

## ORIGINAL ARTICLE

# Associations between Sociodemographic, Body Mass Index, Body Image Perception, Physical Activity and Sleep Quality with Mental Health among University Students in Universiti Putra Malaysia during the COVID-19 Pandemic

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## ABSTRACT

**Introduction:** Mental health problem among university students during COVID-19 pandemic became one of the global main issues. There is limited study on mental health among university student during COVID-19 pandemic. Therefore, this study aimed to determine the associations between socio-demographic, body mass index, body image perception, physical activity and sleep quality with mental health among university students in Universiti Putra Malaysia. **Methods:** This is a cross-sectional study with a total sample of 130 students aged 18 to 25 years old which were recruited through a multistage sampling. An English online self-administered questionnaire was used to collect the data on socio-demographic characteristics, weight and height, body image perception (BSQ-8C), physical activity (GPAQ), sleep quality (PSQI), and mental health (DASS-21). **Results:** Majority of the respondents were female (76.2%), Malay (78.5%), in second year of study (28.5%), from low income family (59.2%) and stayed with parents during COVID-19 pandemic (57.7%). Results showed 44.6% of respondents had depressive symptoms, 56.9% had anxiety symptoms and 29.2% had stress symptoms with severity mild to extremely severe. Body mass index ( $r=0.205$ ,  $p<0.005$ ), body image perception ( $r=0.538$ ,  $p<0.001$ ), and sleep quality ( $r=0.460$ ,  $p<0.001$ ) were associated with depression subscale. Meanwhile, body image perception ( $r=0.449$ ,  $p<0.001$ ), and sleep quality ( $r=0.450$ ,  $p<0.001$ ) were correlated with anxiety subscale. Stress subscale was correlated with body image perception ( $r=0.473$ ,  $p<0.001$ ) and sleep quality ( $r=0.492$ ,  $p<0.001$ ). **Conclusion:** Affected students should be helped and referred to healthcare practitioner to ensure they able to overcome with these problems and remains healthy during this pandemic. *Malaysian Journal of Medicine and Health Sciences* (2023) 19(4):139-147. doi:10.47836/mjmhs19.4.21

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## INTRODUCTION

Mental health is defined as “a state of well-being where an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community” (1). A disturbance in the mood, thinking and behaviour that can cause difficulty to cope with daily life activities is called mental illness or mental health disorders (2). Mental illness is the growing public health concern that contributes to 16% of the global burden of disease injury among youths (1). University student is one of the population groups that have the tendency to acquire

mental health problem especially during this COVID-19 pandemic. They are a special group of people in critical phase in life shifting from adolescence to adulthood and believed as one of the most stressful moments in a person’s life (3). The feeling of fear, worry and stress in facing the COVID-19 pandemic with the life challenges to survive can affect the mental health of individuals. A study on the outcome of mental health of population in United State during the COVID-19 pandemic reported that 20% of participants had clinically increased levels of depressive symptoms, 16.58 % reported increased anxiety symptoms and 5.38% reported increased levels of trauma symptoms (4). A study in China reported the prevalence of anxiety and depression among university student during the COVID-19 pandemic was 7.7% and 12.2 % respectively (5). From the previous local studies, university students were found suffered from depression and anxiety (13, 240). However, most of data on mental

health among university students in Malaysia were collected before the COVID-19 pandemic. It is crucial to study the mental health problem among university students as they have a potential influence on the family and their contribution to the country's workforce in the near future in this country (3). Therefore, this study is aimed to determine the association between socio-demographic, body mass index, body image perception, physical activity and sleep quality with mental health among university students in Universiti Putra Malaysia during the COVID-19 pandemic. The updated prevalence of mental health and its associated factors among university students need to be done so that an intervention program and treatment can be done to help individuals who affected.

## MATERIALS AND METHODS

### Study Population and Design

This cross-sectional study was conducted among university students aged 18 to 25 years old in Universiti Putra Malaysia. Ethical approval was obtained from the JKEUPM (Ethics Committee for Research involving Human Subject) (Project reference number: JKEUPM-2020-510). The respondents were recruited through a multistage sampling and three faculties were selected. In this multistage sampling, there were 14 faculties in total and these faculties were divided into three categories which resulted into three faculties were selected. The sample size was calculated using a formula of sample size correlation studies by Cole (1997) and additional adjustments on the design effect, response rate and expected proportion of eligibility. The highest number of sample size was 79 respondents and after consideration of the additional adjustments, the final sample size required for this study was 130 respondents. The inclusion criteria were male and female, undergraduate students with age range 18 to 25 years old. The exclusion criterion was international students and those on medication in depression, anxiety and stress. Due to the COVID19 pandemic, this study was conducted through online survey. An English language self-administered survey was created using Google Form and distributed to the respondents through social media such as WhatsApp. There were 130 respondents responded to the questionnaire and fulfilled the inclusion and exclusion criteria. The data collection was conducted through online survey from April 2021 to May 2021.

