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Quality of Life of University Students During The COVID-19 Pandemic: Age, History of Medical Illness, Religious Coping, COVID-19 Related Stressors, Psychological Factors and Social Support Were Predictive of Quality of Life

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Research

Keywords: Quality of life, depression, anxiety, social support, COVID-19 pandemic, university students

Posted Date: November 13th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-104496/v1

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Abstract

***Background**:* In Malaysia, the coronavirus disease 2019 (COVID-19) began to spread in March 2020, and the infection has not been fully controlled since then. Despite the significant impact of COVID-19 on mental health among university students, data on the related quality of life (QoL) are lacking in this group of the population. This study aimed to evaluate QoL and determine its association with various factors and social support in a cohort of Malaysian university students during the COVID-19 pandemic.

***Methods**:* This online, cross-sectional survey recruited 316 university students from the medical faculties of two Malaysian public universities. They were administered a self-reported questionnaire to gather data on demographic, personal, clinical and psychological characteristics; the 21-item depression, anxiety and stress scale (DASS-21) to assess the severity of their depressive, anxiety and stress symptoms; the multidimensional scale of perceived social support (MSPSS) to assess the degree of social support; and the World Health Organization quality of life-BREF (WHOQoL-BREF) to assess QoL.

***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. Religious coping; greater number of hours of online classes attended; and greater social support from family, friends and significant others were found to be significantly associated with higher QoL among the participants. Older age, frustration because of loss of daily routine and study disruption, living in areas with a high prevalence of COVID-19 cases, a history of pre-existing medical illness, and a higher severity of depressive and anxiety symptoms were significantly associated with lower QoL.

***Conclusion**:* COVID-19 impaired the QoL of university students even after the movement control order (MCO) was lifted. Our findings indicated the pivotal role of online mental and physical healthcare services to improve the QoL of university students during the uncertain time of the COVID-19 pandemic.

Background

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is a highly infectious and contagious virus belonging to the coronavirus family. Since its announcement by the World Health Organization (WHO) as a global pandemic on 11 March 2020, it has caused a major health hazard globally—the coronavirus disease 2019 (COVID-19) pandemic [1]. Malaysia, which has been experiencing an alarming increase in the prevalence of COVID-19 since early March 2020, imposed a movement control order (MCO) throughout the entire country from March 2020 to June 2020. Under the 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 was not fully under control. Fear of being infected with COVID-19 and uncertainty about the future resulting from the socioeconomic downfall and academic disruption stemming from this global pandemic have enormous psychological effects on university students [3–7].

Quality of life (QoL) has emerged as an important measure in psychiatric research because of its frequent use as an assessment and treatment outcome indicator. The WHO's quality of life-BREF (WHOQoL-BREF) is a QoL measuring tool that can be used to compare health-related QoL across a huge variety of conditions or illnesses; it is also used as a tool to indicate the outcome of various QoL interventions [8]. Several factors, such as gender, education environment, years of study, depression, and chronic illness have been identified as predictors of QoL in university students [9]. In the Malaysian context, despite the MCO was lifted in June 2020, all academic activities were still confined, in which all classes are still conducted online since April 2020 and university students were not permitted to access the university's facilities. These new norms in the academic setting in Malaysia disrupt the usual daily routine and academic progress among university students. To the best of our knowledge, to date, data on QoL assessment in university students in response to the COVID-19 pandemic are lacking. Hence, this study filled the research gap via the following activities: (1) evaluating the QoL of university students and (2) assessing the association between various demographic, personal, clinical and psychological factors; social support; and QoL to identify significant predictors of QoL among a cohort of university students during the uncertain time of the COVID-19 pandemic.

Methods

Study setting and participants

This cross-sectional online survey was conducted from 1 July 2020 to 21 July 2020, which was 3 weeks after the Malaysian government lifted the MCO (MCO was lifted on 11 June 2020). During the period of data collection, although the MCO had been lifted, the rate of spread of COVID-19 in the country was not 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 [10]. Recruitment of study participants was carried out by snowball sampling. Two of the largest public universities in Malaysia were selected as the sites of subject recruitment; these were as follows: (1) Universiti Kebangsaan Malaysia (UKM), located in the Klang Valley in the central part of Peninsular Malaysia, and (2) Universiti Sains Malaysia (USM), located in the states of Penang and Kelantan in the northern part of Peninsular Malaysia. Initially, the online survey was disseminated to medical postgraduate students from UKM and USM, and they were told 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 within the medical faculties of the two public Malaysian universities. We selected participants with a diverse range of demographic characteristics according to age, gender and marital status. The study was approved by the Human Research Ethics Committee of USM (USM/JEPeM/COVID19-21) and the Medical Research Committee of the Faculty of Medicine, UKM (UKMPPI/111/8/JEP-2020-370). Those who were 18 years and above, registered as students with the Faculty of Medicine of UKM and USM or the Advanced Medical and Dental Institute, USM, were eligible to participate in the study. Those who presented with psychotic disorders, bipolar mood disorder or a history of illicit drug use were excluded from the study. All the participants provided informed consent, and they were assured of anonymity and

data confidentiality. They completed the questionnaires through an online survey platform (Google Forms).

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 of the participants. The self-reported questionnaire was constructed based on previous surveys on the psychological impact of the SARS and MERS epidemics on university and medical students [11–15]. The participants were also administered the Malay version of the 21-item depression, anxiety and stress scale (DASS-21) to assess the severity of their depressive, anxiety and stress symptoms; the Malay version of the multidimensional scale of perceived social support (MSPSS) to assess the degree of social support; and the Malay version of the WHOQoL-BREF to assess QoL. 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 demographic characteristics of the participants collected in this study included age, gender, marital status and monthly living expenses. The age of participants was recorded as a continuous variable. The gender of participants was categorized into males and females. The marital status was coded into two groups, such as “married” and “single, divorce, or widowed”. Monthly living expenses was categorized into two groups, such as “≤ Ringgit Malaysia 3000” and “> Ringgit Malaysia 3000”.

Personal characteristics

The personal characteristics assessed in this study were types of courses enrolled in university and living arrangement. The responses to the types of course enrolled was reported in two groups: “medical science-based course” (Bachelor of Science, Master of Science and Doctorate degree) and “medicine-based course” (Bachelor of Medicine and Surgery, Master of Medicine and subspeciality training). The responses to living arrangement was coded as “living alone or living with friends” and “living with family”.

