


BMJ Open Quality of life and associated factors among university students during the COVID-19 pandemic: a cross-sectional study

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ABSTRACT

Objective This study aimed to evaluate the quality of life (QoL) and determine its association with various factors and social support among university students during the COVID-19 pandemic after the end of movement lockdown.

Design, setting and participants This online cross-sectional study recruited 316 participants. The inclusion criteria were students 18 years and above who were registered with the faculties of medicine at Malaysian public universities located in Klang Valley and in the states of Penang and Kelantan in Peninsular Malaysia. The exclusion criteria were those who presented with psychotic disorders, bipolar mood disorder or a history of illicit drugs.

Outcome measures Participants were administered a self-reported questionnaire to gather data on demographic, personal, clinical and psychological characteristics. The questionnaire comprised of the 21-item Depression, Anxiety and Stress Scale, the Multidimensional Scale of Perceived Social Support, and the WHO Quality of Life-Brief Version (WHOQoL-BREF).

Results The psychological and social QoL scores were lower than the non-pandemic norms of the general population, while the physical health and environmental QoL scores were comparable. After adjusting for relevant demographic, personal and clinical variables, religious coping, greater number of hours of online classes attended, and greater social support from family, friends and significant others were significantly associated with higher QoL among the participants. Frustration due to study disruption, living in areas with a high prevalence of COVID-19 cases, and a higher severity of depressive and stress symptoms were significantly associated with lower QoL.

Conclusion COVID-19 impaired the QoL of university students even after the movement lockdown was lifted.

INTRODUCTION

SARS-CoV-2 is a highly infectious and contagious virus of the coronavirus family. Since the WHO announced it a global pandemic on 11 March 2020, the COVID-19 pandemic has been a major global health hazard.¹ Malaysia, which has been experiencing an alarming increase in the prevalence of COVID-19

Strengths and limitations of this study

- Data on quality of life (QoL) assessment among university students in response to the COVID-19 pandemic are lacking, particularly after the end of movement lockdowns.
- Data regarding the association between COVID-19-related stressors, psychological complications (such as depression, anxiety and stress), social support and QoL among university students during the COVID-19 pandemic are also scarce.
- This online cross-sectional study filled the research gap by recruiting university students from the northern and central parts of Peninsular Malaysia to evaluate QoL and determine its association with various factors and social support after the end of the movement lockdown.
- The respondents in this study may not be representative of the university student population due to the non-probability sampling method employed.
- The cross-sectional study design did not allow the causal relationship between various factors and QoL to be determined over time.

since early March 2020, imposed a movement control order (MCO) throughout the country from March to June 2020. Under MCO, all forms of public gatherings for social, religious, sporting or cultural purposes were banned, and all places of worship and business premises except for essential services were closed.² The MCO was lifted in June 2020, but the rate of spread of COVID-19 in the country has not been fully under control. Fear of being infected with COVID-19 and uncertainty about the future resulting from the socioeconomic downturn and the academic disruption stemming from this global pandemic have had enormous psychological effects on university students.³⁻⁷

Quality of life (QoL) has emerged as an important measure in psychiatric research due to its frequent use as an assessment and

treatment outcome indicator. The World Health Organization Quality of Life: Brief Version (WHOQoL-BREF) is a measurement tool that can be used to compare health-related QoL across many conditions and illnesses and to indicate the outcome of various QoL interventions.⁸ As movement lockdown and social distancing became the new norm in the daily life of university students during the height of the COVID-19 pandemic, they contributed to a significant reduction in students' activities, which is positively correlated to considerable deterioration in overall QoL.⁹ Hence, it is pivotal to investigate how the COVID-19 pandemic and the movement restrictions that followed affected the QoL of university students, as deterioration of QoL can contribute to diminished academic performance.¹⁰ Several factors, such as gender, education environment, years of study, depression and chronic illness, have been identified as predictors of QoL in university students.¹¹ In Malaysia, although the MCO was lifted in June 2020, all academic activities are still restricted, all classes are still being conducted online since April 2020, and university students have not been permitted to access the university's facilities. These new norms in the academic setting in Malaysia have disrupted the usual daily routine and academic progress of university students, who are the main stakeholders of higher education. This inevitable consequence of the COVID-19 pandemic may have had a considerable impact on university students' QoL. To the best of our knowledge, data on QoL assessment among university students in response to the COVID-19 pandemic are lacking, particularly after the end of movement lockdown. Moreover, data regarding the association between COVID-19-related stressors, psychological complications (such as depression, anxiety and stress), social support and QoL among university students during the COVID-19 pandemic are scarce. Hence, this study fills this research gap by (1) evaluating the QoL of university students and (2) assessing the association between various psychological factors, social support and QoL to identify significant predictors of QoL among university students while adjusting for demographic, personal and clinical factors during the uncertain time of the COVID-19 pandemic and after lifting the movement lockdown.

