Association between Eating Behaviour, Stress Level and Body Mass Index of University Students

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Abstract:

Introduction: Stress among university students is rising and affects eating behaviour and body mass index. This study aims to determine the relationship between stress and eating behaviour and its association with body mass index among undergraduate students in Universiti Sains Malaysia. **Method**: A total of 107 subjects were recruited using the convenience sampling method. Participants were given a questionnaire used composed of sociodemographic items, anthropometry measurements, items from the Cohen's Perceived stress scale questionnaire and eating behaviour (Three-factor eating questionnaire R21). **Results**: Analysis indicated that more than half of the subjects had moderate stress levels (69.2 %). However, there was no significant difference between stress and gender. The analysis between gender and all domains of eating behaviour (cognitive restrain, uncontrolled eating and emotional eating) showed no significant difference. The majority of participants presented a normal BMI. Male students had a significantly higher median BMI (22.68 ± 6.91 kg/m2) than female students (20.68 ± 4.07 kg/m2). The emotional eating was significant among students who were underweight. High perceived stress was significantly associated with a median BMI. There was a significant association between uncontrolled eating domain (p=0.041) and emotional eating domain with perceived stress level. **Conclusion**: Findings of this study can be considered as a preliminary study for intervention research investigating the effectiveness of multi-domain modules for managing eating behaviour and stress among students.

Keywords: Stress, Eating Habits, Emotional Eating, Body Weight

Introduction:

In Asia, the prevalence of overweight and obesity among university students are 20.8% in Bangladesh, 2.9-14.3 % in China, 20-30.1 % in Malaysia, 31% in Thailand, 13-52.6% in Pakistan, and 11-37.5% in India (Peltzer, et al., 2014; Tapera, et al., 2017). University students often reported having higher stress levels, being sedentary and practicing unhealthy eating patterns comprising of processed foods, fried foods, and sweet beverages (Tapera, et al., 2017).

College or university students often feel stressed due to poor stress coping mechanisms (Fijar, et al., 2018). The prevalence of stress among Malaysian students was 40 % (Cheng and Muhammad Khair, 2020) while in Turkey, Hong Kong, and Australia reported 27%, 43% and 52.9%, respectively (Cheng and Muhammad Khair, 2020). The major stress contributing factor among university students is due to the poor ability to adapt to university life (Monteiro, et al., 2014). Various other challenges such as personal psychological issues, family problems, and low socioeconomic status may affect the students` eating behaviour (Kabir, et al., 2018). It is common for a student to experience stress during the exam period as they may have skipped breakfast, delayed mealtime or even taken meals in restaurant (Kabir et al., 2018).

There is a strong relationship between stress level and eating behaviour where high stress is always recognized as a reason for uncontrolled eating behaviour (Penaforte, et al., 2016; Ramadhani and Mahmudiono, 2021; Saat, et al., 2014). A study done among 914 university students in Malaysia stated that 87% of students consumed fried food at least 2-4 times per week, 57% of students consumed high fat food more than 4 times a week and reported lesser intake of fruit and vegetables in their daily diet (Nik Hairi, et al., 2015).

Since university students reported having troubled dietary habits, this study aims to determine the relationship between stress, eating behaviour and its association with BMI among Universiti Sains Malaysia undergraduate students.

Materials and Methods:

Study design

This was a cross-sectional study approved by the Human Research Ethics Committee in Universiti Sains Malaysia [code USM/JEPeM/21060449]. This research included 107 students from the School of Dental Sciences, School of Medical Sciences and School of Health Sciences. The participants were recruited via convenience sampling. Informed consent was obtained from all participants prior to their recruitment to the study. The inclusion criteria of the study participants were Malaysian undergraduate students aged 18 years and above. Students with clinical diagnosed mental health problems were excluded from this study.

Research instrument

The data collection was conducted via a self-administered questionnaire in the English language distributed using the Google form. Items on sociodemographic characteristics included gender, age, ethnicity, school, year of study and current residence of the participants. BMI was self-reported as body weight(kg) divided by squared of height(m2). The WHO BMI cut-off points were used; BMI <18.5 kg/m² (underweight), between 18.5 and 24.9 kg/m² (normal), ≥25 kg/m² (overweight) and ≥ 30.0 kg/m² or above (obese) (World Health Organization, 2020).

The Cohen's Perceived Stress Scale (Cohen, et al., 1983) was used to determine the stress perception of an individual. There were 10 questions pertaining to their feelings and thoughts in the past month with answer option of 0 (Never), 1 (Almost never), 2 (Sometimes), 3 (Often) and 4 (Very often). The total score was calculated via adding the sum of the 10 items. Reverse scoring was applied for question 4, 5, 7 and 8. The Cronbach's alpha of this questionnaire was between 0.84 to 0.86. Scores ranging from 0-13 was considered as low stress, 14-26 was moderate stress and 27-40 was considered as high perceived stress (Cohen et al., 1983).

