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HEALTH-RELATED QUALITY OF LIFE, BODY MASS INDEX, AND DISORDERED EATING AMONG STUDENTS DURING COVID-19 MOVEMENT CONTROL ORDER IN MALAYSIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: University students are a group particularly susceptible to being overweight and obese, as well as disordered eating (DE) behaviors that may infer their health-related quality of life (HRQOL). **Purpose:** To determine the associations of body mass index (BMI) and DE with HRQOL among university students in Selangor, Malaysia during Movement Control Order 1.0 and 2.0 due to COVID-19 pandemic. **Methods**: This cross-sectional study was performed among 189 university students in two universities in Shah Alam and Serdang, Selangor. This study utilized a self-administered questionnaire consisting of socio-demographic information, self-reported weight and height, Eating Attitudes Test (EAT-26) assessing the DE status and 36-Item Short Form Survey (SF-36) assessed the HRQOL. **Results:** The prevalence of overweight and obesity were 15.3% and 16.9%, respectively. Meanwhile, the prevalence of DE was 25.4%. BMI was not significantly correlated with DE (r=0.012, p=0.875). Among eight subscales of HRQOL, BMI was significantly correlated with general mental health (r=0.207, p=0.004) and bodily pain (r=0.153, p=0.036). Meanwhile, there was a significant association between DE with four subscales of HRQOL, which were physical functioning (r=-0.183, p=0.012), role limitations due to physical health (r=-0.155, p=0.033), role limitations due to emotional problems (r=-0.232, p=0.001) and general mental health (r=-0.214, p=0.003). Poorer general mental health was correlated with both higher BMI and higher DE. **Conclusion:** This study suggests the need to add the component of mental health, in addition to healthy body weight and eating behavior in future nutrition interventions to improve the HRQOL among university students.

Keywords: disordered eating, health-related quality of life, university student, body mass index, obesity

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INTRODUCTION

Following the discovery of the country's first COVID-19 case on 25th January 2020, the number of confirmed cases surpassed 553 on 16th March 2020, prompting the Malaysian Prime Minister to issue a Movement Control Order (MCO) on 18th March 2020, as a step to combat the spread of the COVID-19 pandemic by enforcing social distancing and slowing the transmission rate of the virus. Since there were still a lot of positive cases, with 140 additional confirmed new cases, the MCO was moved to Phase 2 on 1st April 2020, and it would last for 14 days, ending on 14th April 2020 (Elengoe, 2020; Ministry of Health Malaysia, 2020). There were four phases of MCO (18th March to 12th May 2020), followed by Conditional MCO (CMCO; 13th May to 9th June 2020) and Recovery MCO (RMCO; 10th June -31st August 2020). It entailed home confinement, restrictions on mass movements and gatherings, and the closure of both public and private higher education institutions nationwide. The pandemic and the resulting disruptions in daily routines likely impacted various aspects of the community, including body weight, eating habits, and overall health (Chin *et al*., 2022; Ferrara *et al*., 2022; Karuniawati *et al*., 2022; Leong Bin Abdullah *et al*., 2021; Tan *et al*., 2022).

Health-related quality of life (HRQOL) comprises of physical, mental, emotional, and social well-being (Farhangi *et al*., 2018), as well as individuals' perceptions of their health status and satisfaction with life (Wan Puteh *et al*., 2019). University students, undergoing a transition to adulthood, are susceptible to engaging in behaviors that pose risks to their long-term health, both physically and psychologically (Nur *et al*., 2017).

Disordered eating (DE) refers to various eating behaviors that do not meet the diagnostic criteria for eating disorders but may contribute to adverse physical and mental effects (Pennesi & Wade, 2016). Stressors related to academic performance, independence, and social integration make university students particularly vulnerable to disordered eating behaviors. Across Southeast Asia, studies have reported relatively high rates of disordered eating, with prevalence ranging from below 10% in some countries to 20.6% in Myanmar (Pengpid & Peltzer, 2018). Recent research among Malaysian university students has indicated a prevalence of approximately 13.9% for disordered eating (Chan *et al*., 2020), surpassing previous estimates (Chin *et al*., 2020; Gan & Yeoh, 2017).