METHODS

Study setting and participants

This cross-sectional online survey was conducted from 1 July to 21 July 2020, which was 3 weeks after the Malaysian government lifted the MCO on 11 June 2020. During the data collection period, although the MCO had been lifted, the rate of spread of COVID-19 in the country has not been fully under control, with the number of cumulative COVID-19 cases at 8840 cases and the number of deaths at 123 cases at the end of the data collection period.¹² The data analysed in this study were partly based on the data from a cross-sectional survey of depression, anxiety and their associated factors among university

students in Malaysia during the COVID-19 pandemic. The sample size was calculated based on the following formula: $n = [(Z_{1-\alpha/2} \times \sigma) / \Delta]^2$, where n is the total estimated sample size; $Z_{1-\alpha/2}$ is the value representing the desired CI in which the confidence level selected was at 95%, with a critical value of 1.96; σ is the standard deviation (SD), which was 18.2 based on the QoL of the general population;¹³ and Δ is precision with a value of 2.5. Hence, the estimated sample size needed was 243 subjects (after considering an additional 20% sample loss). The study participants were recruited by snowball sampling from the medical faculties of Malaysian public university students in Klang Valley in central Peninsular Malaysia and in the states of Penang and Kelantan located in the northern region of Peninsular Malaysia. The online survey was initially disseminated to medical postgraduate students, who were asked to circulate the invitation to participate in the survey to other medical postgraduate students, medical undergraduate students, postgraduate and undergraduate students in medical sciences, and other students from the medical faculties of public Malaysian universities located in the targeted regions. We selected participants with a diverse range of demographic characteristics according to age, gender and marital status. Those who were 18 years and above and were registered as students at the faculties of medicine of the Malaysian public universities located in Klang Valley and the states of Penang and Kelantan in Peninsular Malaysia were eligible to participate. Those who presented with psychotic disorders, bipolar mood disorder or a history of illicit drug use were excluded from the study because these illnesses may lead to impaired mental capacity to answer the questionnaires, since people with these illnesses may present with psychotic symptoms, manic features and cognitive deficit. All participants provided informed consent and were assured of anonymity and data confidentiality. They completed the questionnaires through an online survey platform (Google Forms). A total of 381 participants responded to the online survey. We excluded 65 participants who took less than 60% of the median time to complete the questionnaires in this study (median time=15 min) to avoid any response bias. Double responses from the same participant were prevented by activating the 'limiting responses to once per person' function in Google Forms. The final sample size was 316 participants.

Data collection

A self-report questionnaire was administered to the participants to collect data on the following: demographic and personal characteristics, clinical factors, and COVID-19-related stressors and coping mechanisms of participants. The coding of the responses to the demographic and personal characteristics, clinical factors, and COVID-19-related stressors and coping is presented in online supplemental file 1. The self-reported questionnaire was constructed based on previous surveys on the psychological impact of severe acute respiratory syndrome

and Middle East respiratory syndrome epidemics on university and medical students.^{14–18} We included the self-reported questionnaire in online supplemental file 2. The participants were also administered the Malay version of the 21-item Depression, Anxiety and Stress Scale (DASS-21), the Malay version of the Multidimensional Scale of Perceived Social Support (MSPSS), and the Malay version of the WHOQoL-BREF. In this study, the DASS-21 subscale scores, MSPSS domain scores and WHOQoL-BREF domain scores were presented as continuous variables.

Demographic characteristics

Data on participants' demographic characteristics included age, gender, marital status and monthly living expenses. The assessment and coding of demographic characteristics are summarised in online supplemental file 1.

Personal characteristics

The personal characteristics assessed in this study were the types of courses enrolled in at the university, the level of study which the respondents were enrolled in at the university and living arrangements. The assessment and coding of personal characteristics are summarised in online supplemental file 1.

Clinical factors

Data on two clinical factors were collected in this study: history of pre-existing medical illnesses and history of pre-existing depressive and anxiety disorders. The assessment and coding of clinical factors are summarised in online supplemental file 1.

COVID-19-related stressors and coping mechanisms

Data on COVID-19-related stressors and coping mechanisms included in this study were hours of online classes attended per week, perceived prevalence of COVID-19 cases at the place of residence, frustration due to loss of daily routine, frustration due to disruption of study and use of religious coping to manage stress in response to the COVID-19 pandemic. The assessment and coding for COVID-19-related stressors and coping mechanisms are summarised in online supplemental file 1.

