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# Food Habits and Nutritional Status of Nigerian Undergraduates

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## ABSTRACT

The food habits, nutritional status and nutritional knowledge of undergraduates in two tertiary Institutions in Abia State - Michael Okpara University of Agriculture, Umudike (MOUAU) and Abia State University, Uturu (ABSU) was carried out. A cross sectional survey was carried out on 342 subjects [150 (59 males, 91 females) from MOUAU and 192 (69 males, 123 females) from ABSU] from ages 16-25 years who were randomly selected. Pretested and validated questionnaire was used to obtain information on socio-economic characteristics, food habits and nutrition knowledge while anthropometric characteristics were used to determine their nutritional status. Data was analysed using descriptive statistics and Pearson's correlation. The highest factor that determined food habits was economic factor. Breakfast was the highest skipped meal because of no time. The result of the body mass index (BMI) revealed that majority (MOUAU, 76.7%) and (ABSU, 75%) were in the normal category BMI (18.50-24.99 kg/m$^2$). More than 70% of the respondents from the two institutions had good nutrition knowledge which was reflected in their food habits; however financial inadequacy and time constraint were the major factors that influenced the implementation of the nutrition knowledge. There was no significant difference ($P > 0.05$) between parental socioeconomic status and food habits, between body mass index and food habits. However, the parental socio-economic status and body mass index were significantly ($P < 0.05$) related.

**Keywords:** anthropometric characteristics, body mass index, nutrition knowledge, socioeconomic characteristics, university students

## INTRODUCTION

Food habits and nutritional status of undergraduates are among the principal public health problems in large areas of the world. These undergraduates have been described as university students who have not yet obtained first bachelors degree (Webster 1995; World English Dictionary 2011) and these group are mostly adolescents and young adults. Generally girls form the bulk of this group in the universities. Adolescents have been described by WHO (2003) as individuals between the ages of 10 and 19 years. Adolescence is a unique period of development of physiological, psychosocial and cognitive levels all of which affect the nutritional needs of the adolescence (Qlan 2011). A young adult is a person who has just passed the stage of adolescence. Thus among the undergraduates, a population in late adolescent and early adulthood would be found. During this period, their total nutrient needs reach the highest peak and healthy eating is important to meet the increased body demands. This is a period of risk, a period when health problems with potentially serious consequences occur, and problem behaviours which have potentially severe adverse effects on future health are initiated (Chandra-Mouli *et al.* 2006). This is a time when many are on their own for the first time and will develop many important habits that will follow them in adulthood. With the many stressors and obstacles freshmen face being on their own for the first time, it can derail them from cultivating healthy habits (Jackson *et al.* 2009). Thus this population group experience variety of transformations that lead them to preoccupation with body image, assertion of independence and also uncertainties about sexuality, future relationships and career options (Trexier and Sargent 1993). This leads to display of irregular lifestyle and influences by many outside factors which in turn predisposes them to food habits that ultimately affect their nutritional status. West and Cumines (2006) had noted that adolescence is a period when peer pressure can affect teenage eating behaviour and they may start skipping meals or possibly under-eat or over eat. Also (Shaw 1998; Olumakaiye *et al*. 2010) had revealed problematic eating habit like skipping of meals (especially breakfast) which leads to higher level of snacking among this population group. Delisle *et al.* (1999) also observed that eating habits or patterns are frequently erratic in adolescents and this may be a common factor of nutritional risk, irrespective of area. Qlan (2011) noted that due to time constraints, some students may frequently neglect entire meals during the day, and as a result resort to late-night binge eating. Some dietary patterns which include snacking (usually on energy dense foods), meal skipping (particularly breakfast), irregular and wide use of fast foods appear quite common among adolescents. Some of these factors have been associated with overweight and obesity (Thompson-Mccormick *et al*. 2010). As young adults move into an independent living situation, there is a high risk for unhealthy eating habits (Gower *et al.* 2009). Far from the care of parents, most undergraduates may begin to develop unhealthy eating habits over a short span of time (Freedman and Connors 2010).

Much of the work on this population group has been on the adolescents. There has not been much information on the food habits and nutritional status of undergraduates. This study was undertaken as a result of this lack of information to stimulate interest in the study of the food habits and nutritional status of these undergraduates, some of who may have passed adolescence, determine the relationship between their food habits and nutritional status as well as relationship between the parental socio-economic status of the students and their food habits.

