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ORIGINAL ARTICLE

Factors Associated with Body Weight Changes among Nigerian Postgraduate Students at Universiti Sultan Zainal Abidin (UniSZA), Malaysia

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Abstract

International students usually experience a change in body weight and eating behaviour after migrating to a host country. The aim of this study is to determine the factors associated with body weight changes among Nigerian postgraduate students at Universiti Sultan Zainal Abidin (UniSZA), Malaysia. A prospective study was conducted for six months to determine the association between body weight changes and socio-demographic, eating behavior, physical activity, dietary intake and quality of life. A total of 82 students (76 male and six females) completed a set of self-administered questionnaires, and their weight and height were measured. Descriptive statistic and paired t-test were carried out to analyze the data (IBM SPSS Version 20.0). Multiple linear regression analysis was conducted to determine the factors. Body weight significantly increased by 2.3 ± 0.5 kg after 6 months. Being an art student ($\beta=1.67$, $p=0.006$), being a female ($\beta=-2.68$, $p=0.009$), consuming breakfast once a week ($\beta=5.10$, $P=<0.001$), taking morning tea less than once a month or never at all ($\beta= 3.62$, $p<0.001$), consuming lunch one to three times a month ($\beta=-2.57$, $p= 0.006$), taking afternoon tea two to three days a week ($\beta=2.56$, $P=0.005$), skipping meal sometimes ($\beta=1.22$, $p= 0.049$), taking meal at other food stalls, coffee shops or hawkers' centers less than once a month or never at all ($\beta=-2.31$, $p=<0.001$) were adjusted significant associated factors for body weight changes. Socio-demography and eating behaviour were found to be the significant predicting factors of body weight changes. This paper concludes that the change in environment has an impact on body weight and eating behaviour of Nigerian students.

Keywords: Body weight; eating behaviour; dietary intake; physical activity; international student

Introduction

The transition to university is a critical period for weight gain among young adults (Wengreen and Moncur, 2009). University students are found to be susceptible to weight gain in their first year of inhabitancy at the university (Serlachius, Hamer, and Wardle, 2007). Eating behaviour has been a major concern among university students as a determinant of health status. Several studies have shown that university students tend to have poor eating habits, and this is related to nutritional status. There are many factors pose a barrier to adoption of healthy eating behaviours among university students such as lack of time (Silliman, Rodasfortier, and Neyman, 2004), peer influence or lack of knowledge (Anwar et al., 2011),

sedentary lifestyle, lack of availability of familiar food, and limited finance (Anding et al., 2001). A poor eating habit is also noticeable among international students. When students leave home for studies, their nutritional and physical activity becomes their exclusive responsibility (Zarei et al., 2013), and such change would also occur in their eating behaviours. International students change their life significantly in the host country as they undergo exposure to social environmental changes as well as a change in diet and climate (Hovhannisyan, 2007).

A study conducted by Papadaki et al. (2007) found that university students living away from home in Greece were found to eat fewer fruits and vegetables, and increased their fast food and alcohol intake. International students are more susceptible to stress, anxiety and depression due to the additional challenges they may face in adapting to different country and culture (Rosenthal, Russell, and Thomson, 2008). Increasing stress of the student might negatively influence their diet (Mikolajczyk, El Ansari, and Maxwell, 2009) which in turn affect body weight. Several factors were found to be associated with weight status such as eating behavior (Bjørnarå et al., 2013; Rosenheck, 2012; Savige et al., 2007), socio-demographic factors like gender, education level, age, income level, ethnicity (Mokhtari, Jamaluddin, and Saad, 2015; Sneve and Jorde, 2008; Zarei et al., 2013), physical activity (Golubic et al., 2014; Hammer et al., 2014; Zarei et al., 2013), environmental and lifestyle factors (Burgoine et al., 2014; Deforche, Van Dyck, Deliens, and De Bourdeaudhuij, 2015; Mackenbach et al., 2014).