### Measurements

#### *Socio-demographic Characteristics*

A self-reported data was collected on the age, gender, ethnicity, marital status, year of study, programme of study, faculty, monthly family income and location of stay during COVID-19 pandemic. The categorisation of family monthly income was based on the Department of Statistics Malaysia.

#### *Body Mass Index*

The weight (kg) and height (cm) of the respondents were based on the self-reported measurement. The weight and height were used to calculate the body mass index (BMI) by following the formula to calculate BMI. After BMI have been calculated, the respondents were grouped into different body weight status categories based on the World Health Organization (1998) classification (6).

#### *Body Image Perception*

A self-reported questionnaire, Body Shape Questionnaire-8C (BSQ-8C) was used to assess the body shape dissatisfaction for this study. BSQ-8C was a self-report scale and been widely used to assess body dissatisfaction that caused by feelings of being fat (7). BSQ-8C was a short version of BSQ-34 which been used as an "alternate form" to save time and cost (8). Each item was scored 1 to 6 with "never"=1 and "always"=6. The overall score was the sum of scores of the 8 items where a minimum of 8 and maximum of 48 were possible to be obtained (8). Based on the total score, the respondents were classified into four categories regarding their severity of concern with body shape ( $\leq 18$ =No concern, 19–25=Mild concern, 26–33=Moderate concern,  $\geq 34$ =Marked concern) (8).

#### *Physical Activity*

Physical activity was assessed by using Global Physical Activity Questionnaire version 2 (GPAQv2) (9) GPAQ consisted of 16 items that asked the physical activity in typical week. The questions were divided into three domains which were activity at work, travel to and from places and recreational activities also sedentary behaviours (9). The score were in the MET-minutes/week and from the score it was then categorised into three categories. Each of the domains contributed to the different METs value where the Mets value was applied according to the intensity of the activity. The categorisation for GPAQ followed the Global Physical Activity Questionnaire Analysis Guide Version-2 (9).

#### *Sleep Quality*

Sleep quality was assessed by using The Pittsburgh Sleep Quality Index (PSQI) developed and validated by Buysse et al. (1998) (10). PSQI contained 18 items with 4 items were open-ended questions and 14 items rated with 4 Likert-scale. The 18 items assessed seven components of sleep quality during the past month. The 4 Likert-scale was rated with 0-3 where "0" indicates no difficulty, while a score of "3" indicates severe difficulty. The scores of seven components were summed to yield a PSQI global score ranging from 0 to 21 and categorize into good sleeper (scores <6) and poor sleeper (scores  $\geq 6$ ) (10).

#### *Mental Health Status*

Mental health was assessed by using the Depressive Anxiety Stress Scale-21 (DASS-21). This instrument was developed by Lovibond and Lovibond (1995) (11).

DASS-21 was the modified and short-form version of the original DASS-42 which assessed the negative emotional disturbance of individual (11). It was divided into three subscales included depression, anxiety and stress level. Each subscale contained 7 items with 4 Likert-scale where 0=Never, 1=Sometimes, 2=Often 3=Always. The 7 items from each subscale were summed up and multiplied by two to match the total score from the original 42 items for each subscale (11). The estimated total score for each subscale were 0-42. The subscales were categorised into its severity ratings from normal to extremely severe which differ for each subscale (11).

### Statistical Analysis

The data obtained was analysed by using IBM SPSS Statistics 25.0. Descriptive analysis was performed for both categorical and continuous variables. Categorical variables were reported in the form of frequency and percentage while continuous variables were reported in the form of mean  $\pm$  SD. A chi-square test was conducted to analyse the categorical data. Meanwhile, for normal distribution continuous data were analysed by Pearson correlation test. Spearman test was used when the assumptions of Pearson correlation test was violated. The p-value for all test was set at  $p < 0.05$ .

