

# Household income, frequency of purchasing outside meals, eating behaviour and body mass index status among undergraduate students during first phase of COVID-19 lockdown

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## ABSTRACT

**Introduction:** COVID-19 lockdown has changed the eating behaviours of people, which could affect their body mass index (BMI). These changes affected meal purchasing habits of university students, depending on their household income. Thus, the current study aimed to investigate the association between eating behaviour, household income, frequency of purchasing outside meals with BMI among undergraduate students. **Methods:** This was a retrospective cross-sectional study conducted among 112 undergraduate students. Subjects recalled information during the first phase of COVID-19 lockdown, which was from March 2020 till July 2020. Questionnaire consisted of socio-demography, anthropometry, frequency of purchasing outside meals, and eating behaviour using the Malay version Dutch Eating Behaviour Questionnaire (DEBQ). **Results:** About 64.3% of subjects reported purchasing outside meals 1-2 times per week. Higher restrained eating behaviour score was correlated with purchasing outside meals about 3-4 times and >4 times a week. Normal weight students had significantly higher restrained eating behaviour score [3.0(1.1)] than those in the obese group [2.9(1.1)]. Household income had no association with frequency of purchasing outside meals. **Conclusion:** Eating behaviour affected BMI and the frequency of purchasing outside meals during COVID-19 lockdown. COVID-19 lockdown has resulted in tremendous changes in the eating behaviour and physical activity pattern of university students. Future studies should focus on increasing the nutrition knowledge of university students, especially on the aspect of eating out.

**Keywords:** body mass index, COVID-19, eating behaviour, household income, purchasing meals

## INTRODUCTION

The worldwide pandemic of COVID-19 has caused a significant burden on public health and disruption in daily life. In Malaysia, the government introduced the enforcement of the Movement Control Order (MCO) effective from 18<sup>th</sup> March

2020, with the main aim of isolating the source of COVID-19 outbreak and as a strategy to flatten the pandemic curve in the country (Heikal Ismail *et al.*, 2020). During the restriction order, people had to stay at home, and all working activities were shuttered temporarily and turned

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doi: <https://doi.org/10.31246/mjn-2021-0129>

into working from home (Pellegrini *et al.*, 2020).

The adverse mental health burden during the COVID-19 pandemic has been evaluated by a few studies and was greatly associated with increased weight gain (Pellegrini *et al.*, 2020). Social isolation has impacted people's lifestyle behaviours with increased sedentarism and reduced outdoor time, ultimately causing increased weight gain (Pellegrini *et al.*, 2020). Higher body mass index (BMI) was also shown to correlate with lower levels of physical activity, poor diet quality, and a greater frequency of overeating during the crisis (Tan, He & MacGregor, 2020). A study in Italy involving 41 children and adolescents with obesity found that participants reported less time exercising and increased consumption of junk foods than before the lockdown period (Pietrobelli *et al.*, 2020).

Malaysia is ranked as having the highest obesity rate in Southeast Asia. A study conducted among five public universities in Malaysia demonstrated that the prevalence of overweight and obesity among undergraduate students are 23.0% and 17.6%, respectively (Wan Mohamed Radzi *et al.*, 2019). The major factors that lead to obesity are inadequate physical activity, overeating, and other environmental factors such as stress and exposure to unhealthy foods (Wan Mohamed Radzi *et al.*, 2019). The COVID-19 pandemic may worsen and increase the prevalence of obesity in Malaysia as the crisis has impacted normal lifestyle behaviours.

University students' eating behaviour is influenced by various factors such as peer influence, adjusting to campus lifestyle, exam pressure, cost of living, nutrition knowledge, and cooking skills (Kabir, Miah & Islam, 2018). Before the COVID-19 pandemic, university students often purchased foods and beverages for lunch and snacks on

campus. During the lockdown period, people had to stay at home; some might cook at home, while others might go out and buy food through an online ordering system or application. Food purchasing via online applications was not common before the pandemic due to cost (Tam *et al.*, 2016). However, during the pandemic lockdown period, food purchasing using online food applications increased, as it helped to avoid going to crowded places (Candra, Ayudina & Arashi, 2021; Hassen *et al.*, 2021).

Outside foods, or out-of-home foods, have become increasingly popular recently with online ordering applications and e-hailing deliveries such as Grabfood, Foodpanda, Dahmakan, Bungkusit, and many more. Due to easy accessibility to foods, they are thought to be one of the key contributory factors in the increasing number of overweight and obese individuals. In addition, most of the meals served in restaurants are unfavourable in terms of their nutritional content (Janssen *et al.*, 2018).