In Malaysia, the number of foreign students is increasing dramatically since 2003 (Zarei et al., 2013). However, nutritional status of the foreign student and their eating behaviours, especially among Nigerian students studying at a higher educational level such as at UniSZA has never been investigated. A study carried out by Zarei et al., (2013) among the Middle East postgraduate students in Universiti Putra Malaysia, reported that gender and physical activity was associated with the body weight status. In their study, the nutritional behaviour of the students was poor. Another study reported that age, gender, income level and physical activity were associated with the body weight of university students (Mokhtari et al., 2015). Previous study also shows that the dietary habit of the international student was significantly deteriorated during their first year of study (Hovhannisyan, 2007). Therefore, it is important to determine the behavior factors (socio-demographic, eating behavior, physical activity, dietary intake and quality of life) associated with body weight changes of Nigerian postgraduate students in UniSZA, a public university in Malaysia.

Methodology

Participants and Ethical Consideration

A prospective study was conducted at Universiti Sultan Zainal Abidin (UniSZA), in Malaysia. Baseline data were taken one month after Nigerian students' arrived at UniSZA and six months after the baseline data was collected. A total of 108 Nigerian postgraduate students were included in this study. Eighty two Nigerian postgraduate students returned the completed questionnaires, while 26 failed. A written consent was obtained to those agreed to participate in the study. Ethical approval for the study was granted by the Human Research Ethics Committee of Universiti Sultan Zainal Abidin [UniSZA.N/1/628-1JId 2(4)].

Socio-demographic and Anthropometric Measurements

Socio-demographic information's including; age, gender, date of birth, marital status, the source of income, living arrangement, the field of study and place of living were self-reported. Body weight was measured using a digital scale (Seca 813, Hamburg, Germany) to the nearest 0.1 kg. Participants were asked to remove their shoes and step on the scale. Height was measured to the nearest 0.1 cm using a stadiometer (Seca 217, Hamburg, Germany)

where the participants stood straight with their back facing the body meter while the measuring beam is pulled down to rest on the head. Body mass index (BMI) was calculated, and used to categorize the weight status of the participants as underweight (BMI less than 18.5 kg/m²), normal (BMI = 18.5 to 24.99 kg/m²), overweight (BMI 25 to 29.99 kg/m²) and obese (BMI greater or equals to 30kg/m²), according to World Health Organization classification (WHO Expert Consultation, 2004).

Dietary Assessment

Dietary intake of each respondent was assessed through 3-days 24-hour dietary record, which was self-reported by the subjects. The subjects were asked to indicate all foods and beverages they ate and drank for three days (two weekdays and one weekend), as well as the types, method of preparation brand name, and the amount eaten. Types and quantity of foods consumed were entered into Nutritionist Pro Inc. software (Axxya System), to analyze the energy and selected nutrient of the food.

Eating Behaviours Questionnaire (EBQ)

EBQ was used to determine the eating behaviour of the subjects. EBQ is a nine-item scale that assesses the frequency of meal consumption, the frequency of snacking between meals, types of snacks consumed, and frequency of eating outside the home and take away foods, use of dietary supplements, dietary practice and participation in weight management programs (Chin and Mohd Nasir, 2009). It was scaled 1 to 6 (1= every day, 2= 4 to 6 days a week, 3= 2 to 3 days a week, 4= once in a week, 5= 1 to 3 times a month, and 6= never or less than once a month).

International Physical Activity Questionnaire (IPAQ)

Self-reported physical activity data was collected using the IPAQ-short form. The IPAQ-short form asks respondents to report the frequency and duration of walking, moderate and vigorous intensity activity performed during the last seven days for at least 10 minutes duration per session. The continuous score was calculated and expressed as an MET-minute per week (multiple of resting metabolic rate). A MET-minute was computed by multiplying the MET score by the number of days per week and duration in minutes performed by the three specific types of activity: vigorous-intensity activities, moderate-intensity activities, and walking. Walking MET-minutes/week = 3.3 * walking minutes * walking days. Moderate MET-minutes/week = 4.0 * moderate-intensity activity minutes * moderate-intensity days. Vigorous MET-minutes/week = 8.0 * vigorous-intensity activity minutes * vigorous-intensity days. Total physical activity MET-minutes/week = sum of walking + moderate + vigorous MET- minutes/week scores (IPAQ, 2005).