The three-factor eating questionnaire R21 (TFEQ-R21) was used to determine the eating behaviour of an individual (Stunkard and Messick, 1985). The TFEQ-R21 included three main domains of eating behaviour namely cognitive restrain (CR) (6 items), uncontrolled eating (UE) (6 items), and emotional eating (EE) (9 items). The cognitive restraint scale was used to assess the control over food consumption to influence body weight and shape, while the emotional eating assessed the tendency to over-eat when experiencing negative mood states such as loneliness, anxious or depressed. On the other hand, uncontrolled eating scale had been used to measure the tendency to lose control over eating when feeling hungry or when exposed to external stimuli (Tholin et al., 2005). Question 1 to 16 had similar response categories 1 (Definitely agree), 2 (Mostly agree), 3 (Mostly disagree), 4 (Definitely disagree). Reverse scoring was applied for the first 16

questions with scores of 1=4, 2=3, 3=2, 4=1 and for question 17-20, normal scoring was applied such as 1=1, 2=2, 3=3 and 4=4. Besides, for last question (question 21) it was recorded as 1–2 scores as 1; 3–4 as 2; 5–6 as 3; 7–8 as 4. Higher scores indicate worsening eating behaviour (Cappelleri et al., 2009).

Data analysis

Statistical analysis was done using the IBM SPSS version 26.0. Numerical data was presented as mean (SD) or median (IQR) based on the distribution normality. Categorical data were present as frequency (percentage). The association between eating behaviour domains and body mass index were tested using Pearson product-moment correlation or Spearman's rank correlation test. The relationship between the stress level with eating behaviour domains and body mass index were determined using the One-Way analysis of variance (ANOVA) if normally distributed and Kruskal-Wallis if not normally distributed. Significance level was set at *p* value less than 0.05.

Results:

Sociodemographic characteristics

The sociodemographic characteristics of the participants who participated in this study are presented in Table 1. The majority of the study participants were Malay (59.81%) and female (65.40%).

Table 1 Frequency distribution table for demographic characteristic (N= 107)

Characteristics	n	%
Age (y) (Median/IQR)	22.00 ± 2.00	
Ethnicity		
Malay	64	59.81
Indian	21	19.63
Chinese	15	14.02
Others	7	6.54
Gender		
Male	37	34.60
Female	70	65.40

Anthropometric characteristics, stress level and eating behaviour

The majority of the participants had a normal body mass index (BMI) range with median of 21.60 ± 4.79 kg/m^2. Male students had a significantly higher median BMI (22.68 ± 6.91kg/m^2) compared to female students (20.68 ± 4.07kg/m^2) (p<0.05).

More than half of the study participants reported moderate stress levels (69.2%). Only 15% of the participants reported having high stress levels (15.0%). However, there were no significant gender differences between stress and eating behaviour domains (Table 2)

Table 2 Stress level, eating behaviour and BMI level according to gender.

Parameters	Total (n = 107)		Male (n= 37)		Female (n=70)		p value
	n	%	n	%	n	%	
Stress Level							0.550
Low	16	15.00	4	10.80	12	17.10	
Moderate	74	69.20	28	75.70	46	65.70	
High	17	15.90	5	13.50	12	17.10	
Eating Behaviour (Mean/SD) *							
Cognitive Restrain	2.57 ± 0.34		2.55 ± 0.36		2.59 ± 0.33		0.581
Uncontrolled Eating	2.56 ± 0.43		2.56 ± 0.46		2.55 ± 0.42		0.877

Emotional Eating	2.80 ± 0.71	2.85 ± 0.76	2.77 ± 0.68	0.581
Body Mass Index (Median/IQR)	21.60 ± 4.79	22.68 ± 6.91	20.68 ± 4.07	0.001

*SD: Standard Deviation; IQR: Interquartile range

Association Between Eating Behaviour and Body Mass Index (BMI)

Higher emotional eating scores were associated with lower BMI ($p<0.02$). However, no significant association was found between uncontrolled eating behaviour and cognitive restraint with BMI. (Table 3).

Table 3 Association between eating behaviour with BMI

Parameter	Eating Behaviour Domain	r-value	*p*-value
Body Mass Index (kg/m²)	Cognitive restraint	0.008	0.933
	Uncontrolled Eating	-0.178	0.067
	Emotional Eating	-0.224	0.020*

*$p<0.05$ significant using Spearman's rank correlation

Association Between Eating Behaviour and BMI With Stress Level

Subjects with low stress levels had significantly higher median values of emotional eating scores (3.50,0.96) as compared to those with moderate (2.67, 1.17) and high (2.83,1.08) perceived stress levels ($p<0.05$). Similarly, uncontrolled eating scores were highest in the low stress group.

Those with the highest perceived stress were reported to have higher BMI (22.60, 9.12 kg/m²) as compared to the those with moderate (21.62, 4.92 kg/m²) and low (19.78, 6.26 kg/m²) stress levels (Table 5).