Food purchasing behaviour among consumers, especially university students, is affected by several factors such as purchasing intention, social pressure, socioeconomic status, food availability, and convenience (Whatnall *et al.*, 2021). Frequent out-of-home food consumption has been associated with a higher BMI, enhanced cardio-metabolic risk, and various negative health outcomes (Janssen *et al.*, 2018). Therefore, food type, quantity, and frequency of eating food outside of home may significantly impact nutrient intake levels and BMI status (Choi *et al.*, 2019). With that, this study aimed to determine the association between household income, frequency of purchasing outside meals, eating behaviour, and BMI status among Universiti Sains Malaysia (USM) undergraduate students during the COVID-19 lockdown period.

## MATERIALS AND METHODS

This study was a retrospective cross-sectional study conducted among undergraduate students between the ages of 19 and 30 years old, who were enrolled in the Medical, Dental, and Health Sciences courses at USM Health Campus. The exclusion criteria were postgraduate students. Subjects were required to recall information during the first phase of the COVID-19 lockdown in Malaysia from March 2020 to July 2020. A questionnaire in using the Google Form platform was distributed via WhatsApp, Telegram, and email. Only subjects who provided consent on the first page of the form were recruited in this study. Subjects were chosen via convenience sampling method. This study obtained ethical approval from the USM Human Research Ethics Committee (USM/JEPeM/21010069).

In this study, the prevalence value was obtained from the frequency of changes in weight and eating behaviour in 150 randomly selected young adults with obesity during the COVID-19 lockdown period (Pellegrini *et al.*, 2020). Sample size was calculated using the single proportion formula (Ahmad *et al.*, 2012). With a drop-out rate of 20%, a sample size of 112 was calculated with a prevalence value of 93.5%, a z-score of 1.96, and a precision value of 0.05. An additional 20% of research subjects were used to overcome non-response bias or when the study obtained incomplete data from participants that would affect the outcome of this study.

The questionnaire in this study consisted of four sections: socio-demography, anthropometry, frequency of purchasing outside meals, and eating behaviour. Socio-demography consisted of age, location during COVID-19 lockdown (either in the hostel or at home), and household income. Household income classification was

adapted from the study by Ibrahim *et al.* (2019). Anthropometry information were self-reported, with weight in kilograms (kg), height in metres (m), and BMI in  $\text{kg}/\text{m}^2$ . BMI was calculated by dividing weight over height squared, then further categorised into underweight (BMI <18.5  $\text{kg}/\text{m}^2$ ), normal (BMI 18.5 – 24.9  $\text{kg}/\text{m}^2$ ), overweight (BMI 25.0 – 29.9  $\text{kg}/\text{m}^2$ ), and obesity (BMI  $\geq 30.0$   $\text{kg}/\text{m}^2$ ) (WHO Expert Consultation, 2004).

For the section on purchasing outside meals, students were asked, "How often in a week do you purchase meals from outside during the first phase COVID-19 lockdown?" It had four answer options: no purchase of outside food in a week, purchase 1-2 times per week, 3-4 times per week, and >4 times per week. Purchasing outside meals included online purchasing via food delivery applications.

Lastly, eating behaviour was assessed using the Malay version of Dutch Eating Behaviour Questionnaire (DEBQ) (Subramaniam *et al.*, 2017). The Malay DEBQ had 30 items in the questionnaire as opposed to 33 items in the English version. Three items had to be removed due to low reliability. The Malay DEBQ measured three domains of unhealthy eating behaviours. The domains were restrained eating, emotional eating, and external eating. Restrained eating refers to restricting food intake to control body weight. Emotional eating refers to coping with negative emotions, such as anxiety or irritability, using food. Lastly, external eating refers to external triggers that influence eating behaviour, such as the presentation or aroma of food. Each item has five answer options, namely 1 = never, 2 = seldom, 3 = sometimes, 4 = often, and 5 = very often. The total score for each domain was calculated by adding the scores for each item in the respective domains. Higher scores indicated a greater tendency for poor eating behaviours. The results for each

domain were presented as numerical values. After removing items 21, 14, and 27 from the questionnaire, the internal consistency values for emotional, external, and restrained eating were 0.914, 0.819, and 0.856, respectively.