Quality of Life Questionnaire

The individual facet relating to quality of life was assessed using the World Health Organization - Quality of Life Questionnaire (WHOQoL-BREF), which was self-administered by the respondents. WHOQoL-BREF questionnaire which was a short questionnaire consisting of 26 items (version of World Health Organization Quality of Life assessment; WHOQoL-100) from four different domains; Physical health (7 items), Psychological (6 items), Social relationship (3 items) and Environmental domain (8 items), and two questions on overall quality of life and general health (WHO, 1996). Items are rated on a five-point Likert scale (low score of 1 to high score of 5) to determine raw item scores. The domain

score was calculated by taking the mean of all items included in each domain, and multiplied by a factor of four, in order to make domain scores comparable with the scores used in the WHOQoL-100. The four domain scores represent an individual's perception of quality of life in each particular domain. The domain score is scaled in a positive direction, with higher scores representing a higher quality of life (WHO, 1996).

Data Analysis

Statistical analysis was conducted using a statistical program for science (IBM SPSS, Version 20.0). Descriptive statistic was carried out, and the result is presented as frequencies and percentages for categorical variables and as means and standard deviations, minimum and maximum for continuous variables. Paired t-test was applied to compare the difference of two mean in the pre-post measurement. Multiple linear regression method was applied to determine the factors (socio-demographic, eating behaviour, physical activity, dietary intake and quality of life) associated with the body weight changes. Variables chosen for multiple linear regression analysis using stepwise method were decided not only based on statistical significance in univariable analysis ($p < 0.25$) but also on principles of parsimony and biological plausibility. Final results were presented with crude and adjusted regression coefficients with 95% confidence interval (CI) and corresponding p-values. A p-value of less than 0.05 was regarded as statistically significant.

Results

Socio-demographic Characteristics of the Students

Table 1 presents the socio-demographic characteristics of the students in the present study. Of 82 students, 76 are male and six are females, with a mean age of 28.1 ± 2.0 years old. More than half of the students were single and 26.8% were married. In this sample, 91.5% of the students reside in the campus and only 8.5% of the students reside off campus with their family. The majority of the students were from science based courses (58.5%) while others were from art and social science. The mean amount spent on food was RM15.60 (816.90 Nigerian Naira) per day.

Table 1. Socio-demographic and anthropometric characteristic of the participants

Characteristic	n (%)	Mean \pm SD
Age		28.1 \pm 2.0
Gender		
Male	76 (92.7)	
Female	6 (7.3)	
Marital status		
Single	60 (73.2)	
Married	22 (26.8)	
Place of living		
On campus	75 (91.5)	
Off campus	7 (8.5)	
Field of study		
Science	47 (58.5)	
Art	20 (23.2)	
Social Science	15 (18.3)	
Amount spent for food (RM)/ day		15.6 \pm 4.4

Changes in Body Weight, Dietary Intake, Physical Activity and Quality of Life after 6 Months

The present study found that there was a significant increase in body weight of 2.3 kg and a body mass index of 0.5 kg/m² of the students (p <0.001) (Table 2) after six months of living in Malaysia. The number of underweight students reduced from 19.5% to 14.6%, while the number of overweight/obese students increased from 11.0% to 12.2%. About 72% of the students increased in body weight while 22% decreased in weight and 6.1% remained unchanged after six months in Malaysia.

The dietary intake of the students significantly changed after six months (Table 2). There was a significant decrease in total caloric intake (p=0.045) and fat intake (p=0.006). However, there was no significant changes in protein (p= 0.700) and carbohydrate intake (p=0.065). A significant decrease in sodium intake was observed after six months (p=0.012). On the other hand, the intake of potassium (p=0.009) significantly increased after six months.

