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# The association of breakfast consumption habit, snacking behavior and body mass index among university students

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## **ABSTRACT**

The increased prevalence of obesity among adolescent are associated with short and long term morbidity and mortality outcomes raises major public health concern. The evidence supporting the association between breakfast consumption and body weight is growing, but the mechanisms to explain this relationship are less understood. Breakfast skipping habit and consuming more energy dense snack might be associated with obesity; however the results from previous research are still inconclusive. This study aims to describe the association between breakfast consumption habit and snacking behaviors with their body mass index (BMI) among university students. Cross-sectional study was conducted in August 2009 among undergraduate university students in Kuala Selangor district, Malaysia. One hundred sixty eight students (n=168) were volunteered to complete a breakfast consumption habit questionnaire (BCHQ). The BCHQ consisting of 26 questions assessing their breakfast and snacking habits including demographic data. Self-reported height and weight data were collected. Hypothesis testing was completed using multiple logistic regressions where statistical significance level was set at  $\alpha$ =0.05. Majority of 168 students reported a BMI in the healthy range (<25 kgm<sup>-2</sup>). Overall, 24% of students reported not to taking breakfast on the day of data collection. There was no significant difference between the normal (BMI<25 kgm<sup>-2</sup>) and overweight group with respect to healthy snack and ED score, 10.2 (3.6) and 11.7 (4.0); 13.8 (5.3) and 14.1 (4.0) respectively. Only sex (OR=0.07, p = < 0.001) and healthy food frequency (OR= 1.2; p = 0.035) were related to BMI status.

**Keyword:** Breakfast habit, Body mass index status

#### INTRODUCTION

The shift from teenage years to adulthood has been shown to be a period of acceptance for many negative health behaviors including increases in smoking, decreases in physical activity, and fruits and vegetables consumption (Cullen and Baranowski, 1996). As for college students, research has found that the first year of their student life may often lead to the adoption of unhealthy dietary pattern (Papadaki et al., 2007) and they are more susceptible to gain more weight and fat (Hoffman et al., 2006).

Obesity rates in adolescent are rapidly increasing worldwide (Doll et al., 2002). Obesity is caused by a continuing imbalance between energy intake and disbursement (Tappy and Le, 2010). Obesity in adulthood is suggested to be a result of obesity during childhood and adolescence (Goran, 2001). Moreover obesity has long been associated with increased risk for serious health outcomes including hypertension, coronary heart disease and insulin resistance (Must and Strauss, 1999, Sjöberg et al.,

2003). On the other hand, low physical activity and dietary habits increase the risk of becoming overweight and obese (Williamson et al., 1993). Furthermore, as suggested by Koplan et al. (2005) and Berg et al. (2009), skipping breakfast also plays an important role in obesity. In addition, children and adolescents who habitually skip breakfast are at higher risk for skipping other meals, snacking, being less physically active and being overweight and obese (Utter et al., 2007, Rampersaud et al., 2005).

Having breakfast also was suggested to have potential important clinical application to the treatment of binge eating disorder (Masheb and Grilo, 2006). Recently, the National Health and Nutrition Examination Survey (NHANES) also found that by increasing number of eating occasions by not skipping meal especially breakfast and avoid snacking was associated with reduced weight and obesity in adults (Keast et al., 2009). Other than that, taking breakfast has a significant effect on reduction of dietary fat and spontaneous snack intake (Schlundt et al., 1992). Prevention of overweight and obesity is recommended to reduce this growing

public health problem and eating breakfast daily is one of the suggested prevention methods (Barlow, 2007). However another research found that breakfast skipping not give significant effect on BMI but they still suggested that the breakfast habit and physical activity to be included in prevention programmes aimed at reducing obesity among adolescents (Mota et al., 2008).

Although the association of breakfast habit and obesity are widely studied, little is known about the relationship in our local setting. Therefore, the aim of present study was to describe whether the breakfast habit and snack consumption frequency were associated with body mass index (BMI) among young adults attending Health Sciences Faculty, UiTM Malaysia.