### Statistical analysis

The SPSS software version 27.0 (IBM Corp, Armonk, New York) was used to analyse the data. The statistical significance level was set at  $p < 0.05$  (two-tailed) at a 95% confidence interval. Descriptive statistics were used to summarise the sociodemographic characteristics of subjects. Numerical data were presented as mean (standard deviation, *SD*) for normally distributed

data or median (interquartile range, *IQR*) for non-normally distributed data. Categorical data were presented as frequency (percentage). Chi-square test of independence was used to assess the association between the frequency of purchasing outside meals, BMI, and household income. Comparison had been done between each individual eating behaviour domains (numerical data), with frequency of purchasing outside meals (categorical data), and BMI (categorical data) using the one-way between-group analysis of variance (ANOVA) (if normally distributed) or Kruskal-Wallis test (if not normally distributed).

**Table 1.** Socio-demography, frequency of purchasing outside meals and anthropometric parameters of subjects during COVID-19 lockdown [data expressed as mean (*SD*) or *n* (%)]

<i>Characteristic</i>	<i>Mean (SD)</i>	<i>n (%)</i>
Age, years	22.5 (1.3)	
Monthly household income		
≤MYR 1000		26 (23.2)
MYR 1001-3000		28 (25.0)
MYR 3001-5000		17 (15.2)
≥MYR 5001		41 (36.6)
Location		
Home		92 (82.1)
Campus hostel		20 (17.9)
Frequency of purchasing outside meals		
No purchase of outside food in a week		14 (12.5)
1 – 2 times per week		72 (64.3)
3 – 4 times per week		15 (13.4)
>4 times per week		11 (9.8)
Weight (kg)	57.2 (14.3)	
Height (cm)	156.2 (6.8)	
BMI (kg/m <sup>2</sup> )	24.3 (5.3)	
BMI category		
Underweight		19 (17.0)
Normal		61 (54.5)
Overweight		16 (14.3)
Obese		16 (14.3)
Eating behaviour score		
External eating domain	3.5 (0.6)	
Restrained eating domain	2.7 (0.8)	
Emotional eating domain	2.6 (0.7)	

BMI=body mass index, MYR=Malaysian Ringgit, m=metre, kg=kilograms, cm=centimetre, *SD*=standard deviation

## RESULTS

There were 112 subjects with mean age of 22.5 (SD=1.3) years. The majority of subjects (82.1%) resided in their respective homes during the study period. About 36.6% of the subjects had a high monthly household income of MYR 5001 and above. A total of 64.3% of students reported purchasing meals from outside 1-2 times per week during the lockdown period. On the other hand, mean weight and height of subjects were 57.2 (14.3) kg and 156.2 (6.8) cm, respectively. About 54.5% of subjects had normal BMI. The worst domain of eating behaviour was external eating domain, reported at a score of 3.5 (0.6) (Table 1).

Table 2 shows the associations between household income and BMI with the frequency of purchasing outside meals. Both parameters had no statistically significant associations ( $p>0.05$ ) and were tested using Pearson's chi-square test (Table 2).

A higher restrained eating score was reported among those who had higher frequency of purchasing meals outside

of home. Students who purchased 3-4 times per week and >4 times per week had the highest scores in the restrained eating domain as compared to other categories. Besides, significant comparison was observed between BMI categories with restrained eating behaviour between BMI status and restrained eating ( $p<0.001$ ), tested using the One-way ANOVA test. Subjects with normal BMI had the highest score in the restrained eating domain [3.0(1.1)] as compared to other BMI categories (Table 3).

## DISCUSSION

In the current study, the majority of the subjects (64.3%) reported purchasing outside meals about 1-2 times a week during the COVID-19 lockdown period. A cross-sectional online survey involving 1,071 adults in three European countries found that most respondents had never shopped online for foods or groceries before the pandemic struck. However, most respondents stopped eating out during the pandemic and preferred home

**Table 2.** Associations between frequency of purchasing outside meals with household income and BMI status among subjects