## RESULTS

Table I shows the socio-demographic characteristics of the respondents. From the 130 respondents, 23.8% (n=31) were male and 76.2% (n=99) were female. The mean age for the respondents was  $21.98 \pm 1.16$  years ranging from 18 to 25 years old. The majority was from age group 22-25 (66.9%) while other was from the other age group, 19-21(33.1%). Ethnicity of the respondents were mostly from Malay (78.5%), followed by Chinese (13.8%), Indian (6.2%) and others (1.5%). Others were from Sabahan (1.5%). All of the respondents were single and majority were from the second year of study (28.5%). The respondents were recruited from three different programme of study which was Bachelor of Science Human Development and Management (36.9%) from Faculty of Human Ecology, Bachelor of Science Molecular Biology (36.2%) from Faculty of Biotechnology and Molecular Science, and Bachelor of Design in Industrial Design (26.9%) from Faculty of Design and Architecture. Regarding family monthly income, most of the respondents were from low income family (59.2%) and few from high income family (10.0%). During the COVID-19 pandemic, 57.7% (n=75) of the respondents were stayed with their family (with parents), 33.8% (n=44) were stayed at residential college and 8.5% (n=11) stayed at rental house (without parents).

The descriptive statistics for body weight status, body image perception, physical activity and sleep quality were shown in Table II. The mean weight of the respondents was  $57.12 \pm 14.13$  kg and the mean height

**Table I: Socio-demographic characteristics of the respondents (N=130)**

| Characteristics                                  | Mean $\pm$ SD         | n (%)      |
|--|-----------------------|------------|
| <b>Age (years)</b>                               | $21.98 \pm 1.16$      |            |
| 18-21  |                       | 43(33.1)   |
| 22-25  |                       | 87(66.9)   |
| <b>Gender</b>                                    |                       |            |
| Male   |                       | 31 (23.8)  |
| Female   |                       | 99 (76.2)  |
| <b>Ethnicity</b>                                 |                       |            |
| Malay  |                       | 102 (78.5) |
| Chinese  |                       | 18(13.8)   |
| Indian   |                       | 8(6.2)     |
| Others   |                       | 2 (1.5)    |
| <b>Marital Status</b>                            |                       |            |
| Single   |                       | 130(100)   |
| <b>Year of Study</b>                             |                       |            |
| First year                                       |                       | 34(26.2)   |
| Second year                                      |                       | 37(28.5)   |
| Third year                                       |                       | 35(26.9)   |
| Fourth year                                      |                       | 24(18.5)   |
| <b>Programme of Study</b>                        |                       |            |
| B. Sc. (Human Development and Management)        |                       | 48(36.9)   |
| B. Sc. (Molecular Biology)                       |                       | 47 (36.2)  |
| Bachelor of Design (Industrial Design)           |                       | 35 (26.9)  |
| <b>Faculty</b>                                   |                       |            |
| Human Ecology                                    |                       | 48(36.9)   |
| Biotechnology and Molecular Science              |                       | 47 (36.2)  |
| Design and Architecture                          |                       | 35 (26.9)  |
| <b>Family Monthly Income (RM)</b>                | $5274.98 \pm 4484.37$ |            |
| Low ( $\leq$ RM4,849.99)                         |                       | 77(59.2)   |
| Middle (RM4,850 – RM10,959.99)                   |                       | 40(30.8)   |
| High $\geq$ RM10,960                             |                       | 13(10.0)   |
| <b>Location of Stay during COVID-19 Pandemic</b> |                       |            |
| Family household (with parents)                  |                       | 75(57.7)   |
| Rental house (without parents)                   |                       | 11(8.5)    |
| Residential college                              |                       | 44(33.8)   |

was  $160.18 \pm 7.95$  cm. Meanwhile, the mean BMI for the respondents was  $22.23 \pm 5.23$  kg/m<sup>2</sup> and the BMI classification showed more than half (55.4%) of the respondents had normal body weight. There were 53.1% in total who had mild to marked concern of their body image which 13.1% were mild, 17.7% were moderate and 22.3% were marked concern of their body image. The mean score for body image perception was  $23.5 \pm 12.58$ . Based on the physical activity level category, almost half (48.4%) of the respondents had low physical activity level, followed by moderate physical activity level (28.5%) and high physical activity level (23.1%). There were 55.4% (n=72) of the respondents had poor sleep quality and 44.6% (n=58) had good sleep quality. The mean global sleep quality score was  $6.44 \pm 3.194$ . Table III shows the descriptive statistics for depression, anxiety and stress subscales. According to the severity