Clinical factors

Data on two clinical factors were collected in this study, which were history of pre-existing medical illnesses and history of pre-existing depressive and anxiety disorders. History of pre-existing medical illnesses was evaluated through the question, “Do you have history of any medical illnesses?” The responses were coded as “No” and “Yes”. History of pre-existing depressive and anxiety disorders was evaluated through the question, “Do you have history of any depressive or anxiety disorders?” The responses were coded as “No” and “Yes”.

COVID-19 related stressors and coping

Data on COVID-19 related stressors and coping included in this study were hours of online classes attended per week, perceived prevalence of COVID-19 cases at place of living, frustration because of loss of daily routine, frustration because of disruption of study and use of religious coping to manage stress in response to the COVID-19 pandemic. Hours of online classes attended per week was reported as a continuous variable. Perceived prevalence of COVID-19 cases at the area of living was investigated through the question, “Was your place of living located in an area with high prevalence of COVID-19 positive cases?” The responses were coded as “No” and “Yes”. Frustration due to loss of daily routine was reported through the question, “Did you feel frustrated during the movement control order because of loss of daily routine which you usually performed prior to the emergence of the COVID-19 pandemic?” The responses were coded as ‘No’ and ‘Yes’. Frustration due to disruption of study was assessed through the question, “Did you feel frustrated during the movement control order because your study or academic activities were disrupted?” The responses were coded as ‘No’ and ‘Yes’. The use of religious coping in managing stress during the COVID-19 pandemic was recorded based on the question, ‘Did religion help you to cope with stress during the COVID-19 pandemic?’ The responses were coded as ‘No’ and ‘Yes’.

Depression, anxiety and stress

The presence of depression, anxiety and stress as well as the severity of these symptoms were evaluated with the DASS-21. The DASS-21 is a self-report questionnaire consisting of 21 items, with 7 items per subscale; the subscales are depression, anxiety and stress. Each item is scored on a Likert scale from 0 (did not apply to me at all) to 3 (applied to me very much). Sum scores are computed by adding the scores on the items per subscale and multiplying them by a factor of 2. Sum scores for each of the subscales may range between 0 and 42. Hence, the total score of the DASS-21 ranges from 0 to 120. The cut-off scores for case findings in DASS-21 are as follows: 9 for the depression subscale, 7 for the anxiety subscale and 14 for the stress subscale [16]. The Malay version of the DASS-21 has good Cronbach’s alpha values of 0.75, 0.74 and 0.79 for the depression, anxiety and stress subscales, respectively [17].

Social support

The perceived social support received from family, friends and significant others were measured by the MSPSS. The MSPSS is a self-administered instrument that measures the perceived adequacy of the available amount of social support individuals receive from friends, family and significant others/special persons. The MSPSS has 12 items, where each item is rated on a 7-point Likert scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). Hence, the cumulative scores of the MSPSS range from 12 to 84. Each domain comprises four items; hence, the cumulative scores for each domain range from 4 to 28. The higher the score, the higher the level of perceived social support of the individual. The original version of the MSPSS has good internal consistency (Cronbach’s $\alpha = 0.88$) [18]. The Malay version of the MSPSS has been validated among Malaysian university students, showing a high internal consistency (Cronbach’s $\alpha = 0.94$) [19].

Quality of life

The quality of life of the participants was measured by the WHOQoL-BREF. The WHOQoL-BREF is a self-administered questionnaire that was used to assess the QoL of the subjects. It comprises 26 items; items 1 and 2 are general questions on QoL, whereas the other items are grouped into four domains (i.e. physical health, psychological, social relationship and environment-related QoL. Each item is scored on a Likert scale ranging from 1 to 5. Each domain is scored with values from 0 to 100, with higher scores indicating better QoL. The WHOQoL-BREF has good psychometric properties [20]. The general norms for the WHOQoL-BREF domain scores are as follows: 70.6 (standard deviation = 14.0) for psychological QoL, 73.5 (standard deviation = 18.1) for physical health QoL, 75.1 (standard deviation = 13.0) for environmental QoL and 71.5 (standard deviation = 18.2) for social relationships QoL [21]. The Malay version of the WHOQoL-BREF has also demonstrated excellent psychometric properties, with an internal consistency (Cronbach's α) of 0.89 [22].

Statistical analysis

Statistical analyses were performed with the Statistical Package for Social Sciences (SPSS) version 26 (SPSS 26; SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were reported for demographic, personal, clinical factors and COVID-19 related stressors and coping of the participants, as well as for the DASS-21, MSPSS and WHOQoL-BREF domain scores (to achieve objective 1 of the study). All the categorical variables were presented as frequencies and percentages, while the continuous variables were presented as means and standard deviations.

To achieve objective 2 of the study, the association between individual demographic, personal, clinical factors, COVID-19 stressors and coping, the depression, anxiety and stress scores; the family, friends and significant others support scores (independent variables); and the physical health, psychological, social relationship and environment-related QoL scores (dependent variables) were assessed with simple linear regression analysis. Then, any variables with a p-value < 0.1 (independent variables) were entered into multiple linear regression models with the physical health, psychological, social relationship and environment-related QoL scores as dependent 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 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.

Results

Study participants

This study recruited a total of 316 participants. The demographic, personal, clinical characteristics and COVID-19 related stressors and coping of the participants are summarised in Table 1. The mean age of the participants was 29.51 years (standard deviation [SD] = 6.16), and most participants were female (n =

221, 70%). More than half the participants were unmarried (*n* = 190, 60%). Most were enrolled in medicine-related courses (*n* = 247, 78%), and more than half of the participants spent less than Ringgit Malaysia 3000 on monthly expenses (*n* = 196, 62%). A larger proportion of the participants were Muslim (*n* = 219, 69%). More than half the participants (*n* = 215, 68%) felt that religion helped them to cope with stress in response to the COVID-19 pandemic, and most lived with their family while the MCO was in place (*n* = 266, 84%). More than half the participants (*n* = 209, 66%) felt frustrated because their studies or academic activities were disrupted during MCO, but less than half (*n* = 139, 44%) felt frustrated because they were unable to perform their usual daily routine during the MCO. Less than one-fifth of the participants had a history of pre-existing medical illnesses (*n* = 55, 17%), and only 5% (*n* = 15) had a history of pre-existing depressive and anxiety disorders. Three-tenths of the participants agreed that the area where they lived had a high prevalence of COVID-19 positive cases (*n* = 94, 30%), but only 5% (*n* = 17) had a history of being quarantined for 14 days because of exposure to COVID-19-positive cases.
The psychological characteristics, social support and QoL of the participants are presented in Table 2. The mean DASS-21 depression, anxiety and stress subscale scores were 8.53 (SD = 8.37), 6.83 (SD = 7.98) and 10.52 (SD = 8.95), respectively. The prevalence rates of depression, anxiety and stress were 36%, 37% and 42%, respectively. In terms of social support, the mean MSPSS family, friends and significant other domain scores were 22.28 (SD = 4.87), 21.68 (SD = 4.72) and 22.07 (SD = 9.16), respectively. The mean physical health QoL, psychological QoL, social relationship QoL and environment 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.