Table 5 Association between stress level and eating behaviour

Parameter	Low stress level (n=16) Median (IQR)	Moderate stress level (n=74) Median (IQR)	High perceived stress level (n=17) Median (IQR)	*p*-value
Cognitive Restrain	2.42(0.29)	2.67(0.50)	2.50(0.42)	0.358
Uncontrolled Eating	2.67(0.33)	2.56(0.58)	2.22(0.78)	0.041*
Emotional Eating	3.50(0.96)	2.67(1.17)	2.83(1.08)	0.013*
Body Mass Index (kg/m²)	19.78(6.26)	21.62(4.92)	22.60(9.12)	0.001*

IQR: Interquartile range
*Kruskal-Wallis test, significant at $p<0.05$

Discussion:

In this study, males had a significantly higher median BMI than females. The overall median BMI of the subjects were in the normal weight category (World Health Organization, 2020). Cheng and Muhammad Khair (2020) reported that higher BMI in men is due to the tendency to consume higher calories compared to females. In general, young females are typically more health conscious and more likely to avoid high calorie foods for achieving weight loss or maintaining optimal body image (Cheng and Muhammad Khair, 2020).

More than half of the participants in the current study reported moderate stress. This finding is parallel with previous studies conducted in Saudi Arabia, India, and Malaysia (AlAteeq, et al., 2020; Bhavani Nivetha, et al., 2018; Sami, et al., 2014). This is most likely due to the fact that university students are emerging adults who are interested in exploring their identities, working for independence, and fulfilling various roles (AlAteeq, et al., 2020).

The findings of this study demonstrated a significant relationship between lower BMI with higher scores in the domain of emotional eating regardless of gender. The study by Kowalkowska and Poínhos (2021) stated that emotional eating was positively associated with BMI among female students. Students tend to eat more when they are emotionally disturbed which contributes to weight gain. Similarly, a study among Lebanese University students revealed that BMI was positively associated with emotional eating (Aoun, et al., 2019). (Poínhos, et al., 2015). The other two domains of eating behaviour such as cognitive restraint and uncontrolled eating were not associated with BMI. A previous study found a positive correlation between cognitive restrain and BMI (Kowalkowska and Poínhos, 2021) where cognitive restrain was associated with higher BMI. This may be because of self-initiated eating restrain for the purpose of weight control which will lead to weight gain (Tonja Thomas and Neela Badrie, 2010). Another study done among Sudanese medical students stated that eating behaviour is significantly associated with BMI (Yousif, et al., 2019). A study on the eating behaviour of Malaysian university students showed a significant positive association between abnormal eating and BMI (Mona Mohamed, et al., 2020).

This study found that high stress level was significantly associated with low BMI. The findings resonate with with previous study which found that higher perceived stress was associated with overweight or obesity (Pelletier, et al., 2016). Another study among medical students in China showed a significant increase in overweight and obesity with higher stress levels due to frequent examinations, tight curriculum schedules and long clinical hours (Chen, et al., 2020). Besides that, overweight and obesity among university students enrolled in health care courses were attributed to several factors such as having less time for family and friends, higher workload, talking to patients about personal problems, dealing with disease and death, and insufficient time for recreation (Gajjala, et al., 2016). However, some studies have reported no association between BMI and perceived stress (Nur Zakiah, et al., 2010; Saat, et al., 2014).

The findings of this study revealed that students with low stress levels was significantly associated with uncontrolled eating and emotional eating. This is in contrast with the findings of other studies which found stress to be related to a lower preference for healthy food (Choi, 2020). Students with higher stress levels tend to consume more fast food and sugar containing snacks as comfort food. On the other hand, a study by Serin (2018) stated that healthy people with normal body weight will have positive emotions that affect their food intake as positive emotion is based on the satisfaction of a person. Examples of positive emotions are happiness, gratitude, pleasure, enthusiasm, pride and healthy lifestyle (Serin, 2018). As for uncontrolled eating, students may eat more to satisfy themselves with caloric dense food or high fat food. Both positive and negative emotions can alter the eating behaviour of a person (Cheng and Wong, 2021). Positive emotions can increase the consumption of palatable food (Cheng and Wong, 2021). Individuals who engage in emotional eating as a coping strategy will have a greater tendency to consume palatable-snacks in response to stress (Amestoy and Fiocco, 2021). Most of the students who experienced negative emotions were more inclined to eat less but eat more when they had positive emotions (Alalwan, et al., 2019). Furthermore, boredom can drive emotional eating behaviour (Alalwan, et al., 2019). The findings of other studies showed that higher stress is associated with emotional eating and uncontrolled eating (Cheng and Muhammad Khair, 2020; Penaforte, et al., 2016).

This study had few limitations. The anthropometric data was self-reported and may be subjected to bias. Other confounding factors of stress level such as physical activity and dietary intake were not assessed in this study.

Conclusion:

In this present study, it was found that most of the study participants were moderately stressed and had normal BMI. In addition, lower BMI was associated with higher emotional eating scores. Higher stress was associated with greater BMI, however subjects with lower stress levels had greater uncontrolled eating and emotional eating scores. It is essential for university management to screen for psychological problems among students as this may affect their eating habits and overall health status.

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