No significant change was observed for the total physical activities MET minutes/week after six months. After six months of studying in Malaysia, there was also no significant change observed in the overall quality of life and general health of the Nigerian postgraduate students. Among the QoL domain scores, only social relationship domain showed a significant increase in quality of life score (p=0.001), while in other domains, no significant changes were recorded. The result indicates that the level of satisfaction with the facets in the social relationship domain increased. After six months living in Malaysia, the students reported better personal relationships and social support after six months living in Malaysia

Table 2. Anthropometric measurements, dietary intake, physical activity and quality of life of the students at baseline (0 months) and after 6-months of staying in UniSZA, (n = 82)

Variables	0 months	6 months	t-value	p-value
Anthropometric measurements				
Weight (kg)	62.5 ± 11.6	64.2 ± 11.1	-5.338	<0.001*
Height (cm)	171.8 ± 6.8	171.8 ± 6.8		
BMI (kg/m ²)	21.2 ± 3.7	21.7 ± 3.5	-5.225	<0.001*
Dietary Intake				
Total energy (Kcal)	2141.9 ± 434.1	2025.7 ± 346.4	2.041	0.045*
Protein (g/d)	79.5 ± 20.7	80.5 ± 16.5	-0.387	0.700
Carbohydrate (g/d)	285.2 ± 62.9	269.8 ± 46.9	1.868	0.065
Fat (g/d)	77.3 ± 18.1	69.8 ± 18.3	2.803	0.006*
Sodium (mg/d)	3188.5 ± 875.8	2829.8 ± 929.8	2.577	0.012*
Potassium (mg/d)	1769.5 ± 647.6	1991.1 ± 489.7	-2.697	0.009*
Calcium (mg/d)	540 ± 330.6	602.3 ± 169.1	-1.678	0.097
Total physical activity (METmin/week)	1280.8 ± 1240.6	1430.7 ± 1517	-0.937	0.351
Overall quality of life				
General health	4.2 ± 0.8	4.3 ± 0.7	-0.881	0.381
Physical domain	4.0 ± 0.9	4.2 ± 0.7	-1.622	0.109
Psychological domain	15.1 ± 2.1	15.3 ± 1.8	-0.715	0.477
Social relationship domain	15.7 ± 2.2	16.0 ± 1.8	-1.624	0.108
Environment domain	14.7 ± 2.8	15.8 ± 2.7	-3.336	0.001
Environment domain	14.7 ± 2.0	15.0 ± 1.9	-1.526	0.131

* paired t-test, significant level at p<0.05

Changes in Eating Behaviours after 6 Months

Meal and snack consumption between meals of the students at baseline and after six months was presented in Table 3. The daily consumption of breakfast, lunch and dinner reduced from 51.2% to 30.5%, 57.3% to 47.6% and 76.8% to 63.4%, respectively. Apart from main

meals, the daily consumption of snacks during morning time was also reduced from 35.4% to 24.4%, but no difference for afternoon tea time.

Table 3. Frequency of meal and snack between meal consumption of the students at baseline and after six months of staying in UniSZA (n= 82)

Variables	n (%) 0 months	n (%) 6 months
Consumption of breakfast		
Every day	42 (51.2)	25 (30.5)
4-6 days a week	21 (25.6)	27 (32.9)
2-3 days a week	9 (11.0)	17 (20.7)
Once a week	6 (7.3)	4 (4.9)
1-3 times a month	1 (1.2)	3 (3.7)
Never/less than once a month	3 (3.7)	6 (7.3)
Morning tea		
Every day	29 (35.4)	20 (24.4)
4-6 days a week	27 (32.9)	19 (23.2)
2-3 days a week	12 (14.6)	24 (29.3)
Once a week	9 (11.0)	5 (6.1)
1-3 times a month	1 (1.2)	7 (8.5)
Never/less than once a month	4 (4.9)	7 (8.5)
Lunch consumption		
Every day	47 (57.3)	39 (47.6)
4-6 days a week	20 (24.4)	18 (22.0)
2-3 days a week	9 (11.0)	14 (17.1)
Once a week	3 (3.7)	3 (3.7)
1-3 times a month	3 (3.7)	7 (8.5)
Never/less than once a month	0	1 (1.2)
Afternoon tea		
Every day	12 (14.6)	12 (14.6)
4-6 days a week	6 (7.3)	9 (11.0)
2-3 days a week	9 (11.0)	8 (9.8)
Once a week	11 (13.4)	6 (7.3)
1-3 times a month	9 (11.0)	9 (11.0)
Never/less than once a month	35 (42.7)	38 (46.3)
Consumption of dinner		
Every day	63 (76.8)	52 (63.4)
4-6 days a week	9 (11.0)	9 (11.0)
2-3 days a week	4 (4.9)	6 (7.3)
Once a week	0	7 (8.5)
1-3 times a month	2 (2.4)	3 (3.7)
Never/less once a month	4 (4.9)	5 (6.1)
Consume supper		
Every day	10 (12.2)	11 (13.4)
4-6 days a week	6 (7.3)	8 (9.8)
2-3 days a week	13 (15.9)	17 (20.7)
Once a week	8 (9.8)	13 (15.9)
1-3 times a month	10 (12.2)	8 (9.8)
Never/less than once a month	35 (42.7)	25 (30.5)