	<i>Frequency of purchasing outside meals</i>			
	<i>None in a week</i>	<i>1-2 times/ week</i>	<i>3-4 times/ week</i>	<i>&gt;4 times/ week</i>
Monthly household income, <i>n</i> (%)				
≤MYR 1000	6 (33.3)	17 (23.6)	2 (13.3)	1 (14.3)
MYR 1001-RM3000	5(27.8)	17 (23.6)	4 (26.7)	2 (28.6)
MYR 3001-RM5000	3 (16.7)	10 (13.9)	3 (20.0)	1 (14.3)
≥MYR 5001	4(22.2)	28 (38.9)	6 (40.0)	3 (42.9)
<i>p</i> -value	0.710			
BMI, <i>n</i> (%)				
Underweight	5 (27.8)	11 (15.3)	2 (13.3)	1 (14.3)
Normal	6 (33.3)	46 (63.9)	6 (40.0)	3 (42.9)
Overweight	3 (16.7)	8 (11.1)	4 (26.7)	1 (14.3)
Obese	4 (22.2)	7 (9.7)	3 (20.0)	2 (28.6)
<i>p</i> -value	0.185			

\*Significant difference at  $p<0.05$  using Chi-Square test

BMI=body mass index

**Table 3.** Comparisons between eating behaviour domains with frequency of purchasing outside meals and BMI status among subjects [presented as median (IQR)]

	Eating behaviour domain scores		
	Emotional <sup>a</sup>	External <sup>a</sup>	Restrained <sup>b</sup>
Frequency of purchasing outside meals			
None in a week	2.4 (0.7)	3.5 (0.7)	2.5 (1.8)
1-2 times/week	2.6 (0.7)	3.5 (0.6)	2.8 (1.1)
3-4 times/week	2.8 (0.6)	3.6 (0.7)	3.1 (1.7)
>4 times/week	2.9 (1.0)	3.7 (0.3)	3.1 (1.3)
<i>p</i> -value	0.333	0.821	<0.001*
BMI			
Underweight	2.5 (0.7)	3.7 (0.6)	1.7 (0.9)
Normal	2.7 (0.7)	3.5 (0.6)	3.0 (1.1)
Overweight	2.5 (0.8)	3.5 (0.7)	2.8 (0.9)
Obese	2.8 (0.8)	3.5 (0.5)	2.9 (1.1)
<i>p</i> -value	0.512	0.720	<0.001*

<sup>a</sup>One-way ANOVA

<sup>b</sup>Significant difference at *p*<0.001 using Kruskal-Wallis test

BMI=body mass index

delivery (Skotnicka *et al.*, 2021). A study by Seguin *et al.* (2016) conducted among adults showed that 34.0% consumed food from outside 2-4 times per week, but the current study only reported 13.4% who purchased outside meals 3-4 times per week. Another recent study by Whatnall *et al.* (2021) showed that most students reported purchasing foods and/or beverages more than once a week. Students who frequently purchased outside meals had a higher preference for energy-dense foods (Whatnall *et al.*, 2021). A survey conducted in Spain during the COVID-19 lockdown reported that Spanish consumers purchased grocery items, such as flour, bread, fresh vegetables, fruits, milk, and chicken, instead of complete meals for weight control. Lockdown has made people more conscious about their health, driving them to watch health-related videos for a lifestyle change. Thus, Spanish consumers were motivated to change their lifestyle by consuming more home-cooked foods (Laguna *et al.*, 2020).

This study demonstrated that the worst eating behaviour domain was the

external domain, rather than restrained or emotional eating behaviours. One of the possible reasons could be the influence of environmental cues such as social media and mass media (Huang & Su, 2018). Instagram or other social media has become a great concern among youths as it has been reported to inflict negative outcomes on their food consumption due to numerous food advertisements. External eating behaviour can be defined as eating in response to food-related external cues such as the visual and palatability of foods (Subramaniam *et al.*, 2017). For example, food and plating play vital roles in attracting people’s attention and interest (Paakki *et al.*, 2019). Similarly, food advertisements are external stimuli that influence an individual’s food choice, contributing to an increase in excessive energy intake, obesity, and cardiovascular disease (Qutteina *et al.*, 2019). Food advertisements also stimulate the viewers through food content, which influences them to buy and consume the advertised food regardless of its price and nutrient

content. Thus, exposure to external cues from the environment may be one of the reasons why most students exhibited external eating behaviour. On the other hand, another study done by Norazman & Wan Mahmood (2020) among undergraduate students showed that most students manifested restrained eating behaviour, followed by external eating behaviour. However, they did not exhibit emotional eating behaviour.