Depression, anxiety and stress

Presence of depression, anxiety and stress and severity of these symptoms were evaluated with DASS-21, which is a self-report questionnaire comprising seven items per subscale; the subscales are depression, anxiety and stress. Each item was scored on a Likert scale from 0 (did not apply to me at all) to 3 (applied to me very much). The sum scores were computed by adding the scores on the items per subscale and multiplying them by a factor of 2. The sum scores for each subscale may range between 0 and 42. Hence, the total score of the DASS-21 ranges from 0 to 120. The cut-off scores for DASS-21 to define cases are 9 for the depression subscale, 7 for the anxiety subscale and 14 for the stress subscale.¹⁹ The Malay

version of the DASS-21 has good Cronbach's α values of 0.75, 0.74 and 0.79 for the depression, anxiety and stress subscales, respectively.²⁰

Social support

Perceived social support was measured by the MSPSS, which is a self-administered instrument that measures the perceived adequacy of social support individuals receive from friends, family and significant others/special persons. The MSPSS has 12 items, and each item was rated on a 7-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). The cumulative score of the MSPSS ranges from 12 to 84. Each domain comprises four items, and the cumulative score for each domain ranges from 4 to 28. The higher the score, the higher the individual's level of perceived social support. The original version of the MSPSS has good internal consistency (Cronbach's $\alpha=0.88$).²¹ The Malay version of the MSPSS has been validated among Malaysian university students, showing a high internal consistency (Cronbach's $\alpha=0.94$).²²

Quality of life

The QoL of the participants was measured using the WHOQoL-BREF, which is a self-administered questionnaire used to assess QoL. It comprises 26 items: items 1 and 2 are general questions on QoL, and the other items are grouped into four domains (physical health, psychological, social relationship and environmental QoL). Each item is scored on a Likert scale ranging from 1 to 5. Each domain was scored with values from 0 to 100, with higher scores indicating better QoL. The WHOQoL-BREF has good psychometric properties.²³ The general norms for the WHOQoL-BREF domain scores are as follows: 73.5 (SD=18.1) for physical health QoL, 70.6 (SD=14.0) for psychological QoL, 71.5 (SD=18.2) for social relationship QoL and 75.1 (SD=13.0) for environmental QoL.¹³ The Malay version of the WHOQoL-BREF has demonstrated excellent psychometric properties, with an internal consistency (Cronbach's α) of 0.89.²⁴

Statistical analysis

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) V.26. Descriptive statistics were reported for participants' demographic, personal and clinical factors and COVID-19-related stressors and coping mechanisms, as well as for DASS-21, MSPSS and WHOQoL-BREF domain scores (to achieve objective 1 of the study). All categorical variables were presented as frequencies and percentages, while continuous variables were presented as mean and SD. There were no missing data.

To achieve objective 2 of the study, simple and multiple linear regression analyses were used to examine the association between COVID-19-related stressors and coping mechanisms, psychological factors, perceived social support and QoL domains. In the multiple linear regression analyses, we adjusted for relevant demographic,

personal and clinical variables. Multicollinearity was assessed by referring to the variance inflation factor, in which all the independent variables included in the multiple linear regression models had a score of <5, indicating no multicollinearity. The normal probability plot of the residuals of all the multiple linear regression models demonstrated that all the points lay in a reasonably straight diagonal line from bottom left to top right, indicating that the errors of the linear regression models were normally distributed. Statistical significance was set at $p < 0.05$ for the multiple linear regression analyses, and all p values were two-sided.

Patient and public involvement

This study was conducted without involvement of the participants, patients and the public. The findings of the study will be disseminated to the participants via email on request.

RESULTS

Study participants

All participants completed the questionnaire. The demographic, personal and clinical characteristics, and COVID-19-related stressors and coping mechanisms of the participants are summarised in [table 1](#).

The mean physical health, psychological, social relationship and environmental QoL scores were 75.31 (SD=15.11), 67.72 (SD=17.14), 68.32 (SD=18.22) and 74.61 (SD=13.68), respectively. The psychological characteristics, social support and QoL of the participants are presented in [table 1](#).

Association between various factors and physical health QoL

[Table 2](#) illustrates the associations between COVID-19-related stressors and coping mechanisms, psychological characteristics, social support and physical health QoL among the participants. Simple linear regression revealed that several factors were significantly associated with physical health QoL ([table 2](#)). However, the multiple linear regression model indicated that only three variables were significantly associated with higher physical health QoL: a greater number of hours of online classes attended per week ($B=0.287$, 95% CI 0.083 to 0.491, $p=0.006$), higher family support ($B=2.294$, 95% CI 0.848 to 3.740, $p=0.002$) and higher friend support ($B=2.660$, 95% CI 1.216 to 4.105, $p < 0.001$). In contrast, frustration due to study disruption ($B=-4.483$, 95% CI -7.35 to -1.652 , $p=0.002$) and greater severity of stress symptoms ($B=-0.299$, 95% CI -0.601 to -0.003 , $p=0.049$) were significantly associated with lower physical health QoL. The multiple linear regression model contributed to a significant regression equation of $F(20,295)=15.912$ ($p < 0.001$, $R^2=0.519$).