In addition to disordered eating, overweight and obesity pose significant public health concerns across all age groups. The Malaysian National Health and Morbidity Survey 2019 reported that approximately half of Malaysian adults are affected by overweight, obesity, and abdominal obesity (Institute for Public Health, 2020). Among undergraduate students in Kuala Lumpur, recent studies reported a prevalence of 12.1% for overweight and 20.6% for obesity (Chan *et al*., 2020). Similarly, among university students in Kuala Lumpur and Selangor, the prevalence of overweight and obesity was reported as 11.3% and 4.3%, respectively (Chin *et al*., 2020).

The co-occurrence of disordered eating and unhealthy weight status may negatively impact on quality of life. Previous literature has presented contradict findings on the relationship between body mass index (BMI) and HRQOL, with some studies indicating a negative correlation between BMI and overall HRQOL (Antony & Azeem, 2019; Apple *et al*., 2018), while others suggest a linear relationship (Nur *et al*., 2017; Zhu *et al*., 2015). Investigating these relationships among university students is crucial due to their heightened susceptibility to psychological distress and disordered eating behaviors (Gan & Yeoh, 2017).

Despite existing research on these topics, studies examining the link between BMI, disordered eating, and HRQOL among university students in Malaysia during the COVID-19 pandemic are scarce. This is a crucial issue to be explored as the eating behavior might be different in the changed environment (i.e. limited movement during the MCO), which may affect the BMI and HRQOL of the university students. The current study focuses on the first two phases of MCO, i.e. Phase 1 and Phase 2. Phase 1 of MCO took place from 18th March 2020 to 31st March 2020, and Phase 2 from 1st April 2020 to 14th April 2020. The main differences between Phase 1 and Phase 2 of MCO are the increase

in physical capacity was allowed from 60 to 80% for certain permitted sectors and the addition of more sectors to the "positive list" of sectors that are allowed to operate (Ministry of Finance, Malaysia, 2021). Therefore, this study aims to determine the prevalence of overweight, obesity, and disordered eating, as well as explore the relationship between BMI, disordered eating, and HRQOL among university students in Selangor, Malaysia, during MCO Phase 1 and 2.

METHOD

Study Design

This cross-sectional study was performed at one public university and one private university in Selangor, Malaysia. The sampling technique used was convenience sampling. Data collection was carried out during the MCO Phase 1 and 2 in Malaysia due to COVID-19 pandemic from March to April 2020. The inclusion criteria for this study were Malaysian university students aged 18 years old and above, registered at the university during data collection and not being diagnosed with eating disorders or any chronic disease. Data collection was done using Google Form, whereby the respondent's information sheet and consent form were provided prior to the questionnaire.

Sample and Population

The sample size for this study was determined using Daniel's (1999) formula considering 95% confidence level and the prevalence of DE among Malaysian university students of 13.8% (Pengpid & Peltzer, 2018). As a result, 183 was the minimal sample size needed in this study. To overcome non-response, 20% was added to the minimum sample size, made up to 220. After data collection and cleaning, only 189 were included in final analysis.

Socio-Demographic Information

The information on respondents' age, date of birth, sex, ethnicity, and types of universities had to be self-reported.

Anthropometric Measurements

Respondents were asked to self-report their body weight and height, which were then used to calculate their body mass index (BMI). The World Health Organization BMI classification (2000) was used. The cut-off for underweight is < 18.5, normal weight ranges from 18.5 to 24.9 and overweight ranges from 25.0 to 29.9. The cut off ≥ 30 is classified as obese. The potential bias in this study is measurement bias due to self-reported body height and weight. To minimize the measurement bias, outliers checking has been carried out to ensure the accuracy and integrity of the data.

