ORIGINAL ARTICLE

Food Choice Motives, Physical Activity Level and Body Mass Index Status Among Undergraduates Students: A Cross-sectional Study

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ABSTRACT

Introduction: University students had high risk of unhealthy lifestyle habits such as being sedentary and having poor dietary choices due to higher cost of healthy food and the wide availability of fast food. These may contribute to over-weight, obesity and co-morbidities. The aim of the study was to determine the association of food choices motives, physical activity (PA) level and body mass index status among undergraduates in Universiti Sains Malaysia. **Methods:** A total of 125 undergraduate students were recruited. Self-reported online questionnaire was administered to obtain information about sociodemographic information, anthropometric measurements, food choice motives using Food Choices Questionnaire and physical activity using the Global Physical Activity Questionnaire. The association between food choice motive, PA and body mass index was assessed using Spearman correlation and Fisher`s Exact Test. **Results:** The three most important food choice motives are religion, price and sensory appeal. A total of 16% of the subjects were underweight, 19.2% were overweight and 11.2% were obese. 21.6% of the students had low PA level. There was significant inverse association between sensory appeal and BMI ($p = 0.002$, $r = -0.269$). Physical activity was not significantly different between BMI categories. **Conclusion:** Those who have lower BMI reported to have greater sensory appeal, but association between PA and body mass index had no significant difference. Future studies are required for understanding the direct impact of food choice motives on dietary quality and its association with PA motivation and BMI status for reducing the prevalence of obesity among undergraduates.
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INTRODUCTION

Obesity and overweight among university students have been concerning issues. Meta-analysis has indicated that university students are expected to gain weight approximately about an average of 1.6-3.0 kg during a four-year college enrolment period (Bailey et al 2020) (1). Weight gain among university students increases risk of non-communicable diseases. A study conducted by Wan Mohamed Radzi et al (2019) involved collection of body mass index data from five local universities in Malaysia which revealed highest percentage of overweight and obesity among undergraduate students (23%, 17.6%) as compared to the Masters (21.9%, 14.3%) and PhD students (17.8%, 18.4%) (2).

University students' food intake depicted unhealthy eating behaviour including high consumption of fast foods, snacks, candies, carbonated drinks, alcoholic beverages and low consumption of vegetables, fish, whole grains and legumes (3). In Malaysia, majority of the university students skipped breakfast and did not meet the recommendations for energy, vitamin C, thiamine, riboflavin, niacin, iron (females only), and calcium (4). A study conducted among 303 students in University Brunei Darussalam demonstrated that overweight and obese students frequently consumed fast food and had lesser than three meals per day (5). Obesity, in turn, increases the risk of greater mortality rate from multiple chronic diseases such as type 2 diabetes mellitus, hypertension, stroke and cancers (6). Thus, it is essential to recognize university students' food choice motives to understand their dietary intake to plan an intervention in ensuring higher undergraduates having an ideal body weight to prevent morbidities in the future.

Generally, 49.9% university students across eight ASEAN countries had low PA, 33.6% had moderate and 16.6% high PA level as well as 31.5% was reported sedentary, sitting for eight or more hours (7). Decreasing PA level was obvious during young adults' adjustment

to early adulthood with the lowest decline happened during the time where they entered university (8). Low PA associated with young adults are related to physical symptoms such as fatigue, muscle or joint pain, and sleep problems (9). Furthermore, overweight and obese are also related with low PA level (10). Therefore, PA was suggested to minimize excess body weight, avoid body weight regain, and lower the risks of getting metabolic and orthopaedic diseases (10).

University life is considered a platform for young individuals to develop new lifestyles habits including diet, physical activity, screen time, eating out and many more. University students are at high risk of weight gain due to the exposure to obesogenic food, poor food choices such as consumption of food high in fat and sugar as well as lack of physical activity. Thus, it is essential to investigate the association between food choice motives and physical activity with body mass index among undergraduate students.

MATERIALS AND METHODS

This cross-sectional study using the convenience sampling strategy was conducted at the university's accommodation namely USM Health Campus in Kelantan, Malaysia as well as online method using Google Form as some students are still at home. Population involved in this study were the local undergraduates of Health Campus from School of Dental Sciences, School of Medical Sciences and School of Health Sciences from year one to final year. Data collection had been done by approaching potential students who met the inclusion criteria in their hostel room, study area, or library. Meanwhile for the online method, the contact number of the students had been obtained from each class representatives and the google form link is shared via WhatsApp if they agreed to join the study. The subject recruitment started after obtaining ethical approval from the Human Research Ethics Committee USM (USM/JEPeM/21010072). The inclusion criteria of the study were local undergraduate students and students without serious vision problem. Postgraduate students were excluded from this study.