Association between various factors and psychological QoL

[Table 3](#) presents the association between COVID-19-related stressors and coping mechanisms, psychological characteristics, social support and psychological QoL

Table 1 Demographic, personal and clinical characteristics, COVID-19-related stressors and coping, psychological characteristics, social support, and quality of life of participants

Variables	n	%
Demographic characteristics		
Age	29.51*	6.16†
Gender		
Male	95	30
Female	221	70
Marital status		
Married	126	40
Single/divorcee/widowed	190	60
Living expenses spent per month		
≤3000 Malaysian ringgit	196	62
>3000 Malaysian ringgit	120	38
Personal characteristics		
Level of study which the respondents were enrolled in at the university		
Undergraduate course	138	44
Postgraduate course	178	56
Types of course enrolled in at the university		
Medical science-based	69	22
Medicine-based	247	78
Living arrangement		
Live alone/with friends	50	16
Live with family	266	84
Clinical characteristics		
History of pre-existing medical illnesses		
No	261	83
Yes	55	17
History of pre-existing depressive and anxiety disorders		
No	301	95
Yes	15	5
COVID-19-related stressors and coping		
Frustration due to loss of daily routine		
No	177	56
Yes	139	44
Mean hours of online classes attended per week	5.49*	3.45†
Frustration due to study disruption		
No	107	34
Yes	209	66
Was your place of living highly prevalent for COVID-19-positive cases?		
No	222	70
Yes	94	30
Religion helped you to cope with stress during COVID-19?		
No	101	32
Yes	215	68
Psychological characteristics		
Mean DASS-21 depression subscale score	8.53*	8.37†

Continued

Table 1 Continued

Variables	n	%
Mean DASS-21 anxiety subscale score	6.83*	7.98†
Mean DASS-21 stress subscale score	10.52*	8.95†
Social support		
Mean family support score	22.28*	4.87†
Mean friend support score	21.68*	4.72†
Mean significant other support score	22.07*	9.16†
Quality of life		
Mean physical health QoL score	75.31*	15.11†
Mean psychological QoL score	67.72*	17.14†
Mean social QoL score	68.32*	18.22†
Mean environmental QoL score	74.61*	13.68†

*Mean.
†SD.
DASS-21, 21-Item Depression, Anxiety and Stress Scale; QoL, quality of life.

among the participants. Simple linear regression illustrated that several factors were significantly associated with psychological QoL and these are listed in [table 3](#). The multiple linear regression model indicated that higher family support ($B=2.978$, 95% CI 1.633 to 4.322, $p<0.001$), higher friend support ($B=2.369$, 95% CI 1.026 to 3.712, $p=0.001$) and higher significant other support ($B=2.133$, 95% CI 1.004 to 3.263, $p<0.001$) were significantly associated with higher psychological QoL. Only two variables were significantly associated with lower psychological QoL: the perception that the area of residence had a high prevalence of COVID-19 cases ($B=-3.112$, 95% CI -5.658 to -0.566 , $p=0.017$) and greater severity of depressive symptoms ($B=-0.645$, 95% CI -0.898 to -0.393 , $p<0.001$). The multiple linear regression model contributed to a significant regression equation of $F(20,295)=30.897$ ($p<0.001$, $R^2=0.677$).

Associations between various factors and social relationship QoL

The associations between COVID-19 stressors and coping mechanisms, psychological characteristics, social support and social relationship QoL among the participants are summarised in [table 4](#). Simple linear regression indicated that several factors were significantly associated with social relationship QoL and these are listed in [table 4](#). Nevertheless, the multiple linear regression model showed that only agreement that religious coping helped manage stress ($B=4.013$, 95% CI 0.758 to 7.267, $p=0.016$), higher family support ($B=2.091$, 95% CI 0.367 to 3.815, $p=0.018$), higher friend support ($B=5.304$, 95% CI 3.582 to 7.026, $p<0.001$) and higher significant other support ($B=2.164$, 95% CI 0.716 to 3.612, $p=0.004$) were significantly associated with higher social relationship QoL. None of the variables predicted lower social relationship QoL. The multiple linear regression model contributed to

a significant regression equation of $F(20,295)=16.624$ ($p<0.001$, $R^2=0.530$).

Associations between various factors and environmental QoL

The associations between COVID-19-related stressors and coping mechanisms, psychological characteristics, social support and environmental QoL among the participants are illustrated in [table 5](#). Simple linear regression revealed that several factors were significantly associated with environmental QoL, as listed in [table 5](#). The multiple linear regression model confirmed that agreeing that religious coping helped to manage stress ($B=3.930$, 95% CI 1.315 to 6.545, $p=0.003$), higher family support ($B=1.794$, 95% CI 0.409 to 3.179, $p=0.011$), higher friend support ($B=3.100$, 95% CI 1.716 to 4.483, $p<0.001$) and higher significant other support ($B=2.369$, 95% CI 1.205 to 3.532, $p<0.001$) were significantly associated with higher environmental QoL. None of the variables predicted a lower environmental QoL. The multiple linear regression model contributed to a significant regression equation of $F(20,295)=12.631$ ($p<0.001$, $R^2=0.425$).