## MATERIALS AND METHODS

### Survey area

This was a cross-sectional study carried out in two tertiary institutions in Abia State, Nigeria namely Michael Okpara University of Agriculture, Umudike (MOUAU) and Abia State University

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Uturu (ABSU) because they are the only universities in Abia state which was the state considered for the study. As a matter of fact, the researchers were particularly interested in the food habits and nutritional status of undergraduates. This age group was selected because much work has not been done on them in the universities. This age group are also easily influenced by their mates and associates. This may influence their food habits which may likely affect their nutritional status.

## Sampling

Lists of all the students were collected from the registry department of the two universities. A total of 324 students aged 16-25 years were randomly selected from these institutions, 150 from MOUAU (59 males, 91 females) and 192 from ABSU (69 males and 123 females). These were grouped in three based on their ages, group one consisted of ages 16-19 years, group two 20-22 years and group three, ages 23-25 years.

## Data collection

A well structured, pretested and validated questionnaire was used to collect information on socio-economic characteristics, nutrition knowledge, dietary habits and food frequency of the subjects.

## Anthropometric measurement

Body weight was measured using a pretested portable bathroom scale (Hanson Model) to the nearest 0.5 kg. This was done early morning prior to breakfast with minimal clothing on, in line with the Jelliffe (1966) method. This was done three times and the average value recorded as body weight of the individual.

The height of each subject was measured with a constructed height scale made with wooden rod with fiberglass tape attached. Height was measured with the subject standing erect on bare feet and heels put together, heels, buttocks, and back of head touching the upright rod and height read to the nearest 0.1cm in line with the standard methods (Jellife 1966; Lohman 1981).

Arm circumference was measured to the nearest tenth of a centimeter on the left arm of each subject (Jelliffe 1966) using a non stretch fiber glass tape. The measurement was taken with the arm hanging freely by the side at the mid-point between the tip of the acromion process of the scapular and the olecranon process of the ulna.

## Skin-fold thickness

Four (4) sites were measured for skinfold thickness: triceps, biceps, subscapular and suprailiac using Holtain skinfold calipers for the estimation of body fat of the subjects. All measurements were taken on the right side of the body to the nearest 0.1 mm (Onimawo and Cole 2002). Three measurements of each site was taken and the average taken.

## Calculation of body composition parameters

Body weight, height and arm circumference were read off directly from the scales and tapes and the average of the readings taken. Body mass index (BMI) was calculated in $kg/m^2$.

Body density was calculated from Durnin and Rahaman (1967) equation for men and Durnin and Wormersley (1974) equation for women:

$Y = 1.610 – 0.063X$ for men

$Y = 1.6105 – 0.0777X$ for women

where Y = density and X = log (sum of triceps, biceps, subscapular and suprailiac).

Percentage body fat was estimated from Siri's (1956) equation:

$$\% \text{ body fat} = \frac{[(4.95) - 4.5]}{\text{Density}} \times 100$$

**Table 1** Values for determination of optimum body weight.

| Height range (cm) | Values to be subtracted |
|---|---|
| 140-149 | 100 |
| 150-155 | 102 |
| 156-159 | 102.5 |
| 160-165 | 103 |
| 166-169 | 103.5 |
| 170-175 | 104 |
| 176-179 | 104.5 |
| >180 | 106 |

Source: Onimawo (2004)

Total body fat (TBF) in kilograms was calculated as % body fat × body weight (kg)

Lean body mass (LBM) was estimated as body weight (kg) – body fat (kg)

Optimum weight was estimated by the rapid method described by Onimawo (2002). This method involves the subtraction of specific figures from height range values as seen in **Table 1**.

Total body water was estimated using the formula:

$LBM = TBW/0.73$

where LBM (lean body mass) was anthropometrically derived (Wong *et al.* 1989). Thus:

$TBW = LBM \times 0.73$

Arm muscle diameter (AMD) was estimated from the formula:

AMD = arm circumference (mm) – triceps (mm).

## Data analysis

Frequency distribution, percentages, means and standard deviation were analyzed using Statistical Package for Social Sciences (SPSS) for windows version 10.0. Pearson's correlation coefficient was used to check the relationship between parental occupation and food habits as well as relationship between food habit and nutritional status. Significance difference was judged at $P < 0.05$.

## RESULTS

Results of the socio-economic characteristics (**Table 2**) revealed that the majority of subjects (MOUAU 48%, ABSU 50.5%) were within the age range of 20-22 years. Most of the subjects (MOUAU 63.3%, ABSU 50%) spent between N500 to N1000 (approx. $3.22 – $6.43) on food in a week. More than 50% of the subjects (MOUAU 70.7%, ABSU 62.5%) reported that economic factor was the major factor that determined their food choice. Most of their parents were civil servants (MOUAU 38.7%, ABSU 32.8% for fathers; MOUAU 52%, ABSU 40.6% for mothers). Most of the subjects came from families with family size which ranged from 4-9.