Associations between various factors and physical health related QoL among the participants

Table 3 illustrates the association among demographic, personal, clinical and psychological characteristics; social support; and physical health–related QoL among the participants. Simple linear regression revealed that several factors were significantly associated with physical health–related QoL ($p < 0.1$), and these are listed in Table 3. However, the multiple linear regression model indicated that only three variables were significantly associated with higher physical health–related QoL, which were a greater number of hours of online classes attended per week (B = 0.276, 95% confidence interval [CI] = 0.087–0.466, $p = 0.004$), higher family support (B = 2.400, 95% CI = 0.984–3.816, $p = 0.001$) and higher friend support (B = 2.709, 95% CI = 1.334–4.084, $p < 0.001$). In contrast, presence of frustration because of loss of daily routine (B = − 2.781, 95% CI = − 5.482 to − 0.080, $p = 0.044$), presence of frustration because of study disruption (B = − 4.066, 95% CI = − 6.851 to − 1.281, $p = 0.004$), and greater severity of anxiety symptoms (B = − 0.287, 95% CI = − 0.566 to − 0.008, $p = 0.044$) were significantly associated with lower physical health–related QoL. The multiple linear regression model contributed to a significant regression equation of $F(12, 303) = 26.299$, $p < 0.001$ with adjusted $R^2 = 0.491$.

Association between various factors and psychological-related QoL among the participants

Table 4 presents the association between demographic, personal, clinical and psychological characteristics; social support; and psychological-related QoL among the participants. Simple linear regression illustrated that several factors were significantly associated with psychological–related QoL ($p < 0.1$), and these are listed in Table 4. The multiple linear regression model indicated that those who agreed that religious coping helped them to manage their stress (B = 2.610, 95% CI = 0.081–5.139, $p = 0.043$), higher family support (B = 2.926, 95% CI = 1.581–4.272, $p < 0.001$), higher friend support (B = 2.360, 95% CI = 1.053–3.666, $p < 0.001$) and higher significant other support (B = 2.230, 95% CI = 1.107–3.353, $p < 0.001$) were significantly associated with higher psychological-related QoL. Only two variables were significantly associated with lower psychological-related QoL, which were the perception that the area of residence had a high prevalence of COVID-19 cases (B = − 3.392, 95% CI = − 5.888 to − 0.897, $p = 0.008$) and greater severity of depressive symptoms (B = − 0.640, 95% CI = − 0.892 to − 0.387, $p < 0.001$). The multiple linear regression model contributed to a significant regression equation of $F(12,303) = 43.310$, $p < 0.001$ with adjusted $R^2 = 0.653$.

Associations between various factors and social relationship QoL among the participants

The associations between demographic, personal, clinical and psychological characteristics; social support; and social relationship QoL among the participants are summarised in Table 5. Simple linear regression indicated that several factors were significantly associated with social relationship QoL ($p < 0.1$), and these are listed in Table 5. Nevertheless, the multiple linear regression model showed that only agreement that religious coping helped manage stress (B = 3.892, 95% CI = 0.651–7.132, $p = 0.019$), higher family support (B = 2.115, 95% CI = 0.400–3.830, $p = 0.016$), higher friend support (B = 5.494, 95% CI = 3.822–7.166, $p < 0.001$) and higher significant other support (B = 2.195, 95% CI = 0.756–3.633, $p = 0.003$) 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 $F(13,302) = 24.809$, $p < 0.001$ with adjusted $R^2 = 0.496$.

Associations between various factors and environment related QoL among the participants

The association between demographic, personal, clinical and psychological characteristics; social support; and environment QoL among the participants are illustrated in Table 6. Simple linear regression revealed that several factors were significantly associated with environment QoL ($p < 0.1$), and these are listed in Table 6. The multiple linear regression model confirmed that agreeing that religious coping helped to manage stress (B = 3.607, 95% CI = 1.036–6.178, $p = 0.006$), higher family support (B = 1.670, 95% CI = 0.299–3.042, $p = 0.017$), higher friend support (B = 2.978, 95% CI = 1.637–4.320, $p < 0.001$) and higher significant other support (B = 2.302, 95% CI = 1.191–3.413, $p < 0.001$) were significantly associated with higher environment QoL. In contrast, increasing age (B = − 0.447, 95% CI = − 0.660 to − 0.235, $p < 0.001$) was the only variable significantly associated with lower environmental QoL. The multiple linear

regression model contributed to a significant regression equation of $F(12,303) = 20.341$, $p < 0.001$ with adjusted $R^2 = 0.424$.

Discussion

This study investigated the QoL of a cohort of Malaysian university students and its association with various factors and social supports at a time when the country is still battling the COVID-19 pandemic. As a comparison to the norms of the WHOQoL-BREF domain scores in the non-pandemic affected general population [21], the psychological ($67.72_{[study]}$ vs $70.6_{[general\ population]}$) and social relationship QoL levels ($68.32_{[study]}$ vs $71.5_{[general\ population]}$) reported in our study were relatively low, whereas the physical health and environment 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 lead to lower psychological QoL. Furthermore, the practice of social distancing and the restriction on organising and attending social activities as preventive measures to curb the spread of COVID-19 may contribute 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 pointed 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 [23, 24]. Hence, the finding that university students who attended a greater number of hours of classes had higher physical health QoL in this study was in line with what was described in the literature. For the relationship between family and friend support and physical health QoL, a survey of 2348 adults in the United States reported that having good friend networking and friend support predicted increases in good subjective health status. Conversely, family and friend relationship strain may dampen long-term physical health [25]. In addition, greater family and friend support is related to increased moderate-and vigorous-intensity physical activity, which may enhance physical health–related QoL [26, 27]. Although our study did not assess the amount of physical activity engaged in by participants during the COVID-19 pandemic, increasing physical activities, such as exercise at home with family and friends, may be helpful to cope with boredom and a loss of daily routine, potentially enhancing the physical health QoL of the participants. Our findings identified that COVID-19-related stressors (e.g. frustration because of the loss of daily routine and frustration because of study disruption) and higher severity of anxiety symptoms significantly predicted a decrease in physical health QoL of the participants. 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 they were disturbed by loss of their daily academic routine, such as their usual classes and clinical sessions. These difficulties experienced by the participants were associated with increased severity of anxiety symptoms in this study. Similarly, a literature review conducted by Mendlowicz and Stein (2000) highlighted that panic disorder with agoraphobia and generalised anxiety disorder were linked to lower