#### **MATERIAL AND METHODS**

Participants: A cross-sectional study was conducted in a classroom setting with the target group of Malay undergraduate students aged between 18-25 years old. All students studying in Faculty of Health Sciences, UiTM during August 2009 were invited to participate in this research. Only full time registered and healthy students were selected during the study period. Taking a precision of 0.08 at a 95% confidence interval, the minimum sample size calculated by a single proportion formula based on 50% estimated prevalence of daily breakfast habit was 151 participants. A non-probability sampling methods (convenience sampling) was used to sample (n = 168) of university students. Ethical approval was obtained from the university before implementing this research. In order to maximise the number of students' participation, the questionnaires were then distributed to the student prior to a group lecture that bulk of students would be present at. Students were assured that their participation was voluntarily and the questionnaires were anonymous.

Breakfast consumption habit questionnaire (BCHQ): A self reported BCHQ that modified from Dialektakou and Vranas (2008) and Block et al. (2000) were used to assess the frequency of breakfast and quantify the regularity of snack food participants consumed in a typical week. The BCHQ consists of 26 questions included questions about demographic, breakfast habit, snacking behavior and 10 types of Malaysian snack foods. There were eleven questions about participants' demographic data including sex (male or female), ethnicity (Malay

or other race), smoking status (yes or no), residency status (living in campus/ living outside campus/ living with parents), health status (No disease/ Diabetes/ Hypertension/ other diseases) and dieting (yes or no). Participants' age were determined by their last birthday date. Numbers of participants' sibling were also asked. Participants' weekly physical activities (The available answers were integers ranging from 0 to 7 days/week), parental education (University or no university) and average monthly family income in Malaysian Ringgit (RM) were also assessed.

**Breakfast habit:** Breakfast habit was addressed in four different ways following the questionnaires modified from Dialektakou and Vranas (2008) according to; breakfast consumption on the day of data collection, during the current weeks, during the previous week, and on holidays (semester break).

Snacking behavior: A modified version of a food frequency questionnaire created by Block et al. (2000) was used to quantify the frequency of snack food consumed in typical week. Snacking was defined as the consumption of any food item that is not a meal. In total, 10 categories of local snack foods were created. Six of them were considered as energy dense snacks (ED) choices (e.g., salty snacks, carbonated/soft drink, cake, cream biscuits, candy and burger) and four of them were considered healthy snack choices (e.g., Fresh fruit/salad, nuts/seed, low fat dairy product and bread). The scores for each snack category ranged from 0 (never ate the snack) to 4 (consumption exceeded five times in 1 week). The categories were summed to create two separate score: healthy snack and ED snacks. The higher score possible for the healthy and ED snacks were16 and 20, respectively. Snacking habit before lunch also asked. A copy of the BCHQ is accessible from correspondence author.

**BMI:** BMI was calculated as weight in kilogram (kg) divided by the square of height in meter (m²). In this study height and weight were self-reported by participants. Following WHO convention, BMI of 25 kgm² or more is termed obese (Ismail et al., 1995, Consultation, 2004). Individuals with missing data for age, sex, or BMI were excluded.

**Statistical analysis:** Data entry and statistical analysis was carried out using SPSS, version 17.0 (SPSS Inc. Chicago, IL, USA). Hypothesis testing was completed using chi-squared or Fisher's exact test, Independent *t-test* and Mann-Whitney test for univariate analysis and multiple logistic regressions

was applied to determine associated factors for overweight. All variables were included on the multivariate analysis. Backward and forward stepwise logistic regression was used for the variable under interest (obesity and normal BMI) which was binary. The final model was obtained using the likelihood ratio based on maximum likelihood estimate. Model fitness for final model was checked by using the Hosmer-Lemershaw test, over all classification of correct outcome and area under the receiver operating characteristic (ROC) curve. For the categorical variables results are presented as the frequency and its percentage and for numerical variables results are presented as the mean ± SD. However for the multivariate analysis were presented with adjusted odds ratios with 95% confidence intervals, likelihood ratio test statistics and p-value. Significance level was set at  $\alpha$ =0.05.