**Table II: Descriptive table for BMI, body image perception, physical activity and sleep quality (N=130)**

| Variables                                   | Mean ± SD     | n (%)    |
|---|---------------|----------|
| <b>Weight (kg)</b>                          | 57.12 ± 14.13 |          |
| <b>Height (cm)</b>                          | 160.18 ± 7.95 |          |
| <b>BMI (kg/m<sup>2</sup>)</b>               | 22.23 ± 5.23  |          |
| Underweight (<18.5)                         |               | 30(23.1) |
| Normal weight (18.5-24.9)                   |               | 72(55.4) |
| Overweight (25.0-29.9)                      |               | 18(13.8) |
| Obese (≥30.0)                               |               | 10(7.7)  |
| <b>Body Image Perception</b>                | 23.5 ± 12.58  |          |
| No concern (8-18 scores)                    |               | 61(46.9) |
| Mild concern (19-25 scores)                 |               | 17(13.1) |
| Moderate concern (26-33 scores)             |               | 23(17.7) |
| Marked concern (34-48 scores)               |               | 29(22.3) |
| <b>Total of days spent</b>                  | 6.48 ± 5.38   |          |
| <b>Total of durations spent (minutes)</b>   | 200 (438)     |          |
| <b>Total physical activity (METs value)</b> | 1080 (2390)   |          |
| <b>Physical Activity Levels</b>             |               |          |
| Low (<600 METs)                             |               | 63(48.4) |
| Moderate (≥600-2999 METs)                   |               | 37(28.5) |
| High (≥3000 METs)                           |               | 30(23.1) |
| <b>Sleep Quality</b>                        | 6.44 ± 3.19   |          |
| Good sleeper (≤5 scores)                    |               | 58(44.6) |
| Poor sleeper (>5scores)                     |               | 72(55.4) |

distribution of each subscale, 44.6% had depression symptoms with proportion 13.8% were mild, 17.7% were moderate, 6.9% severe and 6.2% extremely severe depression symptoms. Meanwhile, 6.9% were having mild, 25.4% were moderate, 11.5% severe and 13.1% extremely severe anxiety symptoms. For stress subscale, about 11.5% had mild and moderate, 4.6% severe and 1.5% extremely severe stress symptoms. Based on the DASS-21 score, the mean scores of depression subscale were at mild level (9.86 ± 8.96), mean anxiety scores at moderate level (10.23 ± 8.59), and mean stress scores were at normal level (11.09 ± 8.80).

Pearson correlation and Chi-Square test in Table IV and V showed that depression subscale was found associated with body mass index (r=0.205, p=0.019), body image perception (r=0.538, p<0.001;  $\chi^2=14.352$ , p<0.001), and sleep quality (r=0.460, p<0.001;  $\chi^2=13.566$ , p<0.001). Meanwhile, body image perception (r=0.449, p<0.001;  $\chi^2=10.715$ , p=0.001), and sleep quality (r=0.450, p<0.001;  $\chi^2=7.171$ , p=0.007) were correlated with anxiety subscale. Stress subscale was correlated with body image perception (r=0.473, p<0.001;  $\chi^2=12.999$ , p<0.001) and sleep quality (r=0.492, p<0.001;  $\chi^2=16.446$ , p<0.001). Socio-demographic characteristics and physical activity were not associated with depression, anxiety and stress subscales.

**Table III: Descriptive table for mental health status and its subscales (N=130)**

| Variables                     | Mean ± SD    | n (%)    |
|-------------------------------|--------------|----------|
| <b>Depression subscale</b>    | 9.86 ± 8.96  |          |
| Normal (≤9 scores)            |              | 72(55.4) |
| Mild (10-13scores)            |              | 18(13.8) |
| Moderate (14-20 scores)       |              | 23(17.7) |
| Severe (21-27 scores)         |              | 9(6.9)   |
| Extremely severe (≥28 scores) |              | 8(6.2)   |
| <b>Anxiety subscale</b>       | 10.23 ± 8.59 |          |
| Normal (≤7 scores)            |              | 56(43.1) |
| Mild (8-9 scores)             |              | 9(6.9)   |
| Moderate (10-14 scores)       |              | 33(25.4) |
| Severe (15-19 scores)         |              | 15(11.5) |
| Extremely severe (≥20 scores) |              | 17(13.1) |
| <b>Stress subscale</b>        | 11.09 ± 8.80 |          |
| Normal (≤14 scores)           |              | 92(70.8) |
| Mild (15-18 scores)           |              | 15(11.5) |
| Moderate (19-25 scores)       |              | 15(11.5) |
| Severe (26-33 scores)         |              | 6(4.6)   |
| Extremely severe (≥34 scores) |              | 2(1.5)   |

## DISCUSSION

Socio-demographic characteristics showed no associations with depression, anxiety and stress subscales. This study findings were consistent with previous study which age was found had no associations with depression, anxiety and stress subscales (12,13). Similarly, a study in China reported that age was not associated with depression, anxiety and stress subscales during the initial outbreak of COVID-19 (14). Constant using of social media among the youngster to access the information on COVID-19 pandemic could be exhausted and could affected students' mental health which triggered the feeling of anxious (15). Previous studies showed anxiety and stress was not associated with gender (12,13,14). Contradict, previous study found that gender was associated with depression and anxiety symptoms (13,14,15,16). Different encounter in social factors caused male and female were susceptible to experience depression (13). During the current pandemic, greater emotion expression exerted by female with a low coping strategy could trigger unexpected anxiety (15).