Meal skipping behaviour of the students after six months was presented in Fig. 1. Meal skipping slightly increased, with majority of them skips meals. Breakfast was the most frequently skipped meal (61%), followed by lunch (35.4%), and dinner (3.7%) (Fig. 2). The present study also found that the frequency of eating out among the students was reduced after six months (Table 4). The students ate less at hawkers' centers, coffee shops or other food stalls (from 28% to 12.2%), and Western fast food (from 4.9% to 1.2%). The frequency

of buying takeaway food from Western fast food restaurants was also reduced, in which only 3.7% of the students bought takeaway food from Western fast food restaurants every day after six months as compared with baseline (7.3%).

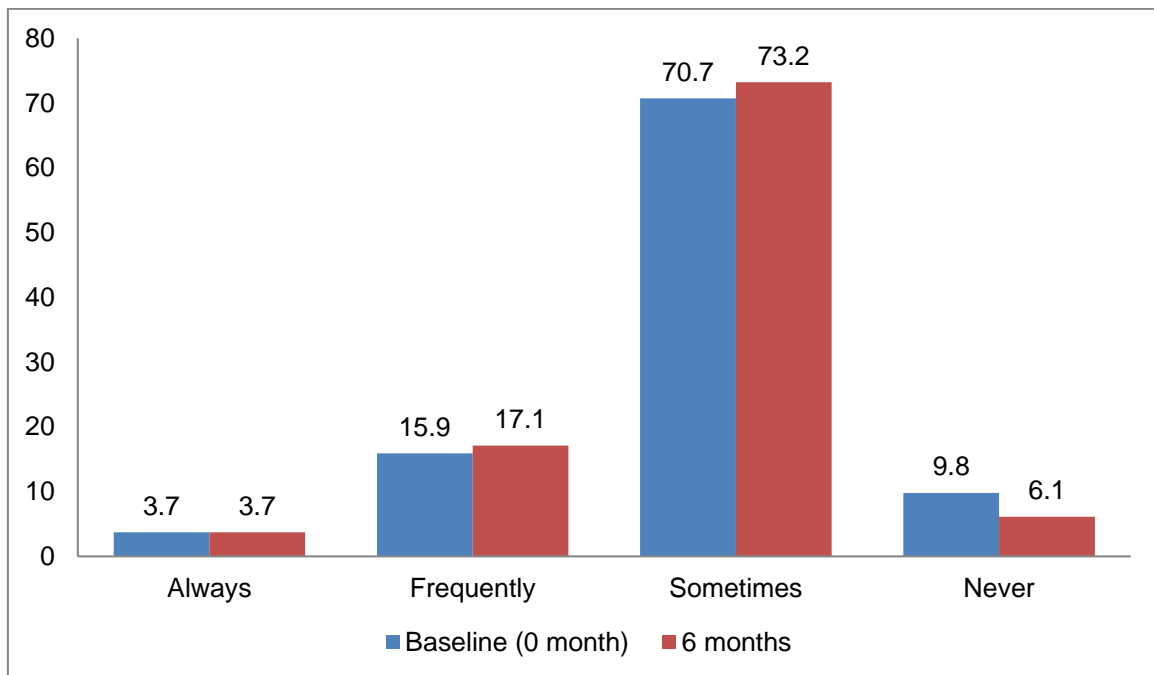


Figure 1. Meal skipping behaviour of the students at baseline (0-months) and after 6-month (%), (n = 82)