In addition, the current study demonstrated that there was no significant association between household income and the frequency of purchasing outside meals. During the first pandemic lockdown, only one person from a family was allowed to go out to purchase groceries at nearby shops. Due to this movement restriction, the frequency of purchasing outside meals online had increased across all categories of household income. People purchased meals from preferred or affordable restaurants far away from their homes. This finding was inconsistent with a previous study done by French, Wall & Mitchell (2010) that showed a significant association between household income, food sources, and food purchases among a community-based sample of 90 households Minneapolis, Minnesota, USA. The study hypothesised that higher-income households spent more on eating out per person than lower-income households (French *et al.*, 2010). Ho *et al.* (2021) stated that students who came from higher-income families might have received more pocket money from their parents and thus had a higher possibility of eating out, such as at fast-food outlets, coffee shops, hawker stalls, buying takeaway or delivery.

According to Yau & Potenza (2013), restrained eating is defined as the voluntary cognitive control to restrict food intake, typically for weight loss or weight maintenance purposes. The current study revealed

no significant association between the frequency of purchasing outside meals with emotional and external eating behaviours. However, there was a significant association with restrained eating behaviour among the students. Students who purchased outside meals 3-4 times a week and >4 times a week had restrained eating behaviour. Students with restrained eating behaviour who frequently purchased outside meals may lack healthy food options in their respective homes or hostels. Thus, they had to purchase healthy meals, such as vegetable soup or noodle soup, from outside. However, there are no data available for comparison. There are many controversial issues and inconsistencies across findings in this area of research (Adams *et al.*, 2015). Whatnall *et al.* (2021) demonstrated contradicting findings of an association between greater frequency of purchasing outside meals and a higher intake of energy-dense, nutrient-poor foods. However, there was no significant association with diet quality score using the Australian Recommended Food Score (ARFS). Additionally, a study by Roy *et al.* (2017) conducted among 103 university students found that students who frequently purchased outside meals for >5 days compared with <2 days had lower diet quality scores. Although there are conflicting findings in most previous research studies, including the current ones, it is important to note that this could be due to differences in assessment tools and varying sample sizes (Roy *et al.*, 2017).

Based on the current study results, there was no significant association between BMI status with emotional and external eating behaviours. However, there was a significant association between BMI status and restrained eating behaviour among the students. Subjects with normal BMI had higher restrained eating behaviour scores than

those in the overweight and obese groups. Restrained eaters in this study had normal BMI, maybe due to consuming smaller portions of less energy-dense foods and beverages. However, they must be aware of not restricting food intake too severely to avoid drastic or excessive weight loss. In addition, restrained eating may prevent weight gain if practised correctly (Olea Lopez & Johnson, 2016). Most people practising restrained eating think they eat a limited amount of food, but the food consumed may still be considered excessive (Muharrani, Achmad & Sudiarti, 2018).

The COVID-19 lockdown has changed the eating behaviours and lifestyles of most individuals. People became more sedentary, and their sense of hunger increased during the lockdown period. Increased consumption of foods, especially snacks, has contributed to weight gain during the lockdown period (Di Renzo *et al.*, 2020). In the current study, overweight and obese subjects also had restrained eating scores closer to those in the normal BMI category. This may be due to the wrong way of practising restrained eating by frequently consuming foods high in sugar and fat, although in smaller amounts, which can still contribute to excessive calorie intake.

This study has limitations. We used a cross-sectional design, which makes determining causality impossible, limiting the validity of the data. Besides, subjects could have under- or overestimated their self-reported weight and height values.

## CONCLUSION

In conclusion, this study revealed that most undergraduate students were from higher-income families. Most of the students reported having purchased meals 1-2 times per week using food delivery applications such as Food

Panda or Grab Food during COVID-19 lockdown. Those with normal weight had higher restrained eating scores than overweight and obese students due to food restrictions. Meanwhile, those who purchased outside meals at least three times per week also had more restrained eating behaviour.

It is hoped that this study will increase the awareness of healthy eating and a healthy lifestyle among young adults, especially university students, thereby reducing the risks of obesity and other chronic diseases. Future studies should focus on increasing university students' nutrition knowledge and skills, especially on the effects of eating out. Moreover, future studies can focus on developing healthy meal preparation modules to motivate university students to prepare healthy home-cooked meals themselves.

## Acknowledgement

We would like to acknowledge Universiti Sains Malaysia for allowing us to conduct this study. Moreover, we are grateful to all the participants who were willing to participate in this study.

## Authors' contributions

DV, principal investigator, conceptualised and designed the study, advised on data analysis and interpretation, prepared the draft of the manuscript and reviewed the manuscript; NHAR, led the data collection, and prepared the draft of the manuscript and reviewed the manuscript.

## Conflict of interest

All authors declare no conflict of interest.

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