Disordered Eating

The Eating Attitudes Test (EAT-26) (Garner *et al*., 1982) was utilized to examine disordered eating. The EAT-26 has 26 items with three subscales: diet, bulimia and food worry, and oral control. The items were assessed on a 6-point Likert scale: "always (1)," "usually (2)," "often (3)," "sometimes (4)," "rarely (5)," and "never (6).". Except for item 26, the replies "sometimes." "Rarely," and "never" received a score of 0, whereas the responses "always," "usually," and "often" received scores of 3, 2, and 1, respectively. The score for item 26 was reversed. The possible total EAT-26 score ranged between 0 and 78. Respondents with a total score of at least 20 on the EAT-26 indicated a high level of concern about dieting, body weight, or problematic eating behaviors, which were classified as disordered eating (DE) group. Meanwhile, respondents who scored less than 20 were classified as non-disordered eating (non-DE) group. The Cronbach's alpha value for the EAT-26 in the present study was 0.803, indicating a high level of internal consistency for this scale.

Health-Related Quality of Life

A validated 36-item Short Form Health Survey questionnaire (SF-36) developed by Ware *et al*. (1993) was employed in this study. This standardized instrument aligns with existing health theories and comprises 36 items, with eight domains of HRQOL. These domains include Physical Functioning (PF, 10 items), Role Limitations due to Physical Problems (RP, 4 items), Role Limitations due to Emotional Problems (RE, 3 items), Vitality (VT, 4 items), General Mental Health (MH, 5 items), Social Functioning (SF, 2 items), Bodily Pain (BP, 2 items), and General Perceptions of Health (GH, 5 items). The scoring ranges from 0 to 100, with higher scores indicating better HRQOL. The

Cronbach's alpha value for the SF-36 in our study was 0.909, indicating a high level of reliability for this scale.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 23.0. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated for all variables. The independent samples t-test was used to compare continuous variables, and the Chi-square test was used for categorical variables when comparing factors between individuals with DE and non-DE. To assess differences in HRQOL based on body weight status, a one-way analysis of variance (ANOVA) was carried out. Pearson's correlation coefficient was computed to determine the relationship between BMI, disordered eating, and HRQOL. The statistical level of significance was fixed at $p < 0.05$ for all statistical tests.

Ethical clearance

This study was approved by the Research Ethics Committee of Management and Science University, Selangor, Malaysia (Ref: MSU-RMC-02/FR01/01/L1/038). Prior to the data collection, written consent was obtained from all respondents.

RESULT

Socio-Demographic Characteristics

Table 1 shows the socio-demographic characteristics of the respondents. A total of 189 university students participated in this study, with the mean age of 22.05 ± 2.84 years. Majority were females (67.2%). Based on ethnicity, most of the respondents were Malay (41.3%), followed by Indian (33.3%), Chinese (19.6%), and other ethnicities (5.8%).

Body Weight Status of The University Students

The majority had normal weight (54.0%), followed by obesity (16.9%), overweight (15.3%) and underweight (13.8%). Prevalence of overweight among males and females were 14.5% and 15.7%, respectively. Meanwhile, the prevalence of obesity among males and females were 25.8% and 12.6%, respectively. No significant difference between both sexes is found in all socio-demographic characteristics namely age, ethnicity, type of university, body weight status and BMI.

Table 1. Socio-demographic characteristics and body weight status of the respondents (n=189)

Characteristics	Male (n=62)	Female (n=127)	Total (n=189)	Test statistics (p-value)
Age (years)	21.71 ± 2.61	22.21 ± 2.93	22.05 ± 2.84	t = -1.256 (p = 0.629)
Ethnicity				
Malay	26 (41.9)	52 (40.9)	78 (41.3)	χ^2 = 2.202 (p = 0.532)
Chinese	14 (22.6)	23 (18.1)	37 (19.6)	
Indian	17 (27.4)	46 (36.2)	63 (33.3)	
Others	5 (8.1)	6 (4.7)	11 (5.8)	
Type of University				
Private	57 (91.9)	105 (82.7)	162 (85.7)	χ^2 = 2.916 (p = 0.088)
Public	5 (8.1)	22 (17.3)	27 (14.3)	
Body weight status				
Underweight	7 (11.3)	19 (15.0)	26 (13.8)	χ^2 = 5.274 (p = 0.155)
Normal weight	30 (48.4)	72 (56.7)	102 (54.0)	
Overweight	9 (14.5)	20 (15.7)	29 (15.3)	
Obesity	16 (25.8)	16 (12.6)	32 (16.9)	
Body Mass Index	24.90 ± 6.12	23.21 ± 5.49	23.76 ± 5.74	t = 1.911 (p = 0.058)

Notes: Results were presented as mean ± standard deviation or n (%). Mean difference was tested using independent t-test or Chi-square test.