physical health QoL, whereas social phobia had a significant but lesser influence on the physical health QoL of anxiety disorder patients [28]. Hence, our study findings further strengthened the link between higher severity of anxiety symptoms and lower physical health QoL.

Four factors were identified as significant predictors of higher psychological QoL, which were as follows: 1) participants who perceived religious coping as helpful to manage stress during the uncertain time of the COVID-19 pandemic and higher levels of 2) family, 3) friend and 4) significant other social support. Conversely, higher severity of depression and perception of living in an area with high prevalence of COVID-19 cases significantly predicted lowering of psychological QoL. It has been reported that 60% of 444 studies that quantitatively investigated the relationship between religious practices and beliefs and depression showed that engaging in more religious practices and activities reduced the severity of depression. Religious coping also increases the supportive community network of depressed people, allows depressed people to cope better in the presence of stressful life events, and facilitates the emergence of meaning and hope out of ordeals or traumatic events; all these factors reduce the severity of depression [29]. Further, questioning of the participants in this study revealed that they believed spending more time in prayer with family at home strengthened their confidence and enabled them to spend more time practising their religion. They also created new meaning out of their ordeal (movement being restricted), believing that God created this pandemic as a test for humankind and that those who embraced this challenge with patience and alliance with God would become stronger. These points may explain the reciprocal relationship between religious coping and higher psychological QoL in this study. Studies on the general population and healthcare workers during the spread of the COVID-19 pandemic pinpointed that higher social support was associated with lower anxiety and depression, whereas lower social support was associated with higher anxiety and depression [30–34]. Greater family and friend support, greater integration into a social network and having a larger social network are also protective against depression [35]. Higher family and friend support have also been shown to enhance psychological well-being [36]. 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 also reported that those who live and work in close proximity to the epicentre of COVID-19 infection had higher odds of experiencing psychological symptoms, such as depressive and posttraumatic stress disorder symptoms [34, 37]. The tighter movement control and fear of contracting the COVID-19 infection (for the 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, and this is attributed to the mood disturbance experienced by the depressed person. The degree of decrement of psychological QoL is inversely proportional to the severity of depressive symptoms [38]. A study of 394 depressive disorder patients in Ethiopia reported that the psychological QoL domain of the WHOQoL-BREF score were as low as 42.8 ± 8.2 [39]. Hence, our finding of the inverse relationship between depressive symptoms' severity and psychological QoL is well documented in the literature.

Our study indicated that using religious coping to manage their stress during the COVID-19 pandemic and having higher family, friend and significant other support predicted increased social relationship QoL among university students. No factors were significantly associated with lower social relationship QoL. Religious practices like attending religious services often increase the social network of attendees and allow frequent exchanges and sharing of information compared with attending such services less frequently [40]. 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 [41]. 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 enhanced their social relationship QoL further. These results may explain the reason behind our finding that those who utilised religious coping to manage stress reported better social relationship QoL. The COVID-19 pandemic has changed the quality of social relationships, where people receive more good support from their family, feel more caring towards family and others and share their feelings with others more often [42]. 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 the environmental QoL, while increasing age was associated with lower environmental QoL among university students during the COVID-19 pandemic. Like our study, in which most participants were Muslim, Gardner et al. (2014) surveyed 114 Muslim university students in New Zealand and highlighted that religious coping was positively related with QoL [43]. Assessment of the individual domains of the WHOQoL-BREF also indicated that positive religious coping is associated with an increase in environmental QoL [44], supporting our finding that religious coping increased environmental QoL. Greater family, friend and significant other social support allow 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 of the physical surroundings and daily living, heightening environmental QoL [45]. Hence, it is not surprising that greater family, friend and significant other social support leads to higher environmental QoL, as reported by this study. The relationship between age and QoL is still controversial. A few studies have reported that increasing age worsens QoL, particularly after controlling for a wide number of variables [46–48]. Similarly, our study indicated that older age worsened the environmental QoL after controlling for other demographic, personal, clinical and psychological factors, as well as social support.

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 older students and those 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 dampen QoL in this study, such as frustration because of loss of daily routine and study disruption and 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 the study skills of university students [49]. Third, as religious coping and family, friend, and significant other social support increased the QoL of university students, HEIs and the government may 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. Fourth, because students with a history of pre-existing medical illness are more likely to have impaired QoL, telemedicine services that involve online consultation with doctors are vital to maintain physical health and improve the QoL of these students. 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 improve the QoL of university students.

There are a few limitations to take note of 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 distribution of demographic characteristics of the participants did not reflect the demographic distribution of all Malaysian university students, our findings may not be generalised as representative of the Malaysian university student population. Despite these limitations, this study filled the research gap of the scarcity of data on QoL of Malaysian university students during the COVID-19 pandemic and 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 three COVID related stressors which predicted lower QoL among university students: frustration because of the loss of daily routine, frustration because of study disruption and perception of living in an area with high prevalence of COVID-19 cases. Two psychological factors were predictive of lower QoL: higher severity of depression and anxiety. While only one clinical factor, which was history of pre-existing medical illness and one demographic factor, which was increasing age were predictive of lower QoL among university students. Conversely, religious coping, higher family, friends and significant others social support were associated with higher QoL among university students. Our findings indicated the pivotal role of online mental and physical healthcare services, and we made some recommendations to improve the QoL of university students during the COVID-19 pandemic.