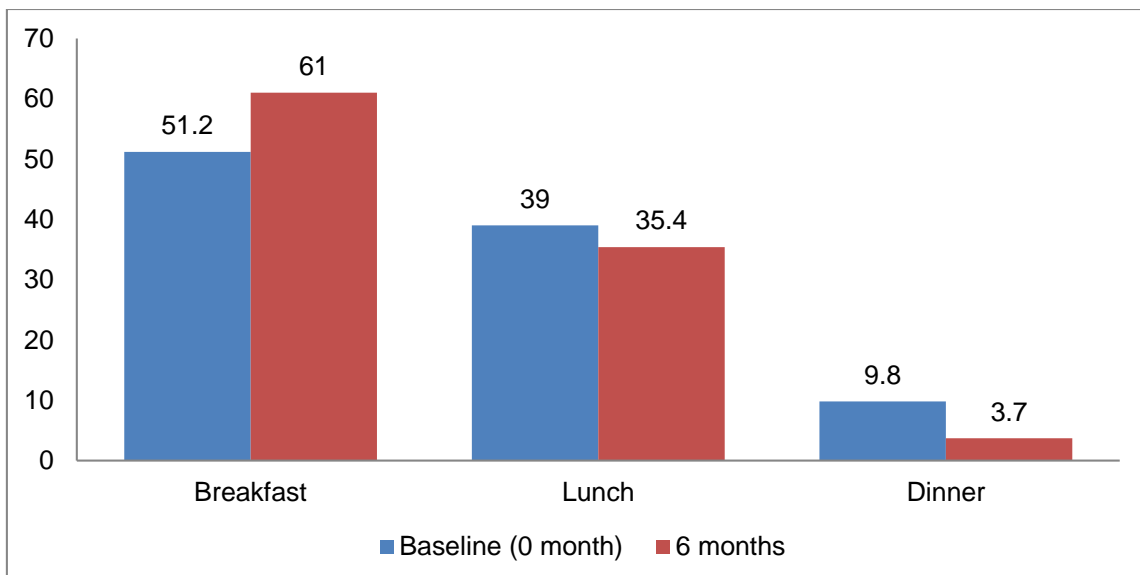


Figure 2. Most frequent skipped meal of the students at baseline (0-months) and after 6-month (%), (n = 82)

Table 4. Frequency of eating away from home of the students at baseline and after six months of staying in UniSZA (n= 82)

Variable	n (%) 0 months	n (%) 6 months
Eat at hawker centers, coffee shops or food stalls		
Every day	23 (28.0)	10 (12.2)
4-6 days a week	16 (19.5)	7 (8.5)
2-3 days a week	9 (11.0)	19 (23.2)
Once a week	11 (13.4)	10 (12.2)
1-3 times a month	8 (9.8)	12 (14.6)
Never/less than once a month	15 (18.3)	24 (29.3)
Eating at Western fast food restaurants		
Every day	4 (4.9)	1 (1.2)
4-6 days a week	2 (2.4)	2 (2.4)
2-3 days a week	12 (14.6)	5 (6.1)
Once a week	10 (12.2)	17 (20.7)
1-3 times a month	21 (25.6)	24 (29.3)
Never/less than once a month	33 (40.2)	33 (40.2)

About 6% of the students frequently consumed supplements after six months compared to baseline (13.4%) (Table 5). Regarding dietary practice, no much change was observed after six months. Most of the participants still claimed that they reduced their intake of high fat and high sugar and only a small proportion of the students (2.4%) followed a specific weight loss diet regimen.

Table 5. Dietary supplementations and types of dietary practice of the students at baseline and after six months of staying in UniSZA (n = 82)

Variables	n (%) 0 months	n (%) 6 months
Dietary supplement consumption		
Yes	11 (13.4)	5 (6.0)
No	71 (86.6)	77 (93.9)
Source of advice of dietary supplement consumption		
Physician	9 (81.8)	4 (80)
Own decision	2 (18.2)	1 (20)
Types of dietary practice		
Reduce high fat and high sugar foods.	24 (29.3)	25 (30.5)
Reduce high fat, high sugar and red meat foods.	23 (28)	21 (25.6)
Reduce high fat foods.	3 (3.7)	6 (7.3)
Vegetarians.	2 (2.4)	2 (2.4)
Eat according to a specific weight loss diet menu.	3 (3.7)	2 (2.4)
No special diet menu but eats less to lose weight.	3 (3.7)	6 (7.3)
Not choosy on the types of food eaten and eat any food available.	24 (29.3)	20 (24.4)

