.25 (1.41)	15.00 (2.26)	16.39 (2.85)	14.69 (2.44)	15.58 (1.81)	10.07 (4.77)	5.13 (4.51)	4.83 (5.00)	6.68 (4.39)
Internet	145 (56.9%)	16.03 (1.94)	14.57 (2.54)	15.42 (3.26)	13.84 (2.81)	14.96 (2.25)	10.77 (5.14)	5.92 (4.74)	5.85 (4.60)	7.51 (4.51)
Household member	25 (9.8%)	16.55 (2.31)	14.99 (3.02)	15.47 (3.61)	14.46 (2.55)	15.36 (2.49)	8.56 (6.46)	4.28 (4.61)	4.52 (4.76)	5.79 (5.00)
Other	14 (5.5%)	16.94 (1.99)	16.05 (3.08)	16.76 (3.21)	14.50 (2.22)	16.06 (2.33)	7.29 (4.51)	2.86 (3.28)	2.43 (2.90)	4.19 (3.09)

for the psychological domain compared to students and unemployed ( $p < 0.05$ ). In addition, significantly higher mean physical capacity domain scores were established for volunteers whose household members ( $p < 0.05$ ) and friends ( $p < 0.05$ ) have had COVID-19 infection. The same findings related to the environment domain, albeit with different  $p$ -values ( $p < 0.01$  and  $p < 0.05$ , respectively).

Significantly higher values were noted for the anxiety ( $p < 0.05$ ) and DASS-21 total ( $p < 0.05$ ) scores obtained by women compared to men. Moreover, respondents that had 6-12 volunteering experience ( $p < 0.01$ ) as well as those whose friends had tested positive for COVID-19 ( $p < 0.05$ ) had statistically significantly higher scores related to the stress domain relative to others. Likewise, respondents that have had COVID-19 infection or reported having had a COVID-19-positive household member scored higher on both stress (at  $p < 0.001$  and  $p < 0.01$  level of significance, respectively) and anxiety subscales ( $p < 0.05$ ), as well as DASS-21 Total ( $p < 0.01$  and  $p < 0.05$ , respectively) compared to those that did not. Similarly, greater Stress ( $p < 0.05$ ), Anxiety ( $p < 0.05$ ), Depression ( $p < 0.05$ ), and DASS-21 Total ( $p < 0.05$ ) mean scores were obtained by volunteers who primarily relied on the internet to obtain COVID-19-related information.

The descriptive statistics are reported in Table II, along with the correlations between WHOQOL and DASS-21 domains. As can be seen from the results, the subscales of both instruments are internally correlated, while being negatively correlated with the domains of the other scale.

As previously noted, prior to employing multiple regression models, the collinearity of the independent variables was examined. The findings confirmed the absence of multicollinearity, as the Tolerance value was considerably higher than the 0.10 threshold and its reciprocal VIF exceeded 10.

Next, stepwise linear regression analysis was conducted to determine the statistically significant predictors of the QoL aspects captured by different WHOQOL-BREF domains. For this purpose, gender, age, employment status, volunteering service duration, history of COVID-19 infection among household members, history of COVID-19 infection among friends and relatives, personal history of COVID-19 infection, and most frequently used sources for obtaining pandemic-related information were considered as independent variables. The analyses revealed that lower physical capacity scores could be predicted by female gender ( $\beta = 0.169$ ; 95% CI = [0.194, 1.189];  $p < 0.01$ ) and COVID-19 infection among friends ( $\beta = -0.138$ ; 95% CI = [-3.470, -0.227];  $p < 0.05$ ). Conversely, male gender ( $\beta = 0.133$ ; 95% CI = [0.065, 1.440];  $p < 0.05$ ) and being employed ( $\beta = 0.136$ ; 95% CI = [0.082, 1.508];  $p < 0.05$ ) predicted greater QoL in the psychological domain. The only predictor of a lower QoL in the social relationship domain was internet as the main COVID-19-related information source ( $\beta = -0.125$ ; 95% CI = [-1.603, -0.017];  $p < 0.05$ ). On the other hand, being female ( $\beta = 0.155$ ; 95% CI = [0.196, 1.628];  $p < 0.05$ ) and having COVID-19-positive household members ( $\beta = -0.159$ ; 95% CI = [-1.733, -0.232];  $p = 0.01$ ) predicted lower environment domain scores. Internet as the main COVID-19-re-