#### RESULTS

**Subject demographics:** The demographic characteristics of the participants are listed in table 1. A total of 168 students were sampled, with majority of the participants were female and all the participants were Malays. The mean (SD) age of the male (n = 37) and female (n = 131) students was 20.6 (2.0) and 20.4 (1.8) respectively. Most respondents (63% Male students and 93% Female students) were reported to have a BMI in normal BMI category with a mean (SD) BMI of male students were slightly higher compared to female students, 22.9 (4.6) kgm<sup>-2</sup> and 20.2 (2.6) kgm<sup>-2</sup> respectively (p < 0.001).

Breakfast habits: The frequencies of respondents' breakfast habit according to breakfast consumption on the day of data collection, during the previous week, and on holidays are presented in table 2. Majority of the students were having breakfast on the day of data collection, with a total of 73.6% and 90% reported having breakfast in normal BMI and obesity grouped respectively (p = 0.164). Most respondents either in normal BMI or overweight groups reported to have breakfast at least 1 to 3 days per week during the study week and previous week. By contrast, majority of those students reported to have breakfast during holidays. However there was no significant difference between the two groups with respect to their breakfast habit during holidays (p = 0.917).

Table 1 Characteristics of the study populations

	Sex			
	Male		Femal	
Characteristics	(n=37		е	
	)		( <i>n</i> =131	
			)	
	n	%	n	%
BMI				
<18.5	6	16.2	39	29.8*
18.5-24.9	17	46.0	86	65.6*
25-29.9	10	27.0	5	3.8*
>30	4	10.8	1	0.8*
Residence				
Inside the	28	75.7	106	80.9
campus				
Outside the	9	24.3	19	14.5
campus				
With Family	0		6	4.6
Smoking status				
Not a smoker	30	81.1	131	100*
Smoker	7	18.9	0	

<sup>\*</sup>p-value < 0.05

Table 2 Frequency of breakfast consumed according to BMI status

	BMI status			
Breakfast consumed	BMI < 25 ( <i>n</i> =148)		Overweight (n=20)	
	n	%	n	%
The day of data collection				
Having breakfast	109	73.6	18	90.0
No	39	26.4	2	10.0
Current week				
Everyday	43	29.1	6	30.0
4-6 days	37	25.0	2	10.0
1-3 days	66	44.6	12	60.0
<pre><once a="" never<="" or="" pre="" week=""></once></pre>	2	1.4	0	
Previous week				
Everyday	39	26.4	7	35.0
4-6 days	42	28.4	3	15.0
1-3 days	62	41.9	8	40.0
<pre><once a="" never<="" or="" pre="" week=""></once></pre>	5	3.4	2	10.0
Holidays				
Everyday	82	55.4	13	65.1
4-6 days	24	16.2	2	10.0
1-3 days	33	22.3	4	20.0
<pre><once ***********************************<="" a="" never="" or="" td="" week=""><td>9</td><td>6.1</td><td>1</td><td>5.0</td></once></pre>	9	6.1	1	5.0

<sup>\*</sup>p-value < 0.05

**Snacking behaviour:** There was no significant difference between the male and female group with respect to healthy snack and ED score, 10.2 (3.5) and 10.4 (3.8); 12.6 (5.0) and 14.1 (5.2) respectively. There was also no significant difference observed between normal and overweight group with respect to healthy snack and ED score (Table 3).

Table 3. Snacking habit according to BMI status

	BMI status			
Breakfast consumed	BMI<25	Overweight		
	( <i>n</i> =148)	( <i>n</i> =20)		
	mean (SD)	mean (SD)		
Healthy snack	10.2 (3.6)	11.7 (4.0)		
Bad snack	13.8 (5.3)	14.1 (4.0)		
	n (%)	n (%)		
Snacking habit before				
lunch				
Never	35 (23.6)	7 (35.0)		
Sometimes	91 (61.5)	12 (60.0)		
Frequently	15 (10.1)	0 (0)		
Always	7 (4.7)	1(5.0)		

<sup>\*</sup>p-value < 0.05

Factors associated with obesity: There were few factors associated with BMI status. Table 4 shows final multiple logistic modelling of factors associated with BMI status. Only sex and healthy snack score were significant associated factor for BMI status. Female students were less likely to become overweight compared to male students (OR=0.07; p=<0.001). Surprisingly, the person who was taking more healthy snack was more likely to become overweight (OR= 1.2; p=0.035).