DISCUSSION

This study investigated the QoL of Malaysian university students and its association with various factors and social support when the country was still battling the COVID-19 pandemic and after the end of movement lockdown. As a comparison with the norms of the WHOQoL-BREF domain scores in the non-pandemic-affected general population,¹³ the psychological ($67.72_{(study)}$ vs $70.6_{(general population)}$) and social relationship ($68.32_{(study)}$ vs $71.5_{(general population)}$) QoL levels reported in our study were relatively low, whereas the physical health and environmental QoL levels were comparable. This finding was not surprising because the prevalence rates of depression, anxiety and stress among the participants in this study were 36%, 37% and 42%, respectively, which may have led to lower psychological QoL. Furthermore, social distancing and restrictions on organising and attending social activities as preventive measures to curb the spread of COVID-19 may have contributed to lower social relationship QoL.

We found that only a greater number of hours of online classes attended per week and higher family and friend support significantly predicted an increase in physical health QoL among the participants. The literature points out that chronic absenteeism from class is associated with a higher risk of engaging in health risk behaviours, such as cigarette smoking, chronic alcohol use and risky sexual behaviours. In contrast, a sense of academic achievement is associated with a higher level of general health.^{25 26} Hence, the finding that university students who attended a greater number of hours of classes had a higher physical health QoL in this study is in line with what has been described in the literature. For the relationship between family and friend support and physical health QoL, a survey of 2348 adults in the USA reported that having good friend networks and friend

Table 2 Association between various factors and physical health quality of life

Variables	Simple linear regression		Multiple linear regression model†	
	B (95% CI)	P value	B (95% CI)	P value
COVID-19-related stressors and coping				
Frustration due to loss of daily routine				
No	Reference		Reference	
Yes	-9.166 (-12.384 to -5.949)	<0.001*	-2.544 (-5.354 to 0.266)	0.076
Mean hours of online classes attended per week	0.240 (-0.014 to 0.493)	0.064	0.287 (0.083 to 0.491)	0.006*
Frustration due to study disruption				
No	Reference		Reference	
Yes	-8.367 (-11.783 to -4.952)	<0.001*	-4.483 (-7.315 to -1.652)	0.002*
Was your place of living highly prevalent for COVID-19-positive cases?				
No	Reference		Reference	
Yes	-3.647 (-7.289 to -0.005)	0.050	-2.001 (-4.740 to 0.738)	0.152
Religion helped you to cope with stress during COVID-19?				
No	Reference		Reference	
Yes	2.910 (-0.667 to 6.488)	0.110	1.928 (-0.803 to 4.658)	0.166
Psychological characteristics				
Mean DASS-21 depression subscale score	-0.997 (-1.164 to -0.830)	<0.001*	-0.062 (-0.334 to 0.210)	0.654
Mean DASS-21 anxiety subscale score	-0.909 (-1.093 to -0.724)	<0.001*	-0.254 (-0.540 to 0.031)	0.081
Mean DASS-21 stress subscale score	-0.959 (-1.113 to -0.804)	<0.001*	-0.299 (-0.601 to -0.003)	0.049*
Social support				
Mean family support score	6.284 (5.068 to 7.499)	<0.001*	2.294 (0.848 to 3.740)	0.002*
Mean friend support score	6.332 (5.102 to 7.561)	<0.001*	2.660 (1.216 to 4.105)	<0.001*
Mean significant other support score	3.967 (2.836 to 5.098)	<0.001*	0.217 (-0.997 to 1.432)	0.725

*Statistical significance at $p < 0.05$.

†Multiple linear regression model reported that $F(20,295)=15.912$, $p < 0.001$, with $R^2=0.519$, adjusted for age, gender, marital status, living expenses, level of study which the respondents were enrolled in at the university, course enrolled in at the university, living arrangement, and history of pre-existing medical, depressive and anxiety disorders.

DASS-21, 21-Item Depression, Anxiety and Stress Scale.

support predicted increases in good subjective health status. Conversely, family and friend relationship strain may decrease long-term physical health.²⁷ In addition, greater family and friend support is related to increased moderate-intensity and vigorous-intensity physical activity, which may enhance physical health QoL.^{28 29} Although our study did not assess participants' physical activity during the COVID-19 pandemic, increasing physical activity, such as exercising at home with family and friends, may help people cope with boredom and loss of daily routine, potentially enhancing physical health QoL. Our findings identified that frustration due to study disruption and higher severity of stress symptoms significantly predicted a decrease in participants' physical health QoL. Interestingly, further questioning of the participants indicated that they were complaining of uncertainty about their future as their study was prolonged, their graduation time would be delayed as a result of the COVID-19 pandemic, and that they were disturbed by loss of their daily academic routine,

such as their usual classes and clinical sessions. Moreover, a switch from conventional inperson or classroom teaching to the new norm of tele-education or online classes may have disrupted the academic momentum of university students, particularly medical students in vulnerable groups, such as those with financial difficulties and students living in rural or remote areas of the country. Such students may have experienced lack of internet access, problems with internet coverage and financial constraints that forced them to take up jobs to sustain them during the trying times of COVID-19, which may have hampered their commitment to adapt to the new norm of online learning.³⁰ The difficulties experienced by the participants were associated with increased severity of stress symptoms. High levels of stress among university students, particularly medical students, may lead to stress-related physical exhaustion, which may impair physical health QoL.³¹ Hence, our study findings further strengthen the link between higher severity of anxiety symptoms and lower physical health QoL.