No associations were found between year of study with any of the subscales. Consistently, previous study showed that year of study had no associations with depression and anxiety (13,17). Inconsistently, students in Jordan reported a significant association between year of study and stress during COVID-19 pandemic (18). Jia and Loo (2018) also found year of study was significantly associated with stress with first year students perceived more stress compared to other year (12). In this study, the sudden changes in the mode of classes from physical

**Table IV: Associations between sociodemographic characteristics with depression, anxiety and stress subscale (N=130)**

| Variables  | Depressive symptoms |            | $\chi^2$                              | p-value        | Anxiety symptoms |            | $\chi^2$                 | p-value        | Stress symptoms |            | $\chi^2$                              | p-value        |
|--|---------------------|------------|---------------------------------------|----------------|------------------|------------|--------------------------|----------------|-----------------|------------|---------------------------------------|----------------|
|  | No (n=72)           | Yes (n=58) |                                       |                | No (n=56)        | Yes (n=74) |                          |                | No (n=92)       | Yes (n=38) |                                       |                |
| <b>Age (years)</b>                               |                     |            | 0.399<br><i>r</i> =0.046 <sup>a</sup> | 0.528<br>0.603 |                  |            | 0.000<br><i>r</i> =0.044 | 1.000<br>0.620 |                 |            | 0.001<br><i>r</i> =0.000 <sup>a</sup> | 0.977<br>0.999 |
| 18-21  | 26(36.1)            | 17(29.3)   |                                       |                | 19(33.9)         | 24(32.4)   |                          |                | 31(33.7)        | 12(31.6)   |                                       |                |
| 22-25  | 46(63.9)            | 41(70.7)   |                                       |                | 37(66.1)         | 50(67.6)   |                          |                | 61(66.3)        | 26(68.4)   |                                       |                |
| <b>Gender</b>                                    |                     |            | 1.221                                 | 0.269          |                  |            | 0.000                    | 1.000          |                 |            | 1.344                                 | 0.246          |
| Male   | 14(19.4)            | 17(29.3)   |                                       |                | 13(23.2)         | 18(24.3)   |                          |                | 25(27.2)        | 6(15.8)    |                                       |                |
| Female   | 58(80.6)            | 41(70.7)   |                                       |                | 43(76.8)         | 56(75.7)   |                          |                | 67(72.8)        | 32(84.2)   |                                       |                |
| <b>Ethnicity</b>                                 |                     |            | 0.858                                 | 0.354          |                  |            | 0.331                    | 0.565          |                 |            | 2.233                                 | 0.135          |
| Bumiputera                                       | 55(76.4)            | 49(84.5)   |                                       |                | 43(76.8)         | 61(82.4)   |                          |                | 70(76.1)        | 34(89.5)   |                                       |                |
| Non-Bumiputera                                   | 17(23.6)            | 9(15.5)    |                                       |                | 13(23.2)         | 13(17.6)   |                          |                | 22(23.9)        | 4(10.5)    |                                       |                |
| <b>Year of Study</b>                             |                     |            | 0.876                                 | 0.349          |                  |            | 0.106                    | 0.745          |                 |            | 0.010                                 | 0.922          |
| First & second year                              | 63(56.8)            | 8(42.1)    |                                       |                | 32(57.1)         | 39(52.7)   |                          |                | 51(55.4)        | 20(52.6)   |                                       |                |
| Third & fourth year                              | 48(43.2)            | 11(57.9)   |                                       |                | 24(42.9)         | 35(47.3)   |                          |                | 41(44.6)        | 18(47.4)   |                                       |                |
| <b>Programme of Study</b>                        |                     |            | 3.867                                 | 0.145          |                  |            | 1.511                    | 0.470          |                 |            | 1.533                                 | 0.465          |
| B. Sc. (HDM)                                     | 31(43.1)            | 17(29.3)   |                                       |                | 24(42.9)         | 24(32.4)   |                          |                | 37(40.2)        | 11(28.9)   |                                       |                |
| B. Sc. (MB)                                      | 26(36.1)            | 21(36.2)   |                                       |                | 18(32.1)         | 29(39.2)   |                          |                | 31(26.1)        | 16(42.1)   |                                       |                |
| Bachelor of Design (ID)                          | 15(20.8)            | 20(34.5)   |                                       |                | 14(25.0)         | 21(28.4)   |                          |                | 24(26.1)        | 11(28.9)   |                                       |                |
| <b>Faculty</b>                                   |                     |            | 3.867                                 | 0.145          |                  |            | 1.511                    | 0.470          |                 |            | 1.533                                 | 0.465          |
| Human Ecology                                    | 31(43.1)            | 17(29.3)   |                                       |                | 24(42.9)         | 24(32.4)   |                          |                | 37(40.2)        | 11(28.9)   |                                       |                |
| Biotechnology and Molecular Science              | 26(36.1)            | 21(36.2)   |                                       |                | 18(32.1)         | 29(39.2)   |                          |                | 31(26.1)        | 16(42.1)   |                                       |                |
| Design and Architecture                          | 15(20.8)            | 20(34.5)   |                                       |                | 14(25.0)         | 21(28.4)   |                          |                | 24(26.1)        | 11(28.9)   |                                       |                |
| <b>Family Monthly Income (RM)</b>                |                     |            | 0.443<br><i>r</i> =0.037 <sup>a</sup> | 0.506<br>0.675 |                  |            | 0.014<br><i>r</i> =0.143 | 0.905<br>0.104 |                 |            | 0.621<br><i>r</i> =0.105 <sup>a</sup> | 0.431<br>0.235 |
| ≤ RM4,849.99                                     | 45(62.5)            | 32(55.2)   |                                       |                | 34(60.7)         | 43(53.1)   |                          |                | 57(62.0)        | 20(52.6)   |                                       |                |
| ≥ RM4,850  | 27(37.5)            | 26(44.8)   |                                       |                | 22(39.3)         | 31(41.9)   |                          |                | 35(38.0)        | 18(47.4)   |                                       |                |
| <b>Location of Stay during COVID-19 Pandemic</b> |                     |            | 3.140                                 | 0.076          |                  |            | 1.310                    | 0.252          |                 |            | 0.309                                 | 0.579          |
| With parents                                     | 47(65.3)            | 28(48.3)   |                                       |                | 36(64.3)         | 39(52.7)   |                          |                | 55(59.8)        | 20(52.6)   |                                       |                |
| Without parents                                  | 25(34.7)            | 30(51.7)   |                                       |                | 20(35.7)         | 35(47.3)   |                          |                | 37(40.2)        | 18(47.4)   |                                       |                |