Abbreviations

COVID-19
coronavirus disease 2019; QoL:quality of life; DASS-21:21-item depression, anxiety and stress scale; MSPSS:multidimensional scale of perceived social support; WHOQoL-BREF:World Health Organization quality of life-BREF; MCO:movement control order; SARS-CoV-2:severe acute respiratory syndrome coronavirus-2; WHO:World Health Organization; UKM:Universiti Kebangsaan Malaysia; USM:Universiti Sains Malaysia; MERS:Middle East respiratory syndrome; SPSS:Statistical Package for Social Sciences; HEI:higher education institution

Declarations

Ethics approval and consent to participate

Ethics approval was obtained from Human Ethics Committee of the Medical Research Committee of the Faculty of Medicine, UKM (UKMPPI/111/8/JEP-2020-370) and the Human Research Ethics Committee of USM (USM/JEPeM/COVID19-21). All procedures performed in this study involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments. Informed consent was provided by the participants of the study.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This research was funded by the Short Term Grant (Grant number: 304/CIPPT/6315236) from Universiti Sains Malaysia. The funding source had no role in the design of the study, the collection, analysis and interpretation of the data, and the writing of the manuscript.

Authors’ contributions

MFILBA lead the study. MFILBA, NSM, SHT, and MAM collected the data. MFILBA prepared the original draft. NSM, SHT and MAM reviewed and edited the final manuscript. All authors have read and approved the final manuscript.

Acknowledgements

The authors thank Dr. Michael Wong Pak Kai and Dr. Sarah Firdaus from Universiti Sains Malaysia for their assistance in data collection of this research project.

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References

1. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (2020a). Accessed 19 Oct 2020.
2. Bunyan J. PM: Malaysia under movement control order from Wed until March 31, all shops closed except for essential services. The Malay Mail. 2020. https://www.malaymail.com/news/malaysia/2020/03/16/pm-malaysia-in-lockdown-from-wed-until-march-31-all-shops-closed-except-for/1847204. Accessed 19 Oct 2020.
3. Cao WJ, Fang ZW, Hou GQ, Han M, Xu, XR, Dong JX, et al. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res. 2020;287:112934.
4. Elmer T, Mepham K, Stadtfeld C. Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland. PLoS ONE. 2020;15(7):e0236337.
5. Li YC, Wang Y, Jiang JW, Valdimarsdóttir UA, Fall K, Fang F, et al. Psychological distress among health professional students during the COVID-19 outbreak. Psychol Med. 2020; doi: 10.1017/S0033291720001555.
6. Sundarasen S, Chinna K and Kamaludin K, Nurunnabi M, Mohammad Baloch G, Khoshaimet HB, al. Psychological impact of COVID-19 and lockdown among university students in Malaysia: implications and policy recommendations. Int J Environ Res Public Health. 2020;17(17):6206.
7. Zolotov Y, Reznik A, Bender S, Konstantinov V, Reznik A,1 Isralowitz R. (2020) COVID-19 fear, mental health, and substance use among Israeli university students. Int J Ment Health Addict. 2020; doi: 10.1007/s11469-020-00351-8.
8. Guyatt GH, Feeny DH, Patrick DL. Measuring health-related quality of life. Ann Intern Med. 1993;118(8):622-9.
9. Solis AC, Lotufo-Neto F. Predictors of quality of life in Brazilian medical students: a systematic review and meta-analysis. Braz J Psychiatry. 2019;41(6):556-67.
10. World Health Organization. COVID-19 in Malaysia Situation Report 10. Available at: file:///C:/Users/User/Downloads/malaysia-situation-report-10.pdf (2020b). Accessed 23 Oct 2020.

11. Wong JGWS, Cheung EPT, Cheung V, Cheung C, Chan MTY, Chua SE, et al. Psychological responses to the SARS outbreak in healthcare students in Hong Kong. Med Teach. 2004;26(7):657-66.
12. Loh L-C, Mohd Ali A, Ang T-H, Chelliah A. Impact of a spreading epidemic on medical students. Malays J Med Sci. 2006;13(2):30–6.
13. Wong TW, Gao Y, Tam WWS. Anxiety among university students during the SARS epidemic in Hong Kong. Stress Health. 2006;23(1):31–5.
14. Jeong H, Yim HW, Song YJ, Ki M, Min JA, Cho JH, et al. Mental health status of people isolated due to Middle East Respiratory Syndrome. Epidemiol Health. 2016;38:e2016048.
15. Preti E, Di Mattei V, Perego G, Ferrari F, Mazzetti M, Tarantoet, P., et al. The psychological impact of epidemic and pandemic outbreaks on healthcare workers: rapid review of the evidence. Curr Psychiatry Rep. 2020;22(8):43.
16. Lovibond SH, Lovibond PF. Manual for the Depression Anxiety Stress Scales. Sydney, NSW, Australia: Psychology Foundation of Australia; 1995.
17. Musa R, Fadzil MA, Zain Z. Translation, validation and psychometric properties of Bahasa Malaysia version of the Depression Anxiety and Stress Scales (DASS). ASEAN Journal of Psychiatry. 2007;8(2):82-9.
18. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J Pers Assess. 1988;52(1):30–41.
19. Ng CG, Amer Siddiq AN, Aida SA, Zainal NZ, Koh OH. Validation of the Malay version of the multidimensional scale of perceived social support (MSPSS-M) among a group of medical students in Faculty of Medicine, University Malaya. Asian J Psychiatr. 2010;3:3–6.
20. The WHOQOL Group. Development of the World Health Organization WHOQOL-BREF Quality of Life assessment. Psychol Med. 1998;28(3):551-8.
21. Hawthorne G, Herrman H, Murphy B. Interpreting the WHOQOL-BRÈF: preliminary population norms and effect sizes. Soc Indic Res. 2006;77:37–59.
22. Hasanah CI, Naing L, Rahman ARA. World Health Organization Quality of Life Assessment: Brief Version in Bahasa Malaysia. Med J Malaysia. 2003;58(1):79-88.
23. El Ansari W, Stock C. Is the health and wellbeing of university students associated with their academic performance? cross sectional findings from the United Kingdom. Int J Environ Res Public Health. 2010;7(2):509-27.
24. Allison MA, Attisha E, Council On School Health. The link between school attendance and good health. Pediatrics. 2019;143(2):e20183648.
25. Walen HR, Lachman ME. Social support and strain from partner, family, and friends: Costs and benefits for men and women in adulthood. J Soc Pers Relat. 2000;17(1):5-30.
26. Morrissey JL, Janz KF, Letuchy EM, Francis SL, Levy SM. The effect of family and friend support on physical activity through adolescence: a longitudinal study. Int J Behav Nutr Phys Act. 2015;12:103.