**Table II.** Summary of WHOQOL-BREF and DASS-21 domains.

	M	SD	$\alpha$	1	2	3	4	5	6	7	8
1. Physical Capacity	16.2	1.9	0.73								
2. Psychological	14.8	2.6	0.78	0.75**							
3. Social Relationship	15.8	3.2	0.73	0.53**	0.56**						
4. Environment	14.2	2.7	0.83	0.73**	0.69**	0.54**					
5. WHOQOL Total	15.2	2.2	0.92	0.85**	0.87**	0.81**	0.86**				
6. Stress	10.2	5.2	0.88	-0.49**	-0.54**	-0.36*	-0.42**	-0.52**			
7. Anxiety	5.36	4.6	0.86	-0.44**	-0.44**	-0.39**	-0.36**	-0.47**	0.79**		
8. Depression	5.24	4.7	0.88	-0.47**	-0.54**	-0.46**	-0.39**	-0.55**	0.76**	0.84**	
9. DASS-21 Total	6.92	4.5	0.94	-0.50**	-0.55**	-0.44**	-0.42**	-0.56**	0.92**	0.94**	0.93**

\*  $p < .05$ ; \*\*  $p < .01$ .

lated information source was also a predictor of a lower overall QoL measured through the WHO-QOL-BREF ( $\beta = -0.143$ ; 95% CI = [-1.169, -0.092];  $p < 0.05$ ) (Table III).

To identify the main contributors to stress, as measured by DASS-21, three steps were considered, each of which had a statistically significant F statistic, and the findings are reported in Table IV. Based on the third step of the stepwise regression analysis, having COVID-19-positive household members ( $\beta = 0.241$ ; 95% CI = [1.433, 4.387];  $p < 0.001$ ), being a student ( $\beta = -0.150$ ; 95% CI = [-3.222, -0.350];  $p < 0.05$ ) and personal history of COVID-19 infection ( $\beta = 0.127$ ; 95% CI = [0.029, 2.831];  $p < 0.05$ ) emerged as the most influen-

tial factors. Similarly, female gender ( $\beta = -0.133$ ; 95% CI = [-2.610, -0.117];  $p < 0.05$ ), TV as the main COVID-19-related information source ( $\beta = -0.125$ ; 95% CI = [-4.997, -0.072];  $p < 0.05$ ), and personal history of COVID-19 infection ( $\beta = 0.122$ ; 95% CI = [0.006, 2.445];  $p < 0.05$ ) contributed to greater anxiety scores. Likewise, higher depression scores were predicted by internet as the main COVID-19-related information source ( $\beta = 0.154$ ; 95% CI = [0.300, 2.617];  $p < 0.05$ ) and being a student ( $\beta = -0.123$ ; 95% CI = [-2.648, -0.015];  $p < 0.05$ ). Finally, for the lower overall DASS-21 score, having COVID-19-positive household members was the only significant predictor ( $\beta = 0.189$ ; 95% CI = [0.705, 3.250];  $p < 0.01$ ).