Prevalence of Disordered Eating in University Students

The prevalence of DE according to socio-demographic background and body weight status is shown in Table 2. The overall prevalence of DE in this study was 25.4%. Meanwhile, the prevalence of DE for male and female were 19.4% and 28.3%, respectively. There were no significant differences in the prevalence of DE according to sex ($\chi2 = 1.778$, $p = 0.182$), ethnicity ($\chi2 = 3.867$, $p = 0.276$), types of university ($\chi2 = 0.168$, $p = 0.682$) and body weight status ($\chi2 = 3.268$, $p = 0.352$).

Table 2. Prevalence of disordered eating by socio-demographic characteristics and body weight status (n=189)

Variables	Disordered Eating	Non-Disordered Eating	Test statistics (p-value)
Sex			
Male	12 (19.4)	50 (80.6)	$\chi^2 = 1.778$
Female	36 (28.3)	91 (71.7)	(p = 0.182)
Ethnicity			
Malay	24 (30.8)	54 (69.2)	$\chi^2 = 3.867$
Chinese	6 (16.2)	31 (83.8)	(p = 0.276)
Indian	14 (22.2)	49 (77.8)	
Others	4 (36.4)	7 (63.6)	
Type of University			
Private	42 (25.9)	120 (74.1)	$\chi^2 = 0.168$
Public	6 (22.2)	21 (77.8)	(p = 0.682)
Body weight status			
Underweight	4 (15.4)	22 (84.6)	$\chi^2 = 3.268$
Normal weight	31 (30.4)	71 (69.6)	(p = 0.352)
Overweight	6 (20.7)	23 (79.3)	
Obesity	7 (21.9)	25 (78.1)	
Body mass index	23.64 ± 4.96	23.80 ± 5.99	t = -0.171 (p = 0.864)

Notes: Results were presented as mean ± standard deviation or n (%). Mean difference was tested using independent t-test or Chi-square test.

Health-Related Quality of Life Among University Students

Table 3 shows the mean score and difference of HRQOL by sex and DE status. No significant difference was found between males and females in the mean score of all HRQOL subscales. On the other hand, this study found that the non-DE group had significantly higher mean score of HRQOL compared to DE group in terms of PF (t= -2.783, p= 0.006), RP (t= - 2.246, p= 0.026) and RE (t= -3.037, p= 0.003). Furthermore, no significant difference was found in other HRQOL subscales between DE and non-DE.

Table 3. Mean score and difference of health-related quality of life by sex and disordered eating status (n=189)

HRQOL Subscales	Sex			Disordered Eating Status			Total
	Male (Mean±SD)	Female (Mean±SD)	t (p-value)	Disordered Eating (Mean±SD)	Non-Disordered Eating (Mean±SD)	t (p-value)	
Physical functioning**	66.61±33.24	68.15±29.47	-0.309 (0.758)	57.19±32.71	71.21±29.23	-2.783 (0.006)	67.64±30.68
Role limitation due to physical health*	66.53±35.63	74.41±32.50	-1.468 (0.145)	62.50±36.47	75.00±32.18	-2.246 (0.026)	71.83±3.67
Role limitation due to emotional problems**	64.52±37.63	70.60±37.24	-1.052 (0.294)	53.47±41.68	73.75±34.46	-3.037 (0.003)	68.61±37.38
Vitality	53.31±14.46	50.63±12.15	1.334 (0.184)	49.69±14.31	52.13±12.48	-1.126 (0.261)	51.51±12.97
General mental health	61.87±17.26	59.18±16.05	1.055 (0.293)	56.25±18.16	61.36±15.70	-1.871 (0.063)	60.06±16.46
Social functioning	71.17±20.69	64.76±24.11	1.794 (0.075)	64.06±26.12	67.81±22.12	-0.969 (0.334)	66.87±3.19
Bodily pain	76.01±21.13	70.20±21.68	1.744 (0.083)	73.60±22.15	71.60±21.50	0.552 (0.582)	72.10±21.62
General health perception	63.15±18.47	61.46±15.30	0.664 (0.507)	62.29±16.95	61.91±16.24	0.137 (0.891)	62.01±16.38