Table 3 Association between various factors and psychological quality of life

Variables	Simple linear regression		Multiple linear regression model†	
	B (95% CI)	P value	B (95% CI)	P value
COVID-19-related stressors and coping				
Frustration due to loss of daily routine				
No	Reference		Reference	
Yes	-9.321 (-13.006 to -5.637)	<0.001*	-2.200 (-4.812 to 0.412)	0.098
Mean hours of online classes attended per week	0.202 (-0.087 to 0.491)	0.170	0.150 (-0.040 to 0.340)	0.121
Frustration due to study disruption				
No	Reference		Reference	
Yes	-5.814 (-9.776 to -1.852)	0.004*	0.362 (-2.270 to 2.994)	0.787
Was your place of living highly prevalent for COVID-19-positive cases?				
No	Reference		Reference	
Yes	-5.438 (-9.550 to -1.326)	0.010*	-3.112 (-5.658 to -0.566)	0.017*
Religion helped you to cope with stress during COVID-19?				
No	Reference		Reference	
Yes	5.212 (1.180 to 9.245)	0.011*	2.433 (-0.105 to 4.971)	0.060
Psychological characteristics				
Mean DASS-21 depression subscale score	-1.440 (-1.601 to -1.278)	<0.001*	-0.645 (-0.898 to -0.393)	<0.001*
Mean DASS-21 anxiety subscale score	-1.119 (-1.323 to -0.916)	<0.001*	-0.178 (-0.444 to 0.087)	0.187
Mean DASS-21 stress subscale score	-1.204 (-1.369 to -1.038)	<0.001*	-0.123 (-0.404 to 0.157)	0.387
Social support				
Mean family support score	9.082 (7.854 to 10.311)	<0.001*	2.978 (1.633 to 4.322)	<0.001*
Mean friend support score	8.500 (7.200 to 9.800)	<0.001*	2.369 (1.026 to 3.712)	0.001*
Mean significant other support score	6.744 (5.589 to 7.899)	<0.001*	2.133 (1.004 to 3.263)	<0.001*

*Statistical significance at $p < 0.05$.

†Multiple linear regression model reported that $F(20,295)=30.897$, $p < 0.001$, with $R^2=0.677$, adjusted for age, gender, marital status, living expenses, level of study which the respondents were enrolled in at the university, course enrolled in at the university, living arrangement, and history of pre-existing medical, depressive and anxiety disorders.

DASS-21, 21-Item Depression, Anxiety and Stress Scale.

Three factors were identified as significant predictors of higher psychological QoL: higher levels of (1) family, (2) friend and (3) significant other social support. Conversely, both higher severity of depression and perception of living in an area with a high prevalence of COVID-19 cases significantly predicted lower psychological QoL. Studies on the general population and healthcare workers during the COVID-19 pandemic have pinpointed that higher social support was associated with lower anxiety and depression, whereas lower social support was associated with higher anxiety and depression.^{32–36} Greater family and friend support, greater integration into a social network and having a larger social network are also protective against depression.³⁷ Higher family and friend support has also been shown to enhance psychological well-being.³⁸ Hence, it is not surprising that higher family, friend and significant other social support for the participants in this study was associated with higher psychological QoL. Our finding that those who perceived the area in which they lived to have a high prevalence

of COVID-19 cases showed reduced psychological QoL is similar to the findings of two studies in China, which reported that those living and working in close proximity to the epicentre of COVID-19 infection had higher odds of experiencing psychological symptoms such as depressive and post-traumatic stress disorder symptoms.^{36–39} The tighter movement control and the fear of contracting COVID-19 (for self and family) in those who perceived that they lived in an area with a high prevalence of COVID-19 cases may have led to the emergence of higher negative affect, depreciating respondents' psychological QoL. Depression has been reported to diminish psychological QoL, which is attributed to the mood disturbance experienced by a person with depression. The degree of decrement of psychological QoL is inversely proportional to the severity of depressive symptoms.⁴⁰ A study of 394 patients with depressive disorder in Ethiopia reported that the psychological QoL domain of the WHOQoL-BREF score was as low as 42.8 ± 8.20 .⁴¹ Hence, our finding of the inverse relationship between severity of depressive

Table 4 Association between various factors and social relationship quality of life