**Table III.** Predictors of WHOQOL-BREF scale.

Models	Beta (95% CI)
<b>Physical Capacity</b>	
Step 1: ( $\Delta R^2 = 0.023$ ; F (1,253) = 7.065; $p = 0.008$ )	
Gender (ref.: female)	0.165 (0.175 – 1.177), $p = 0.008$
Step 2: ( $\Delta R^2 = 0.039$ ; F (2,252) = 6.109; $p = 0.003$ )	
Gender (ref.: female)	0.169 (0.194-1.189), $p = 0.007$
COVID-19 infection among friends (ref.: no)	-0.138 (-3.470- -0.227), $p = 0.026$
<b>Psychological</b>	
Step 1: ( $\Delta R^2 = 0.016$ ; F (1,253) = 5.224; $p = 0.023$ )	
Employment status employed (ref.: student)	0.142 (0.115 – 1.550), $p = 0.023$
Step 2: ( $\Delta R^2 = 0.030$ ; F (2,252) = 4.975; $p = 0.008$ )	
Employment status employed (ref.: student)	0.136 (0.082 – 1.508), $p = 0.029$
Gender (ref.: female)	0.133 (0.065 – 1.440), $p = 0.032$
<b>Social Relationship</b>	
Step 1: ( $\Delta R^2 = 0.012$ ; F (1,253) = 4.042; $p = 0.045$ )	
Internet as a source of information about COVID-19 (ref.: TV)	-0.125 (-1.603 - -0.017), $p = 0.045$
<b>Environment</b>	
Step 1: ( $\Delta R^2 = 0.027$ ; F (1,253) = 7.921; $p = 0.005$ )	
COVID-19 among household members (ref.: no)	-0.174 (-1.832 - -0.324), $p = 0.005$
Step 2: ( $\Delta R^2 = 0.046$ ; F (2,252) = 7.192; $p = 0.001$ )	
COVID-19 among household members (ref.: no)	-0.159 (-1.733 - -0.232), $p = 0.010$
Gender (ref.: female)	0.155 (0.196 – 1.628), $p = 0.013$
<b>WHOQOL Total</b>	
Step 1: ( $\Delta R^2 = 0.017$ ; F (1,253) = 5.312; $p = 0.022$ )	
Internet as a source of information about COVID-19 (ref.: TV)	-0.143 (-1.169 - -0.092), $p = 0.022$

Independent variables: gender, age, employment status, duration of volunteering, the main source of information about Covid-19, COVID-19 infection among household members, COVID-19 infection among friends, COVID-19 infection among participants.

**Table IV.** Predictors of DASS-21 scale.

Models	Beta (95% CI)
<b>Stress</b>	
Step 1: ( $\Delta R^2 = 0.077$ ; $F(1,253) = 22.255$ ; $p < 0.001$ )	
COVID-19 infection among household members (ref.: no)	0.284 (1.997 – 4.860), $p < 0.001$
Step 2: ( $\Delta R^2 = 0.089$ ; $F(2,252) = 13.373$ ; $p < 0.001$ )	
COVID-19 infection among household members (ref.: no)	0.277 (1.912 - 4.762), $p < 0.001$
Employment status employed (ref.: student)	-0.123 (-2.879 - -0.059), $p = 0.041$
Step 3: ( $\Delta R^2 = 0.100$ ; $F(3,251) = 10.369$ ; $p < 0.001$ )	
COVID-19 infection among household members (ref.: no)	0.241 (1.433 – 4.387), $p < 0.001$
Employment status employed (ref.: student)	-0.150 (-3.222 - -0.350), $p = 0.015$
COVID-19 infection among participants (ref.: no)	0.127 (0.029 – 2.831), $p = 0.046$
<b>Anxiety</b>	
Step 1: ( $\Delta R^2 = 0.017$ ; $F(1,253) = 5.506$ ; $p = 0.020$ )	
Gender (ref.: female)	-0.146 (-2.750 - -0.240), $p = 0.020$
Step 2: ( $\Delta R^2 = 0.031$ ; $F(2,252) = 5.031$ ; $p = 0.007$ )	
Gender (ref.: female)	-0.146 (-2.742 - -0.249), $p = 0.019$
Household members as a source of information about COVID-19 pandemic (ref.: TV)	-0.131 (-5.132 - -0.185), $p = 0.035$
Step 3: ( $\Delta R^2 = 0.042$ ; $F(3,251) = 4.698$ ; $p = 0.003$ )	
Gender (ref.: female)	-0.133 (-2.610 - -0.117), $p = 0.032$
Household member as a source of information about COVID-19 pandemic (ref.: TV)	-0.125 (-4.997 - -0.072), $p = 0.044$
COVID-19 infection among participants (ref.: no)	0.122 (0.006 – 2.445), $p = 0.049$
<b>Depression</b>	
Step 1: ( $\Delta R^2 = 0.018$ ; $F(1,253) = 5.569$ ; $p = 0.019$ )	
Internet as a source of information about COVID-19 pandemic (ref.: TV)	0.147 (0.231 – 2.557), $p = 0.019$
Step 2: ( $\Delta R^2 = 0.029$ ; $F(2,252) = 4.802$ ; $p = 0.009$ )	
Internet as a source of information about COVID-19 pandemic (ref.: TV)	0.154 (0.300 – 2.617), $p = 0.014$
Employment status employed (ref.: student)	-0.123 (-2.648 - -0.015), $p = 0.047$
<b>DASS-21 Total</b>	
Step 1: ( $\Delta R^2 = 0.032$ ; $F(1,253) = 9.365$ ; $p = 0.002$ )	
COVID-19 infection among household members (ref.: no)	0.189 (0.705 – 3.250), $p = 0.002$