Notes: Mean difference was tested using independent t-test
*Significant difference between DE and non-DE at p<0.05
**Significant difference between DE and non-DE at p<0.01

Table 4 shows the mean score and difference of HRQOL by body weight status. The mean score of HRQOL, namely VT (F= 6.259, p<0.001), MH (F= 3.295, p= 0.022), SF (F= 2.895, p= 0.037), BP (F= 4.836, p = 0.003) and GH (F= 4.696, p= 0.003) were statistically significantly differed by body weight status. For all these HRQOL, underweight has the lowest score compared to the other three body weight status. Underweight has a significantly lower score of VT compared to all three body weight statuses, significant lower MH compared to overweight and obesity, significant lower SF compared to overweight, significant lower BP in comparison to normal weight and obesity and significantly lower GH in comparison to normal weight and overweight.

Table 4. Mean score and difference of health-related quality of life by body weight status (n=189)

HRQOL Subscales	Body Weight Status				ANOVA		
	Underweight	Normal Weight	Overweight	Obesity	Sum of Squares (SS)	F	P-value
Physical functioning	63.27±29.53	66.67±31.04	75.00±31.11	67.66±30.35	2164.248	0.764	0.516
Role limitation due to physical health	68.27±37.12	73.28±30.72	78.44±35.81	64.06±37.53	3746.320	1.104	0.349
Role limitation due to emotional problem	58.97±35.66	71.90±36.86	70.11±39.18	64.58±38.74	4099.503	0.978	0.404
Vitality***	42.31±11.33[a]	52.99±13.04[b]	55.52±13.39[b]	50.63±10.38[b]	2915.968	6.259	0.000
General mental health*	52.77±17.05[a]	59.33±15.45[a,b]	64.55±16.10[b]	64.25±17.71 [b]	2582.784	3.295	0.022
Social functioning*	57.21±22.69[a]	69.00±23.12[a,b]	72.84±22.43[b]	62.50±22.45[a,b]	4532.424	2.895	0.037
Bodily pain**	58.27±22.88[a]	74.49±20.28[b]	70.69±22.45[a,b]	77.03±20.27[b]	6389.719	4.836	0.003
General health perception**	52.31±12.98[a]	64.85±16.75[b]	63.62±17.67[b]	59.38±13.43[a,b]	3569.319	4.696	0.003

Notes: Mean difference was tested using one-way ANOVA
*Significant difference between different body weight status at p<0.05
**Significant difference between different body weight status at p<0.01
**Significant difference between different body weight status at p<0.001
[a,b]Significant difference based on Tukey post-hoc analysis

Association Between BMI and Disordered Eating with Health-Related Quality of Life

Table 5 shows the association between BMI and DE with HRQOL. A significant and positive association was found between BMI with MH (r= 0.207, p= 0.004) and BP (r= 0.153, p= 0.036). Meanwhile, for the association between DE and HRQOL, there was a significant and negative association between DE and PF (r= -0.183, p= 0.012), RP (r= -0.155, p= 0.033), RE (r= -0.232, p= 0.001) and MH (r= -0.214, p= 0.003).