27. Smith GL, Banting L, Eime R, O'Sullivan G, van Uffelen JGZ. The association between social support and physical activity in older adults: a systematic review. Int J Behav Nutr Phys Act. 2017;14:56.
28. Mendlowicz MV, Stein MB. Quality of life in individuals with anxiety disorders. Am J Psychiatry. 2000;157(5):669–82.
29. Bonelli R, Dew RE, Koenig HG, Rosmarin DH, Vasegh S. Religious and spiritual factors in depression: review and integration of the research. Depress Res Treat. 2012;2012:962860.
30. Cai WP, Lian B, Song XR, Hou TY, Deng GH, Li HF, et al. A cross-sectional study on mental health among health care workers during the outbreak of Corona Virus Disease 2019. Asian J Psychiatr. 2020;51:10211.
31. Li Y, Peng J. Coping strategies as predictors of anxiety: exploring positive experience of Chinese university in health education in COVID-19 pandemic. Creat Educ. 2020;11:735-50.
32. Liu Q, Luo D, Haase JE, Guo QH, Wang XQ, Liu S, et al. The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health. 2020;8:e790–8.
33. Xiao H, Zhang Y, Kong DS, Li SY, Yang NX. The effects of social support on sleep quality of medical staff treating patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in China. Med Sci Monit. 2020;26,e923549-1–e923549-8.
34. Song X, Fu W, Liu X, Luo ZQ, Wang RX, Zhou N, et al. Mental health status of medical staff in emergency departments during the Coronavirus disease 2019 epidemic in China. Brain Behav Immun. 2020;88:60-5.
35. Nguyen AW, Chatters LM, Taylor RJ, Mouzon DM. Social support from family and friends and subjective well-being of older African Americans. J Happiness Stud. 2016;17(3):959–79.
36. McIlvane JM. Reinhardt JP. Interactive effect of support from family and friends in visually impaired elders. J Gerontol B Psychol Sci Soc Sci. 2001;56(6):374–82.
37. Guo J, Feng XL, Wang XH, van IJzendoorn MH. Coping with COVID-19: exposure to covid-19 and negative impact on livelihood predict elevated mental health problems in Chinese adults. Int J Environ Res Public Health. 2020;17(11):3857.
38. Berlim MT, Fleck MP. Quality of life and major depression. In: Ritsner MS and Awad AG. (eds) Quality of Life Impairment in Schizophrenia, Mood and Anxiety Disorders. Dordrecht: Springer; 2007. p. 241-252.
39. Shumye S, Belayneh Z, Mengistu N. Health related quality of life and its correlates among people with depression attending outpatient department in Ethiopia: a cross sectional study. Health Qual Life Outcomes. 2019;17:169.
40. Brewer G, Robinson S, Sumra A, Tatsi E, Gire N. The influence of religious coping and religious social support on health behaviour, health status and health attitudes in a British Christian sample. J Relig Health. 2015;54(6):2225–34.
41. Science Daily. Religion or spirituality has positive impact on romantic/marital relationships, child development, research shows. 2014. https://www.sciencedaily.com/releases/2014/12/141208105320.htm. Accessed 18 Oct 2020.

42. Zhang YF, Ma ZF. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning province, China: A cross-sectional study. Int J Environ Res Public Health. 2020;17(7):2381.
43. Gardner TM, Krägeloh CU, Henning MA. Religious coping, stress, and quality of life of Muslim university students in New Zealand. Ment Health Relig Cult. 2014;17(4):327-38.
44. Vitorino LM, Lucchetti G, Santos AEO, Lucchetti ALG, Ferreira EB, Adamiet NP, et al. Spiritual religious coping is associated with quality of life in institutionalized older adults. J Relig Health. 2016;55(2):549-59.
45. National Research Council (US) Panel on Understanding Divergent Trends in Longevity in High-Income Countries. Explaining Divergent Levels of Longevity in High-Income Countries. Washington (DC): National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK62364/. 2011. Accessed 18 Oct 2020.
46. Hunger M, Thorand B, Schunk M, Döring A, Menn P, Peters A, et al. Multimorbidity and health-related quality of life in the older population: results from the German KORA-age study. Health Qual Life Outcomes. 2011;9:53.
47. Parker L, Moran GM, Roberts LM, Calvert M, McCahon D. The burden of common chronic disease on health-related quality of life in an elderly community-dwelling population in the UK. Fam Pract. 2014;31(5):557-63.
48. Raggi A, Corso B, Minicuci N, Quintas R, Sattin D, De Torres L, et al. Determinants of quality of life in ageing populations: results from a cross-sectional study in Finland, Poland and Spain. PLoS One. 2016;11(7):e0159293.
49. Barrable A, Papadatou-Pastou M, Tzotzoli P. Supporting mental health, wellbeing and study skills in higher education: an online intervention system. Int J Ment Health Syst. 2018;12:54.

Tables

Table 1. Demographic, personal, clinical characteristics, and COVID-19 related stressors and coping of the 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:		
≤ Ringgit Malaysia 3000	196	62
> Ringgit Malaysia 3000	120	38
Personal characteristics:		
-Types of course enrolled in university:		
Medical science-based		22
Medicine-based	69	78
-Living arrangement:	247	
Live alone/with friends		16
Live with family	50	84
Clinical characteristics:	266	
-History of pre-existing medical illnesses:		
No		83
Yes	261	17
-History of pre-existing depressive and anxiety disorders:	55	
No		
Yes		95
COVID-19 related stressors and coping:	301	5
-Frustration due to loss of daily routine:	15	
No		
Yes		56

-Mean hours of online classes attended per week	177	44
-Frustration due to study disruption:	139	
No		3.45[$]
Yes	5.49[#]	
-Was your place of living highly prevalent for COVID-19 positive cases?		34
No	107	66
Yes	209	
-Religion helped you to cope with stress during COVID-19?		
No		70
Yes	222	30
	94	
		32
	101	68
	215	

[#] = mean, [$] = standard deviation

Table 2. Psychological characteristics, social support, and quality of life of the participants