The food habits of the subjects revealed that more than 50% of the subjects ate three meals a day (**Table 3**). However for those who skipped meals, breakfast (MOUAU 36%, ABSU 34.4%) was the most skipped. More than 50% of the students ate between meals (mostly taken between lunch and dinner). Most of the subjects (MOUAU 96%, ABSU 43.8%) cooked their food by themselves. Also, some (MOUAU 36.6%, ABSU 48.4%) preferred eating with friends. About one-quarter of the subjects reported that advertisement made them try new foods. Biscuit (MOUAU 26.7%, ABSU 26.6%) and meat pie (MOUAU 25.3%, ABSU 14.1%) were the snacks mostly consumed.

From the food frequency table, the frequency of daily consumption of some of the foods in MOUAU were as follows: fish (56%), meat (59.3%), vegetable (26.7%), fruits (32%), breakfast cereals (29.3%), *garri* (fried fermented cassava) with soup (28%) and rice with tomato sauce (24%). In ABSU: meat (76%), fish (67.2%), rice and

**Table 2** Socio-economic characteristics of respondents.

| Variables | MOUAU | | ABSU | | Total | |
|---|---|---|---|---|---|---|
| | Freq | % | Freq | % | Freq | % |
| **Age (years)** | | | | | | |
| 16-17 | 21 | 14.0 | 44 | 22.9 | 65 | 19.01 |
| 20-22 | 72 | 48.0 | 97 | 50.5 | 169 | 49.42 |
| 23-25 | 57 | 38.0 | 51 | 26.6 | 108 | 31.58 |
| **Religion** | | | | | | |
| Christianity | 144 | 96.0 | 171 | 89.1 | 315 | 92.11 |
| traditional | 4 | 2.7 | 0 | 0.0 | 4 | 1.17 |
| Islam | 2 | 1.3 | 21 | 10.9 | 23 | 6.73 |
| Others | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| **Family size** | | | | | | |
| 1-3 | 6 | 4.0 | 18 | 9.4 | 25 | 7.31 |
| 4-6 | 65 | 43.3 | 90 | 46.9 | 155 | 45.32 |
| 7-9 | 63 | 42.0 | 69 | 35.9 | 132 | 38.60 |
| 10-13 | 14 | 9.3 | 12 | 6.3 | 26 | 7.60 |
| Over 13 | 2 | 1.3 | 3 | 1.6 | 5 | 1.46 |
| **Amount of money spent on food in a week** | | | | | | |
| N500-N1,000 | 98 | 65.3 | 96 | 50.0 | 194 | 56.73 |
| N1,100-N1,600 | 28 | 18.7 | 84 | 43.8 | 112 | 32.75 |
| N1,700-N2,000 | 20 | 13.3 | 9 | 4.7 | 29 | 8.48 |
| Other | 4 | 2.7 | 3 | 1.6 | 7 | 2.05 |
| **Factors that determine food choice** | | | | | | |
| Religion | 6 | 4.0 | 24 | 12.5 | 30 | 8.77 |
| Culture | 6 | 4.0 | 9 | 4.7 | 15 | 4.39 |
| Economical | 106 | 70.7 | 120 | 62.5 | 226 | 66.08 |
| Social | 14 | 9.3 | 12 | 6.3 | 26 | 7.60 |
| Others | 2 | 1.3 | 27 | 14.1 | 43 | 9.95 |
| **Father's occupation** | | | | | | |
| Not employed | 0 | 0.0 | 6 | 3.1 | 6 | 1.75 |
| Banker | 6 | 4.0 | 9 | 4.7 | 17 | 4.97 |
| Trader | 16 | 11.0 | 18 | 9.4 | 24 | 7.02 |
| Civil servant | 58 | 3.9 | 63 | 32.8 | 121 | 35.38 |
| Farmer | 8 | 5.3 | 21 | 10.9 | 29 | 8.48 |
| Self employed | 26 | 18.7 | 54 | 28.1 | 80 | 23.39 |
| Others | 32 | 21.3 | 18 | 9.4 | 50 | 14.62 |
| **Father's occupation** | | | | | | |
| Housewife | 6 | 4.00 | 6 | 4.7 | 15 | 4.39 |
| Banker | 2 | 1.3 | 9 | 4.7 | 11 | 3.22 |
| Trader | 52 | 34.7 | 69 | 35.9 | 121 | 35.38 |
| Civil servant | 78 | 52.0 | 78 | 40.6 | 156 | 45.61 |
| Seamstress | 2 | 1.3 | 6 | 3.1 | 8 | 2.34 |
| Farmer | 3 | 2.0 | 3 | 1.6 | 6 | 1.75 |
| Others | 7 | 4.7 | 18 | 9.4 | 25 | 7.32 |