Table 5. Association between body mass index (BMI) and disordered eating (total score of EAT-26) with HRQOL (n=189)

HRQOL Subscales	BMI r (p-value)	Disordered Eating r (p-value)
Physical functioning	0.077 (0.295)	-0.183* (0.012)
Role limitation due to physical health	-0.043 (0.554)	-0.155* (0.033)
Role limitation due to emotional problem	-0.004 (0.952)	-0.232** (0.001)
Vitality	0.116 (0.113)	-0.113 (0.122)
General mental health	0.207**(0.004)	-0.214** (0.003)
Social functioning	0.006 (0.937)	-0.123 (0.093)
Bodily pain	0.153* (0.036)	-0.020 (0.783)
General health perception	0.052 (0.480)	-0.038 (0.601)

Notes: Correlation between BMI and DE was r=0.012 (p=0.875)
*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed

DISCUSSION

The prevalence of overweight in the current study was 15.3% and prevalence of obesity was 16.9%. This is compatible to recent studies reported by Chan *et al.* (2020) in which the prevalence of overweight was 12.1% and obesity was 20.6% among undergraduate students in Kuala Lumpur, Malaysia and a study by Chin *et al*. (2020) that reported the prevalence of overweight was 11.3% and obesity was 4.3% among university students in Kuala Lumpur and Selangor, Malaysia.

Males are not significantly different to females in body weight status and BMI. This contradicts the previous study by Chin *et al*. (2020) among university students in Kuala Lumpur and Selangor, Malaysia, in which they found a significantly higher BMI among males compared to females.

The current prevalence of DE was 25.4%, which is higher compared to the previous studies among Malaysian university students which are 13.9% (Chan *et al*., 2020), 20.3% (Chin *et al*., 2020) and 21% (Gan & Yeoh, 2017) and 21.8% (Eow & Gan, 2018). Recent systematic reviews by Linardon *et al*. (2022) and McLean *et al*. (2022) suggest that eating disorders and disordered eating behaviors are probably on the rise as a result of the COVID-19 pandemic. Self-isolation and alterations in the social and household environments probably led to the decline in eating habits.

The prevalence of DE among females (28.3%) was higher compared to males (19.4%), but it was not significant in this study. The finding was consistent with studies among Malaysian university students that stated a higher percentage of female students engaged in DE compared to male student (Chin *et al*., 2020; Eow & Gan, 2018). Females tend to be relatively self-conscious about their weight. The possible factors could be thin female bodies being portrayed in the media as the ideal as well as pressure from peer, cultural and family factors to be what is considered as socially desirable (Saleh *et al*., 2018).

Based on DE status, this study found that the non-DE group had significantly higher PF, RP and RE compared to DE group. Meanwhile, for the association between DE and HRQOL, there was a significant and negative association between DE and PF, RP, RE and MH. As a comparison, DE attitudes were significantly negatively associated with the total score of HRQOL among Greek adolescents (Zervaki *et al*., 2017). The lower HRQOL among those who are having DE compared to their non-DE counterparts was explained in the previous studies. For instance, it was found that eating disorders and DE behaviors are linked to lower HRQOL in children and adolescents based on the Wu *et al*. (2019) systematic review. It was also proposed that, independent of age, gender, or body weight status, DE behavior may be a risk factor for HRQOL in children and adolescents (Wu *et al*., 2019). Additionally, compared to their healthy peers, adolescent females who reported having DE had worse emotional and social functioning, plus lower total HRQOL (Jalali-Farahani *et al*., 2015). In the meantime, among adolescent boys, DE was linked to lower HRQOL overall, school functioning, and emotional functioning (Jalali-Farahani *et al*., 2015).

Furthermore, we also discovered that normal weight was not significantly different with overweight/ obesity for all HRQOL subscales. This is contrary to previous study which demonstrated the class I obese scored significantly higher in the dimensions of RP, GH, VT, SF and RE compared to the normal weight (Zhu *et al*., 2015). Furthermore, our study discovered all HRQOL was significantly lower in underweight compared to other body weight status except for PF, RP and RE, which are consistent with the finding by Zhu *et al* (2015) that underweight had significantly lower scores for all HRQOL except for PF and RE. It contradicts, however, a study that indicated that, in comparison to the normal weight group, overweight and obese individuals of both genders had considerably worse physical HRQOL and mental HRQOL (Abbas *et al*., 2018).