Variables	Mean	Standard deviation
Psychological characteristics:		
-Depression:		
No	201[#]	63[$]
Yes	115[#]	37[$]
-Mean DASS-21 Depression Subscale score	8.53	8.37
-Anxiety:		
No	200[#]	63[$]
Yes	116[#]	37[$]
-Mean DASS-21 Anxiety Subscale score	6.83	7.98
-Stress:		
No	182[#]	58[$]
Yes	134[#]	42[$]
-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 environment QoL score	74.61	13.68

[#] = frequency, [$] = percentage

Table 3. The association between various factors and physical health-related QoL

Variables	Simple linear regression		Multiple linear regression model[a]	
	B	95% CI	B	95% CI
Demographic characteristics:				
-Age:	0.125	-0.147 to 0.397	-	-
- Gender:				
Male	Reference			
Female	1.237	-2.414 to 4.887	-	-
-Marital status:				
Married	Reference			
Single/divorcee/widowed	-2.407	-5.817 to 1.004	-	-
-Living expenses spent per month:				
≤ Ringgit Malaysia 3000				
> Ringgit Malaysia 3000	Reference			
Personal characteristics:	-0.898	-4.348 to 2.552	-	-
-Types of course enrolled in university:				
Medical science-based				
Medicine-based				
-Living arrangement:	Reference			
Live alone/with friends	1.950	-2.099 to 5.999	-	-
Live with family				
Clinical characteristics:	Reference			
-History of pre-existing medical illnesses:	3.643	-0.928 to 8.215	-	-
No				
Yes				
-History of pre-existing depressive and anxiety disorders:				
No	Reference		Reference	
Yes	-10.696*	-9.763 to -3.241	-6.502**	
COVID-19 related stressors and coping:				
-Frustration due to loss of daily routine:				

No		-14.951 to -6.441		
Yes	Reference		Reference	
-Mean hours of online classes attended per week	-12.640*		2.117	
-Frustration due to study disruption:				-4.152 to 8.386
No				
Yes		-20.392 to -4.889		
-Was your place of living highly prevalent for COVID-19 positive cases?	Reference		Reference	
No	-9.166*		-2.781**	
Yes				
-Religion helped you to cope with stress during COVID-19?	0.240*		0.276**	-5.482 to -0.080
No				
Yes		-12.384 to -5.949		
Psychological characteristics:	Reference		Reference	0.087 to 0.466
-Mean DASS-21 Depression Subscale score	-8.367*		-4.066**	
-Mean DASS-21 Anxiety Subscale score		-0.014 to 0.493		
-Mean DASS-21 Stress Subscale score				
Social support:				
-Mean family support score	Reference		Reference	-6.851 to -1.281
-Mean friend support score	-3.647*	-11.783 to -4.952	-1.938	
-Mean significant other support score				
	Reference			
	2.910	-7.289 to -0.005	-	-4.606 to 0.730
	-0.997*		-0.074	
	-0.909*		-0.287**	

	-0.959*	-0.667 to 6.488	-0.284	-
	6.284*		2.400**	-0.343 to 0.194
	6.332*	-1.164 to -0.830	2.709**	
	3.967*	-1.093 to -0.724	0.014	-0.566 to -0.008
		-1.113 to -0.804		-0.580 to 0.011
		5.068 to 7.499		0.984 to 3.816
		5.102 to 7.561		1.334 to 4.084
		2.836 to 5.098		-1.117 to 1.146

* = p < 0.1, ** = statistical significance at p < 0.05, a = multiple linear regression model reported that $F(12,303) = 26.299$, $p < 0.001$ with adjusted $R^2 = 0.491$

Table 4. The association between various factors and psychological-related QoL among the participants

Variables	Simple linear regression		Multiple linear regression model[a]	
	B	95% CI	B	95% CI
Demographic characteristics:				
-Age:	0.216	-0.091 to 0.524	-	-
- Gender:				
Male	Reference			
Female	-0.966	-5.107 to 3.176	-	-
-Marital status:				
Married	Reference		Reference	
Single/divorcee/widowed	-4.114*	-7.967 to -0.261	2.122	-0.433 to 4.678
-Living expenses spent per month:				
≤ Ringgit Malaysia 3000				
> Ringgit Malaysia 3000	Reference			
Personal characteristics:	-0.147	-4.062 to 3.767	-	-
-Types of course enrolled in university:				
Medical science-based				
Medicine-based				
-Living arrangement:	Reference			
Live alone/with friends	-2.373	-6.964 to 2.218	-	-3.696 to 2.652
Live with family				
Clinical characteristics:	Reference		Reference	
-History of pre-existing medical illnesses:	4.781*	-0.397 to 9.960	-0.522	
No				
Yes				
-History of pre-existing depressive and anxiety disorders:				
No	Reference		Reference	
Yes	-7.569*		-2.768	
COVID-19 related stressors and coping:				
-Frustration due to loss of daily routine:				-5.858 to

No		-12.509 to -2.630		0.321
Yes	Reference		Reference	
-Mean hours of online classes attended per week	-20.358*		-0.687	
-Frustration due to study disruption:				
No				
Yes		-29.001 to -11.714		-6.568 to 5.194
-Was your place of living highly prevalent for COVID-19 positive cases?	Reference		Reference	
No	-9.321*		-2.227	
Yes				
-Religion helped you to cope with stress during COVID-19?	0.202		-	
No				
Yes		-13.006 to -5.637		-4.761 to 0.307
Psychological characteristics:	Reference		Reference	
-Mean DASS-21 Depression Subscale score	-5.814*		0.390	
-Mean DASS-21 Anxiety Subscale score		-0.087 to 0.491		-
-Mean DASS-21 Stress Subscale score				
Social support:				
-Mean family support score				
-Mean friend support score		-9.776 to -1.852		-2.203 to 2.983
-Mean significant other support score	Reference		Reference	
	-5.438*		-3.392**	
	Reference		Reference	
	5.212*		2.610**	
		-9.550 to -1.326		-5.888 to -0.897
	-1.440*		-0.640**	

	-1.119*		-0.123	
		1.180 to 9.245		
	-1.204*		-0.159	0.081 to 5.139
	9.082*		2.926**	
	8.500*	-1.601 to -1.278	2.360**	
	6.744*	-1.323 to -0.916	2.230**	-0.892 to -0.387
		-1.369 to -1.038		-0.384 to 0.139
		7.854 to 10.311		-0.437 to 0.119
		7.200 to 9.800		
		5.589 to 7.899		1.581 to 4.272
				1.053 to 3.666
				1.107 to 3.353