Variables	Simple linear regression		Multiple linear regression model†	
	B (95% CI)	P value	B (95% CI)	P value
COVID-19-related stressors and coping				
Frustration due to loss of daily routine				
No	Reference		Reference	
Yes	-7.319 (-11.306 to -3.332)	<0.001*	-0.727 (-4.077 to 2.622)	0.669
Mean hours of online classes attended per week	0.235 (-0.072 to 0.542)	0.133	0.190 (-0.053 to 0.433)	0.125
Frustration due to study disruption				
No	Reference		Reference	
Yes	-6.224 (-10.435 to -2.012)	0.004*	-2.487 (-5.862 to 0.888)	0.148
Was your place of living highly prevalent for COVID-19-positive cases?				
No	Reference		Reference	
Yes	-2.973 (-7.379 to 1.433)	0.185	-1.576 (-4.841 to 1.688)	0.343
Religion helped you to cope with stress during COVID-19?				
No	Reference		Reference	
Yes	6.353 (2.080 to 10.627)	0.004*	4.013 (0.758 to 7.267)	0.016*
Psychological characteristics				
Mean DASS-21 depression subscale score	-1.068 (-1.279 to -0.858)	<0.001*	-0.113 (-0.437 to 0.211)	0.491
Mean DASS-21 anxiety subscale score	-0.861 (-1.096 to -0.627)	<0.001*	-0.198 (-0.539 to 0.142)	0.252
Mean DASS-21 stress subscale score	-0.913 (-1.115 to -0.711)	<0.001*	-0.060 (-0.420 to 0.300)	0.742
Social support				
Mean family support score	8.547 (7.149 to 9.945)	<0.001*	2.091 (0.367 to 3.815)	0.018*
Mean friend support score	9.576 (8.239 to 10.913)	<0.001*	5.304 (3.582 to 7.026)	<0.001*
Mean significant other support score	6.895 (5.647 to 8.142)	<0.001*	2.164 (0.716 to 3.612)	0.004*

*Statistical significance at $p < 0.05$.

†Multiple linear regression model reported that $F(20,295)=16.624$, $p < 0.001$, with $R^2=0.530$, adjusted for age, gender, marital status, living expenses, level of study which the respondents were enrolled in at the university, course enrolled in at the university, living arrangement, and history of pre-existing medical, depressive and anxiety disorders.

DASS-21, 21-Item Depression, Anxiety and Stress Scale.

symptoms and psychological QoL is well documented in the literature.

Our study indicated that using religious coping to manage stress during the COVID-19 pandemic and having higher family, friend and significant other support predicted increased social relationship QoL among the university students. No factors were significantly associated with lower social relationship QoL. Religious practices like attending religious services often increase attendees' social networks and allow frequent exchanges and sharing of information compared with attending such services less frequently.⁴² It has been found that persons who attend religious services with one or both parents have greater promoted feelings of well-being, and those who attend religious services with their spouses exhibit enhanced relationship commitment.⁴³ Further questioning of the participants in our study revealed that those who attempted to cope with the MCO and COVID-19 pandemic with religious coping spent more time in prayers with family at home during the MCO; hence, they

strengthened their family ties and further enhanced their social relationship QoL. These results may explain the reason behind our finding that those who used religious coping to manage stress reported better social relationship QoL. The COVID-19 pandemic has changed the quality of social relationships in that people receive better support from their family, feel more caring towards their family and others, and share their feelings with others more often.⁴⁴ These shifts in social relationships support the association between higher family, friend and significant other support and greater social relationship QoL reported by the university students in this study.

The current study also highlighted that religious coping and greater family, friend and significant other support predicted an increase in environmental QoL, while none of the COVID-19-related stressors and psychological complications were associated with lower environmental QoL among university students during the COVID-19 pandemic. Similar to our study, in which most participants were Muslim, Gardner *et al*⁴⁵ surveyed 114 university

Table 5 Association between various factors and environmental quality of life

Variables	Simple linear regression		Multiple linear regression model†	
	B (95% CI)	P value	B (95% CI)	P value
COVID-19-related stressors and coping				
Frustration due to loss of daily routine				
No	Reference		Reference	
Yes	-4.879 (-7.886 to -1.873)	0.002*	-1.505 (-4.197 to 1.187)	0.272
Mean hours of online classes attended per week	0.281 (0.052 to 0.510)	0.016*	0.182 (-0.013 to 0.377)	0.068
Frustration due to study disruption				
No	Reference		Reference	
Yes	-4.390 (-7.556 to -1.223)	0.007*	-2.537 (-5.249 to 0.175)	0.067
Was your place of living highly prevalent for COVID-19-positive cases?				
No	Reference		Reference	
Yes	-1.263 (-4.577 to 2.051)	0.454	0.705 (-1.919 to 3.328)	0.597
Religion helped you to cope with stress during COVID-19?				
No	Reference		Reference	
Yes	4.361 (1.146 to 7.576)	0.008*	3.930 (1.315 to 6.545)	0.003*
Psychological characteristics				
Mean DASS-21 depression subscale score	-0.690 (-0.855 to -0.526)	<0.001*	-0.097 (-0.357 to 0.163)	0.464
Mean DASS-21 anxiety subscale score	-0.544 (-0.724 to -0.363)	<0.001*	-0.264 (-0.537 to 0.010)	0.059
Mean DASS-21 stress subscale score	-0.588 (-0.745 to -0.431)	<0.001*	0.055 (-0.234 to 0.344)	0.710
Social support				
Mean family support score	5.658 (4.556 to 6.760)	<0.001*	1.794 (0.409 to 3.179)	0.011*
Mean friend support score	6.328 (5.255 to 7.400)	<0.001*	3.100 (1.716 to 4.483)	<0.001*
Mean significant other support score	4.756 (3.792 to 5.719)	<0.001*	2.369 (1.205 to 3.532)	<0.001*

*Statistical significance at $p < 0.05$.