<sup>a</sup>Pearson Correlation test, HDM: Human and Development Management, MB: Molecular Biology, ID: Industrial Design

to online classes due to pandemic had no effect on the students' mental health. The small sample sizes with few selected programmes of study were not strong to find the association between year of study and mental health. The programmes selected in this study were from field of art and social science, sciences, and technical. These three selected field of study had no associations with depression, anxiety and stress. This finding was consistent with previous study which programme of study was not associated with depression and stress (13). However, the same study found anxiety and programme of study were significantly associated (13). Heavy course workload, limited leisure time, lack of access to learning materials and regular assessments can be added as the factor point on students' anxiety. The students from selected programmes in this study expected to have a good management on the psychological health during this pandemic. Thus, no associations were found.

There were no associations were found between family monthly income with depression and anxiety. This finding was consistent with previous study that was conducted before the COVID-19 pandemic (13,17). Inconsistently, a study conducted during COVID-19 pandemic found

those from lowest household income had significant elevated depression and anxiety symptoms (19). For stress, previous study showed students with lower income were more likely to have stress symptoms (17). Financial difficulties were usually faced by students who came from poor families. Difficulty to smooth their expenses caused them to find other sources of income that resulted to perceive stress (20). With the current pandemic, unemployment among parents gave addition point for the students to acquire either depression, anxiety or stress symptoms. With the initiative from government to provide financial aids for the low income family during this pandemic helped lessen the financial worriedness among students. Thus, income was found not associated with any of the subscales.

Previous study showed that not living with family was associated with symptoms of depression and stress (21). Current living arrangement showed an insignificant association with risk of anxiety (15). During this pandemic, homesickness and feeling of fear being away from family had affected mental health of university students (21). However, this study result showed that neither lived with parent nor without parent had no effect