WHOQOL domains 1= Physical Capacity, WHOQOL domains 2= Psychological, WHOQOL domains 3= Social Relationship, WHOQOL domains 4= Environment, WHOQOL 5 = WHOQOL Total. DASS-21 domains 1 = Stress, DASS-21 domains 2 = Anxiety, DASS-21 domains 3 = Depression, DASS-21 4 = DASS-21 Total.

## Discussion

The COVID-19 pandemic has had a long-lasting secondary impact on a range of health parameters and the quality of life of the overall population, with a higher burden than the virus itself<sup>4</sup>. Young people, as a specific social category, were predominantly affected during the pandemic, as shown by numerous reports worldwide<sup>26</sup>.

In Serbia, less than a quarter of young people volunteered during the pandemic (22.6%), and the largest number of these individuals (78.7%) volunteered informally (by providing assistance in their neighborhood) while a small proportion

was involved in formally organized volunteering initiatives (by engaging in local government efforts, etc.)<sup>27</sup>. To the best of our knowledge, this is the first study in Serbia exploring mental health and QoL among young volunteers during the COVID-19 pandemic.

Our findings revealed that men had higher mean scores in all QoL domains, as well as overall QoL. Similar results were reported by Dale et al<sup>28</sup> for the Austrian population, indicating that Austrian women had poorer physical and environmental QoL both during the pandemic relative to their pre-pandemic levels and compared to men<sup>28</sup>. When our sample was segregated with respect

to employment status, a significant difference was noted for psychological health only, which was rated the highest by employed respondents, followed by students, and finally unemployed. These results concur with the findings based on a sample drawn from healthy Israeli adults, which indicated high levels of psychological distress, and a significant reduction in QoL (psychical, psychological, and social domains in particular), especially among women, younger adults, and the unemployed<sup>5</sup>.

We also found that respondents whose household members and friends had not been diagnosed with COVID-19 on average obtained higher scores in the physical capacity and environment domains, supporting the findings reported by Victorino et al<sup>29</sup> based on the analysis of a Brazilian sample. These results are expected, as women typically exhibit poorer mental health than men<sup>30</sup>. However, there is a growing body of evidence suggesting that this gender gap increased during the pandemic<sup>28,31</sup> highlighting the need to take gender into consideration when formulating and implementing mental health policies. Our results coincide with these general trends, as female volunteers scored higher on both anxiety and DASS-21 total scales compared to their male counterparts. Similar results were obtained by Liu et al<sup>32</sup>, who noted a higher prevalence of post-traumatic stress disorder (PTSD) symptoms among women. However, as volunteering is a wide-ranging practice that covers a plethora of heterogeneous activities, direct comparisons across studies are rarely possible.

During the COVID-19 pandemic, in most countries, pertinent information – such as infection and death rates, public health recommendations, governmental policies, and vaccine efficacy – was disseminated primarily *via* social media, online news portals, and television. However, as the information shared *via* unofficial channels is not regulated, it can mislead its consumers<sup>33</sup>. In recognition of this issue, WHO introduced the term ‘infodemic’ during the COVID-19 pandemic to emphasize that having access to a plethora of information (some accurate and some misleading) can have wide-reaching health effects. Our results concur with these assertions, as the highest levels of stress, anxiety, and depression, as well as the total score on the DASS-21 questionnaire, were noted for respondents who were predominantly informed about the COVID-19 pandemic *via* internet. The primary source of information about the COVID-19 pandemic also emerged as the pre-