Factors Associated with the Body Weight Changes

Among the five factors considered to be associated with body weight changes in this study, only socio-demographic and eating behaviour were found to be significant factors. The results showed that being an art student, being female, consumption of breakfast once a week, taking morning tea less than once a month or never at all, consumption of lunch one to three times a month, taking afternoon tea two to three days a week, skipping meal sometimes, taking meal at other food stalls, coffee shops or hawkers' centers less than once a month or never at all were adjusted significant associated factors for changes in body weight (Table 6).

Table 6. Factors associated with body weight changes among Nigerian postgraduate students in UniSZA (n= 82)

Variables	Multiple Linear Regression		
	β	95% CI	p- value
Being art student	1.67	0.49, 2.84	0.006
Being female	-2.68	-4.68, -0.68	0.009
Consumption of breakfast once a week	5.10	2.81, 7.39	<0.001
Taking morning tea less than once a month or never at all	3.62,	1.84, 5.40	<0.001
Consumption of lunch one to three times a month	-2.57	-4.37, -0.78	0.006
Taking afternoon tea two to three days a week	2.56	0.78, 4.34	0.005
Skipping meal sometimes	1.22	0.01, 2.43	0.049
Taking meal at other food stalls, coffee shops or hawkers' centers less than once a month or never at all	-2.31	-3.41, -1.20	<0.001

β adjusted regression coefficient. Stepwise multiple linear regressions method applied, Model reasonably fits. Model assumptions are fulfilled, and there was no interaction among independent variables. Coefficient of determination ($R^2=0.478$).

Results from multiple linear regression showed that being art student was associated with increased body weight compared to science or social science students ($\beta=1.67$, $p=0.006$). On the other hand, being female was associated with decreased body weight compared with a male counterpart ($\beta=-2.68$, $p=0.009$). Furthermore, the analysis showed that those that are taking breakfast once a week and taking morning tea less than once a month or never at all were more likely to have increased in body weight ($\beta=5.10$, $p<0.001$) and ($\beta= 3.62$, $P<0.001$), respectively. Moreover, taking lunch one to three times a month ($\beta=-2.57$, $p= 0.006$) and taking afternoon tea two to three days a week ($\beta=2.56$, $p=0.005$) were associated with decreased and increased body weight, respectively. Besides that those that are skipping meals sometimes were more likely to have increased body weight than those who are not skipping meals ($\beta=1.22$, $p= 0.049$). In addition, those that took a meal at other food stalls, coffee shops or hawkers' centers less than once a month or never at all were more likely to have decreased body weight than those who do not ($\beta=-2.31$, $P <0.001$).

Discussion

This study determined factors associated with body weight changes among Nigerian postgraduate students in UniSZA after six months living in Malaysia. After six months, the students have increased on average 2.3 kg body weight. The weight gain might be due to lifestyle changes, caused by changes in the social and physical environment, which might affect eating and exercise behaviours. After few months of staying in Malaysia, the students adapted to the lifestyle became more comfortable with the food they eat, and they began to understand the culture and activities in Malaysia. A similar finding was reported by international students in America (Almohanna et al., 2010). They gained average of 1.3 kg body weight after three months stay in America. In their study, increased frequency of dining out and adapting to the Western dietary practices is strongly associated with weight gain among students. They were found to be acculturating to the American diet which impacted on their body weight (Almohanna et al., 2015). Weight gain was also found among Chinese international students in South Korea (Lee, Gao, and Kim, 2015). In the study, there was an increase of average 4.5 kg among male students. The students have a higher social relationship with Koreans, and this could give the students more opportunities of eating out. Without controlling their overconsumption of high-calorie foods, this could result in weight gain and obesity (Lee, Gao, and Kim., 2015). Another factor that might influence the body weight of the university students is stress. A study has found that higher level of stress was associated with weight gain (Serlachius et al., 2007). Students were found trying to overcome their stress by eating irregularly. Most of the students skip breakfast and replace the energy intake by eating higher calorie dense food during lunch and dinner. This is evident in the current study among Nigerian students in UniSZA. In fact, a recent study by Adenike Adesola, (2014) reported that in the study of breakfast habit and nutritional status of undergraduates students in Ekiti state of Nigeria, 52% of the students skipped breakfast. A similar result was reported by Afolabi et al.(2013) among 140 Nigerian university students. In this study, lack of time and lack of appetite was the major reasons for skipping meal.