stew (63.5%), vegetables (57.8%). The foods that had the highest percentage in never consumed were coffee (MOUAU 56%, ABSU 52.6%) and pounded yam with soup (MOUAU 35.5%, ABSU 33.9%). In ABSU (25%) took boiled egg once a week, and 17.2% took *moimoi* (steamed cowpea pudding) four times in a week while in MOUAU (20%) took boiled egg once a week and 20% took *moimoi* thrice a week. No respondent in the two institutions reported never consumed for meat, fish, vegetables and fruits.

The response to nutrition knowledge (**Table 4**) revealed that these undergraduates had very basic nutrition knowledge in all the eight nutrition knowledge statements. More than 70% of the subjects from the two institutions got correct answers to the nutrition knowledge/practice questions. About 51% from MOUAU and 55% from ABSU got the questions on why we eat correctly.

More than 75% of the subjects were in the normal BMI grade (18.50-24.99 kg/m$^2$) as classified by Osisanya *et al.* (2003) (**Table 5**). No subject was found in the G3 thinness (BMI < 16.0 kg/m$^2$) and G3 obesity (BMI > 40 kg/m$^2$). Only very small percentages were in either G2 thinness or G2 obesity.

The values for body composition parameters (**Table 6**) revealed the mean weights as follows, for males (66.8 ± 9.13, 64.8 ± 10.5) and females (57.9 ± 5.73, 60.2 ± 9.80) for MOUAU and ABSU, respectively. Also the mean height for the males were (1.7 ± 0.07, 1.70 ± 0.09) and females (1.66 ± 0.07, 1.65 ± 0.06) for MOUAU and ABSU, respectively. The males had more weight than the females and they were equally taller than the females from the results. The total skin-fold thickness for females (MOUAU 53.5 mm, ABSU 57.2 mm) were higher than that of the males (MOUAU 62.6 m, ABSU 37.3 m) in the two institutions. There was no difference between the mid-arm circumference of the males (28.9 ± 4.64) and females (28.3 ± 4.55) in ABSU. Males (MOUAU 6.48 ± 1.42, ABSU 5.8 ± 1.9) had more arm diameter (AMD) than females (MOUAU 2.81 ± 1.15, ABSU 2.94 ± 1.35).

The result of the correlation between parental socioeconomic status, food habit and nutritional status revealed the following (**Table 7**). The correlation between a father's occupation and meal skipping was poor with a negative value (r = -0.55) and that of a father's occupation and snacking (r = 0.30), and both were not significant ($P > 0.05$). The correlation between mother's occupation and meal skipping (r = 0.33) and mother's occupation and snacking (r = 0.46) were both significant ($P > 0.05$). The correlation between meal skipping and body mass index (r = 0.38) and snacking with body mass index (r = 0.68) were both not significant ($P > 0.05$). However, the correlation between father's occupation and body mass index was high (r = 0.78) and that of mother's occupation with body mass index (r = 0.77) were both significant ($P > 0.05$).

## DISCUSSION

The amount of money spent in a week by the subjects was low and could account for the reason why more than 50% reported that economic factor was the major factor that determined their food choice. Another factor to this low expenditure on food per week could be related to their parent's socioeconomic status as most of their parents were civil servants who may likely be in the low or middle income class. Also the family size of most of the respondents ranged from 4-9 which could be a source of more financial burden to the parents. Parents had been reported to have a high impact on adolescents food choice, however peer impact is not ruled out (Akman *et al.* 2010).