Informed consent had been obtained from each study participants before recruitment. A total of 128 subjects were the estimated required sample size, calculated using one proportion formula using the prevalence of obese Malaysian undergraduates, 17.6% (11).

Data of sociodemographic (age, gender, ethnicity, living arrangement, financial aid, and household income), anthropometry (self-reported weight and height), food choice and PA level were collected. For sociodemographic data, living arrangement referred to the current staying status either in hostel, or at home. Meanwhile, financial aid indicated the financial support received by the students in the form of scholarship or

funded by parents. Household income is the income contributed by each family members in the household.

On the other hand, the Body Mass Index (BMI) was computed by dividing self-reported weight in kilograms by height in metres. The Asian BMI cut-off point had been used which indicated underweight as having BMI <18.5 kg/m², normal BMI 18.5 – 22.9 kg/m², overweight as BMI 23.0 – 27.5 kg/m², and obese as BMI >27.5 kg/m² (12).

The factors affecting food choice among undergraduates' students in this study were obtained using the Food Choice Questionnaire (FCQ) which was developed by Steptoe et al., (1995) (13) and was then modified by Asma et al. (2010) (14). In the study by Asma et al (2010) 14, a new domain namely the religion domain had been added making the total domain for the FCQ as ten. The religion domain had two items which required the participants to answer questions related to food consumed certified by government and permissible by religion. The Cronbach's α values of 0.90 indicated that the internal consistency of the FCQ questionnaire was acceptable 10. FCQ consists of 38 items which assessed ten domains associated with food choice motives. The ten factors are health (6 items), mood (6 items), convenience (5 items), sensory appeal (4 items), natural content (three items), price (three items), weight control (three items), familiarity (three items) and ethical concern (three items) and religion (2 items). Every item had a Likert scale option from one to five which meant 1=very not important, 2=not important, 3=less important, 4=important, and 5=very important respectively. Then, the total score for each domain was computed by averaging the scores for every item so that the scale score was between 1 to 5. For example, the convenience domain had total score from 5 to 25. If the participant had score of 20, the scale score was 4 (important). The domain with the highest score were the most important factor perceived by the students when making food choices.

Physical activity (PA) level was measured by using the GPAQ, developed by the World Health Organisation (WHO) (15). It assessed the PA level in three domains which were the occupational-, commuting-, and recreational- PA. Besides, it also assessed sedentariness. There were 16 questions distributed into 6:3:6:1 ratio for each of the three domains and sedentary behaviour. Metabolic Equivalents (METs) was used to indicate the intensity of PA. WHO estimated that people who engage in moderate-intensity activities consume 4 METs while people who perform vigorous-intensity activities consume 8 METs. Then, the total PA levels were computed by totalling the total MET minute for each domain and was then categorised into high, moderate, and low. High physical activity was reported as three or more days of vigorous-intensity activities and total physical activity MET minutes is at least 1500 MET minutes per

week. Meanwhile, moderate intensity physical activity was three or more days of vigorous-intensity activities and involving 60 MET minutes and above per week or five or more days of moderate-intensity activities in all domains and involving 150 minutes and above. Low PA was when the value does not meet the criteria for either high or moderate levels of physical activity.

IBM SPSS statistics version 26.0 (IBM Corp, NY, USA) was used to analyse the data. Data was analysed inferentially and descriptively. Data which were not normally distributed were presented as median (interquartile range), while normally distributed data were presented as mean (standard deviation). The relationship between factors affecting food choices motives and BMI status was analysed using Spearman's correlation as the data was not normally distributed. Association between BMI and PA level was obtained using the Fisher Exact test. The significance level (p value) set was set at less than 0.05.

RESULTS

Sociodemographic and Anthropometric Data of Participants

Majority of the participants in this study were female (56%), of Malay ethnicity (85.6%), had household income of more than RM5000 (48%), and were residing in hostel during the period of study (87.2%). Almost 51.2% of the participants reported having high participation in physical activity. A total of 9.6% and 6.4% of the subjects were overweight and obese respectively with no significant gender differences. Significant gender difference was observed for weight which showed significantly higher median weight for men (61.0(13.0) kg) as compared to women (51.5(13.0) kg) (Table I).

Food Choice Motive Score Among Respondents

On the other hand, the three highest food choice motive for students in this study were religion followed by price, and sensory appeal with median score of 4.5, 4.3, and 4.25, respectively. The lowest food choice motive was weight control (3.53). Analysis according to gender revealed no significant gender differences in all the factors affecting food choice motives (Table II).