Many studies have shown that socio-demographic factors such as education, age, income level were associated with body weight (Edmonds et al., 2008; Mokhtari et al., 2015; Wilson et al., 2012). In the present study, the field of study (being art student) was associated with higher body weight. The art students are usually from languages and communications, law, and education; as such they may have less knowledge about nutrition compared to science based students (Elhassan, Gamal, and Mohammed, 2013). Unhealthier eating behaviour may be related to lack of nutrition knowledge, which in turn affects body weight. The present study also found that gender (being female) was associated with lower body weight. A similar finding was reported by Kaphingst et al., (2007). In their study, using multivariate regression analysis, there was an association between being female and having lower BMI. The greater body weight of male students in the present study might be attributed to several factors such as larger body size than female. Furthermore, men in general, have more muscle mass and less body fat than women. Female are more concern about their body weight, shape, have a higher desire for weight loss and dieting and have lower energy intake (Huda & Ahmad, 2010; Zarei et al., 2013).

Furthermore, result from the present study showed that consumption of breakfast once a week, taking morning tea less than once a month or never at all, taking afternoon tea two to three days a week, skipping meal sometimes was associated with higher body weight, while consumption of lunch one to three times a month was associated with lower body weight. Also, skipping meal sometimes was associated with higher body weight. Skipping breakfast was found to be associated with weight gain (Niemeier et al., 2006). This was also supported by Neumark-sztainer, Wall, & Story, (2013) in which weight control behaviours including meal skipping and eating small meals predicted larger BMI. Those who skipped meals were less likely to engage in physical activity, which might contribute to positive energy balance and weight gain (Rampersaud et al., 2005). It was shown that those who usually skip meals were more likely to be overweight, and there was a significant reduction of obesity risk with increasing number of meal (Bjørnarå et al., 2013; Chin and Mohd Nasir,

2009; Lee et al., 2015). Therefore, it is important to practice regular meal pattern to avoid health consequences associated with meal skipping. Other than that, the present study found that taking meals at other food stalls, coffee shops or hawkers' centers less than once a month or never at all was associated with lower body weight. Naska et al., (2011) showed that eating at restaurants and similar establishments were associated with higher BMI and possibly weight gain.

The findings of this study are limited to students from only one university, which might not represent all Nigerian students in Malaysia. Most of the tools used for data collection are questionnaires; therefore, there might be recall bias (Bjørnarå et al., 2013). The use of BMI to classify college students as overweight is not always appropriate, because BMI does not differentiate between fat and fat-free masses. Therefore, it is likely that some of the students in our sample whose BMI was in the overweight range might have a higher lean tissue, with increased muscle mass, because we did not assess body composition and fat analysis which is another limitation.

To our knowledge, the present study is the first to describe factors associated with body weight changes among Nigerian postgraduate students in Malaysia. The use of the standard measurement protocol also contributed to the strength of this study, reliability and validity of the questionnaires used, including the quality of life (WHOQoL-BREF) and physical activity (IPAQ). Moreover, the researcher employed all Nigerian students in the study. The study was set out to be a well-conducted longitudinal cohort study (six months) with robust statistical analysis.

It is suggested that several research areas related to nutrition and well-being of Nigerian or international students in Malaysia need to be explored, and the scope of future studies should be broadened to include many other institutions. These might allow further accuracies in having a larger data sample. Further studies can also be carried out to determine the factors associated with eating behaviours, and quality of life of international students.

Conclusion

This study is the first to make a significant contribution to our understanding of the factors associated with the body weight changes of Nigerian postgraduate students in UniSZA, Malaysia. Socio-demographic and eating behaviour were found to be the significant predicting factors of body weight changes. Being art students and skipping meal were associated with increased body weight while being female and eating out less were associated with decreased body weight. Changes in the social and environment have an impact on body weight and eating behaviour of Nigerian students.

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