**Table V: Associations between BMI, body image perception, physical activity and sleep quality with depression, anxiety and stress (N=130)**

| Variables                      | Depressive symptoms |            | r                  | p-value | Anxiety symptoms |            | r                  | p-value | Stress symptoms |            | r                  | p-value |
|--------------------------------|---------------------|------------|--------------------|---------|------------------|------------|--------------------|---------|-----------------|------------|--------------------|---------|
|                                | No (n=72)           | Yes (n=58) |                    |         | No (n=56)        | Yes (n=74) |                    |         | No (n=92)       | Yes (n=38) |                    |         |
| <b>BMI (kg/m<sup>2</sup>)</b>  |                     |            | 0.205              | 0.019*  |                  |            | 0.129              | 0.144   |                 |            | 0.167              | 0.058   |
|                                |                     |            | $\chi^2=3.376^a$   | 0.337   |                  |            | $\chi^2=2.398^a$   | 0.494   |                 |            | $\chi^2=7.550^a$   | 0.056   |
| Underweight                    | 19(26.4)            | 11(19.0)   |                    |         | 14(25.0)         | 16(21.6)   |                    |         | 25(27.2)        | 5(13.2)    |                    |         |
| Normal                         | 40(55.6)            | 32(55.2)   |                    |         | 32(57.1)         | 40(54.1)   |                    |         | 49(53.3)        | 23(60.5)   |                    |         |
| Overweight                     | 10(13.9)            | 8(13.8)    |                    |         | 8(14.3)          | 10(13.5)   |                    |         | 14(15.2)        | 4(10.5)    |                    |         |
| Obese                          | 3(4.2)              | 7(12.1)    |                    |         | 2(3.6)           | 8(10.8)    |                    |         | 4(4.3)          | 6(15.8)    |                    |         |
| <b>Body image perception</b>   |                     |            | 0.538              | 0.000** |                  |            | 0.449              | 0.000** |                 |            | 0.473              | 0.000** |
|                                |                     |            | $\chi^2=14.352^a$  | 0.000** |                  |            | $\chi^2=10.715^a$  | 0.001** |                 |            | $\chi^2=12.999^a$  | 0.000** |
| No concern                     | 45(62.5)            | 16(27.6)   |                    |         | 36(64.3)         | 25(33.8)   |                    |         | 53(57.6)        | 8(21.1)    |                    |         |
| Have concern                   | 27(37.5)            | 42(72.4)   |                    |         | 20(35.7)         | 49(66.2)   |                    |         | 39(42.4)        | 30(78.9)   |                    |         |
| <b>Physical activity level</b> |                     |            | 0.168 <sup>b</sup> | 0.058   |                  |            | 0.120 <sup>b</sup> | 0.174   |                 |            | 0.093 <sup>b</sup> | 0.292   |
|                                |                     |            | $\chi^2=1.236^a$   | 0.539   |                  |            | $\chi^2=1.334^a$   | 0.513   |                 |            | $\chi^2=1.868^a$   | 0.393   |
| Low                            | 37(51.4)            | 26(44.8)   |                    |         | 29(51.8)         | 34(45.9)   |                    |         | 47(51.1)        | 16(42.1)   |                    |         |
| Moderate                       | 21(29.2)            | 16(27.6)   |                    |         | 13(23.2)         | 24(32.4)   |                    |         | 23(25.0)        | 14(36.8)   |                    |         |
| High                           | 14(19.4)            | 16(27.6)   |                    |         | 14(25.0)         | 16(21.6)   |                    |         | 22(23.9)        | 8(21.1)    |                    |         |
| <b>Sleep quality</b>           |                     |            | 0.460              | 0.000** |                  |            | 0.450              | 0.000** |                 |            | 0.492              | 0.000** |
|                                |                     |            | $\chi^2=13.566^a$  | 0.000** |                  |            | $\chi^2=7.171^a$   | 0.007** |                 |            | $\chi^2=16.446^a$  | 0.000** |
| Good sleeper                   | 43(59.7)            | 15(25.9)   |                    |         | 33(58.9)         | 25(33.8)   |                    |         | 52(56.5)        | 6(15.8)    |                    |         |
| Poor sleeper                   | 29(40.3)            | 43(74.1)   |                    |         | 23(41.1)         | 49(66.2)   |                    |         | 40(43.5)        | 32(84.2)   |                    |         |

<sup>a</sup>Chi square test, <sup>b</sup>Spearman test \* p-value<0.05, \*\*p-value<0.01

on students’ mental health as both living arrangement had good support system. In this pandemic, a strong support system with family or friends could help people to be away from any mental health.

Current pandemic gave impact on the body weight status of the respondents that lead to acquire depressive symptoms. Body mass index (BMI) was found positively correlated with depression but in a weak relationship. It showed that individuals who had high BMI were tend to have depressive symptoms. Similarly, previous study found BMI was correlated with depression which respondents who obese tend to had depression (22,23). A study suggested that obesity could lead depression and weight management can improve one’s mood, but this improvement may not be the result for the actual weight. Thus, it leads to perceived depression (22). Conversely, studies among Malaysian university students showed that there was no association between BMI and depression (13,24,25). No associations were found between BMI with anxiety and stress which in line with previous study (13, 24). These contradict finding might be due to the self-reported data on BMI which the respondents be biased with the data given and data were collected in different life event.