Correlation between food choices motives and BMI

Sensory appeal was the only domain which had significant, inverse correlation with BMI ($p = 0.002$, $r = -0.269$). Greater sensory appeal was correlated with lower BMI (Table III).

Association between PA Level and BMI category

There was no significant association between physical activity and BMI, tested using Fisher's Exact test (Table IV).

Table I: Sociodemographic and Anthropometric Data of Participants

Parameter	Men (n=55)	Women (n=70)	Total N=125
Age, years, Median (IQR)	24.0(3.0)	23.0(1.0)	23.0(3.0)[a]
Ethnicity,n(%)			
Malay	46 (83.6)	61 (87.0)	107(85.6)[b]
Chinese	8 (14.5)	5 (7.1)	13(10.4)
Indian & Others	1 (1.8)	4(5.9)	5(4.0)
Income,n(%)			
<RM1000	11(20.0)	7(10.0)	18(14.4)[b]
RM1-2000	10(18.2)	4(5.7)	14(11.2)
RM2-3000	6(10.9)	13(18.6)	19(15.2)
RM3-5000	6(10.9)	8(11.4)	14(11.2)
>RM5000	22(40.0)	38(54.3)	60(48.0)
Living status,n(%)			
Hostel	47(85.5)	62(88.6)	109(87.2)[b]
At home	8(14.5)	8(11.4)	16(12.8)
Physical Activity Level,n(%)			
Low	15(27.3)	12(17.1)	27(21.6)[b]
Moderate	19(34.5)	15(21.4)	34(27.2)
High	21(38.2)	43(61.4)	64(51.2)
Weight, Median(IQR)	61.0(13.0)	51.5(13.0)	56.0(16.0)*[a]
Height, Median(IQR)	168.0(9.0)	156.5(6.4)	160.0(13.0)*[a]
Body Mass Index,n(%)			
Underweight	7(12.7)	14(20.0)	21(16.8)[b]
Normal	38(69.1)	46(65.7)	84(67.2)
Overweight	5(9.1)	7(10.0)	12(9.6)
Obese	5(9.1)	3(4.3)	8(6.4)

Abbreviation: IQR: Interquartile range; RM: Malaysian Ringgit
[a]Tested using Mann Whitney test; [b] Tested using Chi-Square test

Table II. Food Choice Motive Score Among Respondents [presented as median(IQR)]

Factors	Men (n=55)	Women (n=70)	Total Median score	p-value
Religion	4.50(1.00)	4.50(1.00)	4.50	0.395
Price	4.33(1.00)	4.67(1.00)	4.30	0.435
Sensory appeal	4.50(1.00)	4.25(0.80)	4.25	0.056
Convenience	4.20(1.00)	4.20(0.67)	4.20	0.964
Mood	4.17(1.20)	4.08(1.00)	4.17	0.436
Health	4.17(1.00)	4.00(0.80)	4.00	0.083
Familiarity	4.00(1.00)	3.67(0.70)	4.00	0.069
Natural content	4.00(1.30)	3.67(1.00)	3.67	0.322
Ethical concern	3.67(1.30)	3.67(1.10)	3.67	0.571
Weight control	3.67(1.30)	3.67(1.30)	3.53	0.654

Table III: Correlation between Body Mass Index and Food Choice Motives among Participants (n= 125)

	Food choices motive	Correlation coefficient, r_s	p value
Body Mass Index, BMI (kg/m²)	Convenience	- 0.050	0.582
	Health	- 0.088	0.330
	Sensory Appeal	- 0.269	0.002*
	Natural Content	- 0.135	0.130
	Price	- 0.007	0.941
	Mood	- 0.138	0.123
	Weight control	0.081	0.370
	Familiarity	- 0.54	0.125
	Religion Factor	-0.023	0.795
	Ethical Concern	-0.067	0.455

*Tested using Spearman's correlation, significant at $p< 0.01$

Table IV: Association between Body Mass Index and Physical Activity

Body Mass Index, n(%)	Physical Activity, n(%)				p-value
	Low	Moderate	High	Total	
Underweight	4(19.0)	5(23.8)	12(57.1)	21(16.8)	0.559
Normal	16(19.0)	26(31.0)	42(50.0)	84(67.2)	
Overweight	5(41.7)	1(8.3)	6(50.0)	12(9.6)	
Obese	2(25.0)	2(25.0)	4(50.0)	8(6.4)	