†Multiple linear regression model reported that $F(20,295)=12.631$, $p < 0.001$, with $R^2=0.425$, adjusted for age, gender, marital status, living expenses, level of study which the respondents were enrolled in at the university, course enrolled in at the university, living arrangement, and history of pre-existing medical, depressive and anxiety disorders.

DASS-21, 21-Item Depression, Anxiety and Stress Scale.

students in New Zealand and highlighted that religious coping was positively related to QoL. Assessment of the individual domains of the WHOQoL-BREF also indicated that positive religious coping is associated with an increase in environmental QoL,⁴⁶ supporting our finding that religious coping increased environmental QoL. Greater family, friend and significant other social support allows persons to strengthen their family ties, increase their social network size with friends and strengthen the positive relationship of a couple or partners. This may improve access of the person to resources and material goods, including financial support. Greater self-efficacy, competence and self-esteem as a result of good support from social networks may increase the sense of security in relation to physical surroundings and daily living, heightening environmental QoL.⁴⁷ Hence, it is not surprising that greater family, friend and significant other social support leads to higher environmental QoL, as reported by this study.

Based on the findings of this study, we can highlight a few recommendations to improve the QoL of university students during the COVID-19 pandemic. First, higher education institutions (HEIs) should pay more attention to students who live in areas where COVID-19 cases are highly prevalent because these groups of students may have impaired QoL. Second, several psychological factors were reported to decrease QoL in this study, such as frustration due to study disruption and a higher severity of depressive and anxiety symptoms. During the COVID-19 pandemic, when social distancing is pivotal as an infection preventive measure, online psychosocial interventions that help curb these psychological complications are of utmost importance. Hence, HEIs should consider arranging online counselling or psychotherapy for university students needing these services. An example of an effective online psychosocial intervention for university students is the MePlusMe programme, which promotes psychological well-being,



supports mood and daily functioning, and enhances university students' study skills.⁴⁸ Third, as religious coping and family, friend and significant other social support increased the QoL of university students, HEIs and the government should focus on efforts to organise more online social support groups, encourage the use of web-conferencing applications to sustain social communication and relationships, and organise more online religious talks through HEI websites during the COVID-19 pandemic. Finally, a sufficient duration of online classes should be arranged to enhance the sense of academic satisfaction and reduce feelings of uncertainty among university students, considering that a greater number of hours of online classes attended improves the QoL of university students. However, the question of whether COVID-19-related stressors have an impact on the academic performance of university students is still unresolved. To date, few studies have investigated how COVID-19 has affected the academic performance of college students and the findings were inconsistent.^{10 49} Despite this shortfall, several factors may be associated with better academic performance during the COVID-19 pandemic, such as better understanding of students' expectations among university instructors, feedback from students after completion of an online class, effective course design according to students' needs and higher degree of happiness among students.^{50 51}

There are a few limitations to note in this study. First, the cross-sectional design of this study did not allow the causal relationship between various factors and QoL to be determined across time. Second, as the participants were not randomly sampled, they may not be representative of university students in Malaysia and hence this may restrict the generalisability of the findings. Third, as the questionnaires were all in the Malay language, it may have led to selection bias as international students could not participate. However, most international students in Malaysia are enrolled in private HEIs rather than in public universities.⁵² In addition, excluding respondents who took less than 60% of the median time of the sample to answer the online questionnaires may also lead to selection bias. Finally, we did not assess the socioeconomic background of the respondents in this study, which could be an important confounding factor. Students from lower socioeconomic backgrounds may have poor internet access and live in unfavourable living conditions, which may diminish their QoL during the COVID-19 pandemic.^{30 53} Despite these limitations, this study fills the research gap on the scarcity of data on QoL of university students after the movement lockdown ended and has allowed several recommendations to be made.

CONCLUSION

In conclusion, this study indicated that university students had lower psychological and social relationship QoL levels in response to the COVID-19 pandemic, even after the MCO was lifted. The current study identified

two COVID-19-related stressors that predicted lower QoL among university students: frustration due to study disruption and perception of living in an area with a high prevalence of COVID-19 cases. Two psychological factors were predictive of lower QoL: higher severity of depression and stress. Conversely, the greater number of hours of classes attended per week, religious coping, and higher family, friends and significant other social support were associated with higher QoL among university students. Our findings indicate the pivotal role of online mental healthcare services and social support groups, and we have made some recommendations to improve the QoL of university students during the COVID-19 pandemic.

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