* = p < 0.1, ** = statistical significance at p < 0.05, a = multiple linear regression model reported that $F(12,303) = 43.310$, $p < 0.001$ with adjusted $R^2 = 0.653$

Table 5. The association between various factors and social relationship QoL among the participants

Variables	Simple linear regression		Multiple linear regression model[a]	
	B	95% CI	B	95% CI
Demographic characteristics:				
-Age:	0.228	-0.100 to 0.555	-	-
- Gender:				
Male	Reference			
Female	2.870	-1.523 to 7.263	-	-
-Marital status:				
Married	Reference		Reference	
Single/divorcee/widowed	-7.264*	-11.309 to -3.219	-1.073	-4.323 to 2.178
-Living expenses spent per month:				
≤ Ringgit Malaysia 3000				
> Ringgit Malaysia 3000	Reference			
Personal characteristics:	-1.125	-5.285 to 3.035	-	-
-Types of course enrolled in university:				
Medical science-based				
Medicine-based				
-Living arrangement:	Reference			
Live alone/with friends	0.265	-4.624 to 5.153	-	-1.651 to 6.482
Live with family				
Clinical characteristics:	Reference		Reference	
-History of pre-existing medical illnesses:	8.557*	3.105 to 14.009	2.416	
No				
Yes				
-History of pre-existing depressive and anxiety disorders:				
No	Reference		Reference	
Yes	-6.224*		-3.817	
COVID-19 related stressors and coping:				
-Frustration due to loss of daily routine:				-5.237 to

No		-11.745 to -1.188		1.408
Yes	Reference		Reference	
-Mean hours of online classes attended per week	-6.466*		-2.006	
-Frustration due to study disruption:				
No				
Yes		-25.484 to -6.829		-7.776 to 0.142
-Was your place of living highly prevalent for COVID-19 positive cases?	Reference		Reference	
No	-7.319*		-0.897	
Yes				
-Religion helped you to cope with stress during COVID-19?	0.235		-	
No				
Yes		-11.306 to -3.332		-4.141 to 2.348
Psychological characteristics:	Reference		Reference	
-Mean DASS-21 Depression Subscale score	-6.224*		-1.914	
-Mean DASS-21 Anxiety Subscale score		-0.072 to 0.542		-
-Mean DASS-21 Stress Subscale score				
Social support:				
-Mean family support score				
-Mean friend support score		-10.435 to -2.012		-5.237 to 1.408
-Mean significant other support score	Reference			
	-2.973		-	
	Reference		Reference	
	6.353*		3.892**	
		-7.379 to 1.433		-
	-1.068*		-0.100	

	-0.861*		-0.156	
		2.080 to 10.627		0.651 to 7.132
	-0.913*		-0.101	
	8.547*		2.115**	
	9.576*	-1.279 to -0.858	5.494**	-0.424 to 0.224
	6.895*	-1.096 to -0.627	2.195**	
				-0.490 to 0.177
		-1.115 to -0.711		
				-0.456 to 0.254
		7.149 to 9.945		
		8.239 to 10.913		0.400 to 3.830
		5.647 to 8.142		3.822 to 7.166
				0.756 to 3.633

* = $p < 0.1$, ** = statistical significance at $p < 0.05$, a = multiple linear regression model reported that $F(13,302) = 24.809$, $p < 0.001$ with adjusted $R^2 = 0.496$

Table 6. The association between various factors and environment related QoL among the participants

Variables	Simple linear regression		Multiple linear regression model[a]	
	B	95% CI	B	95% CI
Demographic characteristics:				
-Age:	-0.225*	-0.470 to 0.020	-0.447**	-0.660 - -0.235
- Gender:				
Male	Reference			
Female	0.798	-2.507 to 4.104	-	-
-Marital status:				
Married	Reference			
Single/divorcee/widowed	-0.251	-3.348 to 2.845	-	-
-Living expenses spent per month:				
≤ Ringgit Malaysia 3000				
> Ringgit Malaysia 3000	Reference			
Personal characteristics:	-1.589	-4.708 to 1.530	-	-
-Types of course enrolled in university:				
Medical science-based				
Medicine-based				
-Living arrangement:	Reference			
Live alone/with friends	1.801	-1.864 to 5.466	-	-
Live with family				
Clinical characteristics:	Reference		Reference	
-History of pre-existing medical illnesses:	4.503*	0.379 to 8.628	-1.241	-4.549 to 2.066
No				
Yes				
-History of pre-existing depressive and anxiety disorders:				
No	Reference			
Yes	-2.038		-	
COVID-19 related stressors and coping:				-
-Frustration due to loss of daily routine:				

No		-6.031 to 1.954		
Yes	Reference			
-Mean hours of online classes attended per week	-5.050		-	
-Frustration due to study disruption:				-
No				
Yes				
-Was your place of living highly prevalent for COVID-19 positive cases?		-12.159 to 2.058		
No	Reference		Reference	
Yes	-4.879*		-1.231	
-Religion helped you to cope with stress during COVID-19?	0.281*		0.152	-3.846 to 1.383
No				
Yes		-7.886 to -1.873		-0.039 to 0.344
Psychological characteristics:	Reference		Reference	
-Mean DASS-21 Depression Subscale score	-4.390*		-2.481	
-Mean DASS-21 Anxiety Subscale score		0.052 to 0.510		
-Mean DASS-21 Stress Subscale score				
Social support:				-5.167 to 0.205
-Mean family support score				
-Mean friend support score		-7.556 to -1.223		
-Mean significant other support score	Reference			
	-1.263		-	
	Reference		Reference	-
	4.361*	-4.577 to 2.051	3.607**	
	-0.690*		-0.070	

-0.544*		-0.189	1.036 to 6.178
	1.146 to 7.576		
-0.588*		-0.007	
5.658*		1.670**	
6.328*	-0.855 to -0.526	2.978**	
4.756*	-0.724 to -0.363	2.302**	-0.326 to 0.185
	-0.745 to -0.431		
	4.556 to 6.760		-0.446 to 0.068
	5.255 to 7.400		
	3.792 to 5.719		-0.286 to 0.272
			0.299 to 3.042
			1.637 to 4.320

	1.191 to 3.413

* = $p < 0.1$, ** = statistical significance at $p < 0.05$, a = multiple linear regression model reported that $F(12,303) = 20.341$, $p < 0.001$ with adjusted $R^2 = 0.424$