#### **DISCUSSION**

With recent development of immunization and screening program many diseases have been eradicated and controlled (Manissero et al., 2008, Kharatmal et al., 2009). Although the disease were detected and cured, changing one personal health behaviour is more promising for prevention in current medical practise long before clinical disease developed (King et al., 2007). One of the preventive measures that could be taken is personal eating habit (De Lorgeril et al., 1994).

Previous studies show that irregular meal pattern have been associated to obesity and overeating is frequently linked with skipping breakfast (KeskiRahkonen et al., 2003, Niemeier et al., 2006). Despite these findings, the involvement of snacking behaviour and breakfast habit towards BMI status of adults still unclear. However since the majority of subjects in this study were of 'normal' BMI status, these finding do not represent future evidence.

Table 4 Associated factor to BMI status

Factors	Crude odds ratio <sup>a</sup>	Adjusted odds ratio <sup>b</sup>	95% CI <sup>c</sup>	p-value
Sex				
Male	1.0			
	0.08	0.07	0.0-0.2	<0.001
Female				
Healthy	1.1	1.2	1.0-1.4	0.035
snack				
score				

<sup>a</sup>Simple logistic regression; <sup>b</sup>Multiple logistic regression (final model); <sup>c</sup>Confidence interval Hosmer-Lemenshow test, p=0.468 Overall classification=90.5%;ROC=0.787

The present study showed similarities with previous study conducted at Beijing University with respect to BMI. In that study, they have observed that male BMI was higher compared to female counterpart (Sakamaki et al., 2005). The lower BMI in female could be due to the reason that female were more concern about their appearance compared to male (James, 2003).

Surprisingly, the present study were contradict with the finding by Šatali et al. (2007) with respect to skipping breakfast by university students in Croatia were regular breakfast was consumed by less than 50% of the participants. The present study showed that majority of the students was taking their breakfast in both normal and overweight group. Sakamaki et al. (2005) also showed that high proportion of Chinese medical students ate breakfast daily. This could be related to busy daily learning schedule among medical students so they need more energy to cope with fatigue (Tanaka et al., 2008). Furthermore, this has no different with the current health sciences schedule at this university.

There was no significant difference observed between overweight and normal BMI student with respect to healthy and ED snack score. This might be due to three important factors which were not studied: genetic (Herbert et al., 2006, Morland et al.,

2006), environmental and behavioural (Morland et al., 2006).

The present study showed that female student less likely to become overweight compared to male students. This could be due to reason that women tend to desire a thinner figure, express more anxiety about becoming fat, and are more likely to diet than men (Jones et al., 2007).

Surprisingly, this study shown that, increasing healthy snack frequency will increase the likelihood to become overweight. This may caused by the students had 'accidently' consume excessive amount of energy from their snack. As conclude by Prentice and Jebb (2003), excessive consumption of energy food will encourage obesity. However, this argument should be further investigated.

One important limitation to the present study was the use of self-reported weight and height data. This may increase the tendency of false declaration of actual height and weight. However such data are very commonly used in epidemiological research (Spencer et al., 2007, Brener et al., 2003).

Despite this limitation, this pilot study revealed that only sex and increased healthy snack frequency are the significant factor for obesity.

A larger study aiming to provide more evidence of the effect of breakfast and snacking behaviour toward BMI changers would be a value. Finally, the time which breakfast was consumed is also important to be further investigated.

## **CONCLUSION:**

These findings suggest that sex and healthy food frequency were significant associated factors of BMI status. There is a need to carry out research to further our understanding of this relationship in detail.

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