Moreover, the current study shows the BMI was significantly and positively associated with BP. High BMI is usually linked to high body fat. Previous studies showed a relationship between high body fat and bodily pain. A systematic review and meta-analysis by Walsh *et al.* (2018) found that elevated body fat is positively correlated with low back pain, knee pain, foot pain, and

general pain. Furthermore, the meta-analysis found a positive cross-sectional relationship between higher body fat and widespread and single-site joint pain in the low-back, knee and foot. Outcomes from longitudinal studies indicate that a higher body fat percentage may raise the risk of developing and exacerbating joint pain (Walsh *et al*., 2018).

The correlation between BMI and DE was not significant in our study. This is in contrast to the past studies where DE showed a significant and positive correlation with BMI (Chin *et al*., 2020; Rouzitalab *et al*., 2019; Saleh et al., 2018) as well as finding significant and negative correlation (Yu *et al*., 2015).

Both BMI and DE have significant association with MH, whereby BMI was positively associated, and DE was negatively associated with MH. This is not surprising as the Health Survey for England shows those with increased BMIs report improved psychological well-being (Archangelidi & Mentzakis, 2018). The finding in the current study related to MH was inconsistent with a previous study using genetic information that found a causal and increasing effect of BMI on depressive symptoms (van den Broek *et al*., 2018) as well as a study by van Vuuren *et al*. (2019) which found overweight, and obesity was significantly linked with mental health problems in adolescent. For young adults, there was no statistically significant outcome of BMI toward mental health (Amin *et al*., 2020).

Higher stress during COVID-19 pandemic and lockdown was shown to be positively associated with increased DE (Czepczor-Bernat *et al*., 2021; Flaudias *et al*., 2020; Jordan *et al*., 2021; Nutley *et al*., 2021). It is believed that the psychosocial stressors brought on by the COVID-19 pandemic, such as disruption to regular schedules, adherence to social distancing measures, mandates to remain indoors, and limited availability of specific foods have contributed to food insecurity. This situation has exacerbated feelings of stress and uncertainty, subsequently raised the reliance on disordered eating behaviors as a coping strategy (Flaudias *et al*., 2020).

The strength of this study is it has provided important insights on the BMI, DE and HRQOL of Malaysian university students aged 18 years and above. Besides that, this study is the first to determine the association between DE and HRQOL among university students in Malaysia during the COVID-19 pandemic. The limitation of the current study is that it is a cross-sectional study, thus it cannot conclude a cause-and-effect relationship between variables. The sample size is also one of the limitations, as this study included 189 respondents to be in the final analysis, instead of 220 respondents, after adding 20% of possible non-response. However, the respondents' number has achieved the minimum required sample size of 183 respondents. In addition, the findings of this study could not be generalized to all Malaysian university students because it was done at only two universities located in Selangor, Malaysia. Furthermore, face-to-face data collection and anthropometric measurements were unable to be done due to MCO during the duration of data collection. Thus, self-measured weight and height may be exposed to bias and not accurate as measured by the researcher.

CONCLUSION

This study has provided an important insight on the link between BMI and DE with HRQOL among Malaysian university students, specifically during the COVID-19 pandemic. For future research, it is suggested that the data collection be done in more numbers of universities, including both public and private university to have a better insight and generalization among university students in Malaysia. Anthropometric measurements such as waist circumference and body fat percentage can be carried out to have a better insight on their body weight status and to determine any possible association with DE and HRQOL. The findings gathered in the current study could be added to the existing literature as response to the scarce published information on this issue among university students in Malaysia. The information can facilitate the development of interventions and strategies that could improve the health and quality of life of the university students.

SUGGESTION

Based on our findings, there are associations between BMI and DE with

HRQOL among the university students. Therefore, future interventions for preventing DE and obesity among university students could be considered in designing comprehensive intervention programs that address both physical and mental health aspects of body weight status and eating behavior. This could include nutritional counseling, physical activity programs, and mental health support services.

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CONFLICT OF INTEREST

The authors have declared that they have no potential conflicts of interest related to this study.

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AUTHOR CONTRIBUTION

Sharifah Intan Zainun Sharif Ishak principal investigator, conceptualized and designed the study, drafted and reviewed the manuscript. Presanna Arumugam data collection, data analysis and interpretation, drafted and reviewed the manuscript. Yit Siew Chin data collection, data analysis and interpretation and reviewed the manuscript.

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