dictor of the overall QoL. Similar findings were obtained in other studies aiming to determine associations between COVID-19-related information exposure and mental health. For example, Bendau et al<sup>33</sup> indicated that, in Germany, the extent of COVID-19-related media exposure was linked to the degree of psychological distress. In addition, Chu et al<sup>34</sup> observed that greater amounts of information from a larger number of sources were associated with higher COVID-19-related fear. Likewise, Mongkhon et al<sup>35</sup> demonstrated that people exposed to the information for three or more hours per day were at a greater risk of developing mental health disorders during the pandemic compared to those that perused such information sources less frequently. These results are in line with the findings obtained by Abbas et al<sup>36</sup> by reviewing literature on the importance of ensuring that correct information is conveyed *via* social media during the COVID-19 health crisis, which indicated that taking regular breaks from social media use is beneficial for users’ mental wellbeing.

Our analyses also enabled us to identify QoL and mental health predictors that may have value beyond the COVID-19 pandemic. Specifically, female gender and having a friend infected with the COVID-19 virus emerged as predictors of issues related to physical capacity and environment domains, which is in accordance with the results reported by Mohsen et al<sup>37</sup>. In addition, unemployment and female gender were predictors of lower QoL in the psychological domain, concurring with the results published by Purba et al<sup>38</sup>. For the overall mental health of the young volunteers that took part in our study, COVID-19 infection among household members was the main predictor. Thus, our overall results are supported by those reported by Mazza et al<sup>39</sup> and Mikić et al<sup>40</sup> who identified young age, female gender, and having a family member infected with COVID-19 as the main factors influencing mental health during the pandemic.

### **Limitations of the Study**

When interpreting the results reported here, several limitations should be noted. First of all, the sample size was relatively small and may not be representative of the general population of young Serbian volunteers. Although no generalizations can be made beyond the studied cohort, the results of this study provided an important insight into the mental health and QoL among volunteers in Serbia during the COVID-19 pandemic. Secondly, women comprised more than 70%



of the study sample and this imbalance in gender composition might have influenced the study results. Certainly, some evidence for sampling bias results from the fact that an above-average share of the participants was female. In addition, as all data analyzed as a part of this investigation was gathered *via* anonymous, self-reported online questionnaires, and even though this was a desired method during the pandemic, it is prone to bias and may have led to unreliable findings. Also, this was the cross-sectional nature of the study, which prevents causal inferences. Additionally, we cannot exclude remaining confounding caused by unmeasured variables, such as income or economic and political issues that were not assessed. Finally, it would have been interesting to compare our results with pre-COVID data, but comparisons were not possible, as there are no such data for young volunteers in Serbia.

## Conclusions

The results yielded by the present study contribute to the extant literature on the effects of COVID-19 pandemic on mental health and QoL among young volunteers. As they are rarely the subject of such investigations, the evidence provided in this work is highly relevant, as it could guide the policymakers in the ongoing efforts to safeguard the mental health of vulnerable populations. Such initiatives should incorporate all QoL domains and should especially focus on young women and the unemployed. Bearing in mind the importance of public engagement and community support in pandemics and other potential health crises, as well as generally in public health, these results are of importance for interventions far beyond the current pandemic.

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### Conflict of Interest

The Authors declare that they have no conflict of interests.

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### Ethics Approval

Our study was approved by the Institutional Review Board of Faculty of Medicine, University of Novi Sad (approval number 01-39/162).

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### Informed Consent

An informed consent form was obtained from the participants before participating in the study.

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### Availability of Data and Material

The authors give their consent for the article publication.

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### Authors' Contributions

Jelena Zvekić-Svorcan, Nataša Igić: conception and design of the study; Andrijana Mikić, Nataša Igić: analysis and interpretation of data; All authors: drafting the article and making critical revisions related to the relevant intellectual content of the manuscript; Jelena Zvekić-Svorcan, Milica Paut Kusturica: supervision; All authors: final approval of the version of the article to be published.

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