Tested using Fisher's Exact test

DISCUSSION

The main objective of this study is to determine the association between food choice motives, physical activity and body mass index among undergraduate students. The study finding revealed that 67.2% of the participants had normal body mass index. This finding was almost similar to a previous study conducted among Malaysian medical university students which also found that 53% of their respondents also had normal BMI (16). The proportion of overweight and obesity in the current study population were 9.6% and 6.4% respectively. These reported to be lower as compared to another study conducted among university students in five public universities in Malaysia which reported higher prevalence of overweight (23.0%) and obesity (17.6%) among the undergraduate students (2). On the other hand, the findings of the current study reported no significant gender differences for the BMI categories. The proportion of overweight and obesity among male were 9.1% while female reported the prevalence of 10.0% and 4.3% respectively. Another study conducted among 290 medical students in Malaysia found higher prevalence of obesity among male (18.3%), but overweight was greater among female (15.7%) (17).

On the other hand, the three most important food choice motives among the participants were religion followed by price and sensory appeal with the least important factor being weight control. This is in accordance with a local study that also reported the importance of religion followed by risk perception and sensory appeal (18). Religion has become the most essential component due to the fact that majority of the respondents in this study were Muslims (85.6%) and their food consumption has to strictly abide the criteria of 'Halal' or the food that are permitted to eat 18. Besides Muslim, the Hindu have their own food beliefs that may influence food choices. For instance, they avoid eating beef as cows are considered sacred in their beliefs (18). Cows provide human with life sustaining milk hence it is seen as a maternal figure and is considered a sin to kill a cow in Hinduism (19).

In addition, health, natural content and weight control factor are less important factors that drive food choice as compared to price of food. Natural content and weight control have been the top three concerns of food choices among the Chinese population due to its medicinal advantages and its effects towards personal wellbeing (18). However, in this study consumption of healthy food is not the priority due to the lack of availability of healthy food in the university cafeteria and moreover, healthy food is usually expensive as compared to fast food which are generally higher in saturated fat and cholesterol (20,21). Fast food is a preferable food for students due to cheaper cost, better taste and peer pressure (21). University students prefer to save money by consuming inexpensive food with high energy density, skipping meals, and reducing the types of dishes in a meal such as omitting fruits and vegetables which eventually lead to weight gain or weight loss (22).

Furthermore, about 21.6% had low physical activity level. This finding is fairly similar to a research in Madrid that observed 22.4% of their undergraduates were sedentary (23). Similarly, 25.9% of the undergraduates in Universiti Malaysia Sarawak (UNIMAS) were inactive (24). However, our results differed from those obtained in a sample of undergraduate students in Universiti Putra Malaysia (UPM), of whom 41.4% were inactive (25) which is higher compared to our study. A meta-analysis has reported that average sitting time among university students are more than eight hours per day due to studying, wiritng assignment, attending online lectures and watching movies (26).

There is a significant inverse association between sensory appeal and BMI. It was observed that consumers who are more focused on taste than health, generally make unhealthier food choices. This is because, foods with poor nutrient content and quality tend to taste better, making it attractive to consumers (27). This claim is supported by another study, that stated a notion that the sensory appearance of healthier food is less alluring and

that it is likely affecting the decision to purchase healthy and functional foods (28). Yet, sufficient explanation on long term food choices and the negative health outcomes such as obesity is still failed to be proven (27).

Besides, no significant association was found between BMI category and physical activity level. This finding was supported by studies that also found no significant relationship between physical activity level and body mass index status (29, 30). This is possibly due to the subjective method used to assess subjects' physical activity making it inaccurate. Subjects might have over-estimated their frequency in engaging in physical activity. A national survey involving Norwegian university students aged between 18-35 years old reported significant association between BMI and exercise, with students who never exercise had the odd ratio of 3.29 of being obese (31).

This study has limitations. Since it is a cross-sectional study, a causal relation cannot be established. Next, convenience sampling, a non-probability sampling technique was used which compromised the degree of representativeness of the target population. In addition, due to pandemic Covid-19 which restricted physical meetings, there may be bias in the self-reported data of weight, height and physical activity.

CONCLUSION

The three highest food choice motives reported in this study are religion, price and sensory appeal. Most of the participants in this study have normal BMI (67.2%) but have high prevalence of low physical activity (21.6%). Sensory appeal has significant, negative correlation with the BMI, showing that overweight/obese individuals are restraint eaters. Thus, authority especially university's management must prepare a guideline for caterer to provide a nutritious food with desired sensory appeal with appropriate cost. University students must be educated on choosing healthier food. As for improvement of PA level, university should highlight the health importance of physical activity via academic syllabus to empower students to participate in sustainable extracurricular activities that could increase students' PA level. Further research may explore the food choice motives of people of various socio-economic background residing in both the urban and rural areas.

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