A positive correlation between body image perception and depression found in this study was supported by previous study conducted by Barnes et al. (2020), Edman et al. (2014), Latiff et al. (2014), and Scheffers

et al. (2019) (13,27,28,29). In other words, respondents who had more concern with their body shape then to become depressed. Besides, there was a positive correlation between body image perception with anxiety. The more concern of body shape significantly increased with the higher anxiety score. This finding was supported by Barnes et al. (2020) and Latiff et al. (2014) (13,27). The result from this study revealed that body image perception was associated with stress which was supported by Latiff et al. (2014) (13). Body image perception showed the higher score of body shape significantly increased with the higher score of stress. However, Fatemeh & Esra, (2021) reported that body image perception was not associated with stress (30). Study revealed that exposure to social media networks, and low self-esteem was associated with body image dissatisfaction (30). Over concern on the body image create the stressor situation that lead to the outbreak of depressive symptoms (30). In relation to current situation, the increasing rate of screen time on social media created a feeling of insecurity with body shape when comparing with those in the social media (31). The feeling of insecurity leads to the dissatisfaction on body image and affect the students emotion. Therefore, during this pandemic the body image perception was found associated with depression, anxiety and stress symptoms.

No association was found between physical activity with depression, anxiety and stress which is supported by the

previous studies (28,32,34,35). Conversely, few studies found significant association between physical activity and depression subscale (32,33,34). A cohort study conducted in the United State during pandemic showed that the physical activity among respondents declined from the 2019 to 2020 spring cohort and significantly associated with depression (31). An intervention was conducted and the result suggested that maintaining healthy physical habits was strongly associated with well-being during pandemic (31). The used of different instruments and self-reported data that required the respondents to recall their previous one week activity could contributed to the difference in the findings with pervious study.

Sleep quality was found had positive correlation with depression. This association indicated that people with poor sleep quality tend to had depression. This finding was supported by previous studies conducted by Ashraful et al. (2018), Pensuksan et al. (2016), Rosso et al. (2020), and Zhang et al. (2018) (3,36,37,38). Chen et al. (2020) also found significant association between sleep quality with depression among China population during the COVID-19 pandemic (39). It is predicted that later sleep timing during pandemic lead to rising of mood disorder and increased depressive symptoms (31). A significant correlation also found in sleep quality with anxiety which supported by Pensuksan et al. (2016) (36). It showed that the higher the sleep quality score, the higher the anxiety score. In line with stress subscale, the higher the sleep quality score, the higher the stress score. The higher sleep quality score indicated the poor sleep quality. This was supported with previous study conducted by Pensuksan et al. (2016) (36). Short sleep duration was found associated with mental health and became the mediator for mental health (40).

There were a few limitations that might affect the result such as the online survey method. Online survey method can be resulted in unfavourable result because the data collected were solely depending on the self-reported data from the respondents and can cause biased in the result especially on the weight and height. As BMI outcome could be bias due to the self-reported data on weight and height, a proper assessment was informed to the respondents in the instruction section prior filling in the data. It is suggested for future study to conduct proper anthropometric measurement for accurate result. Next, the homogenous of the characteristics of the respondents can affect the result. This study was only focusing on the undergraduate students from UPM with only three selected faculties. The result from this study did not be representative to all undergraduate students in UPM. Future study should focus on the wide range characteristics of respondents with large scale number of respondents. The higher the sample number, the result would be representative and precise for the sample population. It is recommended for future study to include social media usage to browse COVID-19

information, academic performance and social support as the expected factors to be associated with mental health.

## CONCLUSION

Overall, 44.6% having depression symptoms, 56.9% having anxiety symptoms and 29.2% having stress symptoms with severity mild to extremely severe. These study findings showed that body weight status was associated with depression subscale. Body image perception and sleep quality were associated with depression, anxiety and stress subscales. The results from this study indicated that anxiety was prevalent among university students compared to depression and stress during this pandemic. Students who had concerned with their body image perception and had poor sleep quality were susceptible to showed depression, anxiety and stress symptoms. Practicing proper sleep duration is important in order to maintain a good mental health. The shift into new norm due to this COVID-19 pandemic had affected almost all of people in this world. University students who are struggling in their studies had to stop going to campus, lack of physical contact with other family members and friends could give a big impact to their mental health. Affected students should be helped and referred to healthcare practitioner to ensure they able to overcome with these problems and remains healthy during this pandemic.

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