More than 50% of the subjects that ate three meals a day could be due to the general orientation of eating three meals a day. However, for those who skipped meals, breakfast was the most skipped. This agrees with other reports (Rees 1984; Shaw 1998; European Food Information Council 2006; Akman *et al*. 2010; Olumakaiye 2010). The most common reason for skipping meals was because of no time which is in agreement with earlier reports (Krondi *et al.* 1983; Chapman 1992; Jenkins and Horner 2005; Olumakaiye 2010) as well as busy schedule (Debby and Motil 2006). Between meals (mostly taken between lunch and dinner) taken by the subjects could probably be to make up for the skipped breakfast in the morning. Shaw (1998) had noted that skipping meals appear to be more related to gender than poverty with girls being more likely than boys to miss breakfast. This study also revealed that more girls skipped breakfast than boys. The continuous process of skipping meals became a habit as more than 50% of the subjects reported that skipping meals and eating between meals were as a result of habits formed over the years. European Food Information Council (2006) had reported that teenagers are exposed to periodic food fads and develop irregular eating habits. The habits of skipping breakfast can have some detrimental effect on the undergraduates as breakfast plays an important role in providing needed energy and nutrients after an overnight fast and can aid in concentration and performance at school. Some studies (Sjoberg *et al.* 2003; Olumakaiye 2010; Thompson-McCormick *et al.* 2010) reported that skipping breakfast may lead to hunger in the morning, result in increased snacking which could further lead to weight gain.

Biscuits which ranked highest among the snacks consumed could probably be because biscuits were relatively cheap and readily available. Chapman (1992) had reported

**Table 3** Food habits characteristics of respondents.

| Variables | MOUAU | | ABSU | | Total | |
|---|---|---|---|---|---|---|
| | Freq | % | Freq | % | Freq | % |
| **Frequency of meals eaten in a day** | | | | | | |
| Once | 4 | 2.7 | 3 | 1.6 | 7 | 2.05 |
| Twice | 44 | 29.3 | 54 | 28.1 | 98 | 28.65 |
| Thrice | 91 | 60.7 | 102 | 53.1 | 193 | 44.68 |
| Four times | 7 | 4.7 | 18 | 9.4 | 25 | 5.79 |
| Others | 4 | 2.7 | 15 | 7.8 | 19 | 4.40 |
| **Meals usually skipped** | | | | | | |
| Breakfast (B) | 54 | 36.0 | 66 | 34.4 | 120 | 27.78 |
| Lunch (L) | 28 | 18.7 | 45 | 23.4 | 73 | 16.90 |
| Dinner (D) | 4 | 2.7 | 21 | 10.9 | 24 | 5.56 |
| B and L | 4 | 2.7 | 15 | 7.8 | 19 | 4.40 |
| B and D | 4 | 2.7 | 6 | 3.1 | 10 | 2.31 |
| L and D | 2 | 1.3 | 0 | 0.0 | 2 | 0.46 |
| Others | 28 | 18.7 | 5.4 | 28.1 | 82 | 18.98 |
| **Reasons for skipping meals** | | | | | | |
| No time | 77 | 51.3 | 96 | 50.0 | 173 | 40.05 |
| Fasting/religious reasons | 14 | 9.3 | 15 | 7.8 | 29 | 6.71 |
| To control weight | 24 | 16.0 | 21 | 10.9 | 45 | 10.42 |
| Cannot afford it | 13 | 6.7 | 15 | 7.8 | 25 | 9.95 |
| **Time of eating between meals** | | | | | | |
| Between breakfast and lunch | 34 | 22.7 | 60 | 31.3 | 94 | 21.76 |
| Between lunch and dinner | 80 | 53.3 | 102 | 53.1 | 182 | 42.13 |
| Between dinner and breakfast | 10 | 6.7 | 15 | 7.8 | 25 | 4.79 |
| **Reasons for eating between meals** | | | | | | |
| Because others do | 2 | 1.3 | 12 | 6.3 | 14 | 3.24 |
| Formed habits | 80 | 53.3 | 102 | 53.3 | 182 | 42.13 |
| Others | 34 | 22.7 | 60 | 31.3 | 94 | 21.76 |
| **Effect of advertisement on food and reason** | | | | | | |
| Makes one try new foods | 36 | 24.0 | 48 | 25.0 | 84 | 19.44 |
| Makes one eat according to advert | 4 | 2.7 | 12 | 6.3 | 16 | 3.70 |
| Makes one loose interest | 20 | 13.3 | 9 | 4.7 | 29 | 6.71 |
| Others | 10 | 6.7 | 0 | 0.0 | 10 | 2.31 |
| **Reasons for snacking** | | | | | | |
| I like them | 80 | 53.3 | 87 | 45.3 | 167 | 38.66 |
| Make up for skipped meals | 48 | 32.0 | 69 | 35.9 | 117 | 27.08 |
| Increase food intake | 10 | 6.7 | 21 | 10.9 | 31 | 7.18 |
| Grew up with it | 6 | 4.0 | 9 | 4.7 | 15 | 3.47 |
| Others | 4 | 2.7 | 3 | 1.6 | 7 | 2.05 |
| **Favourite snacks consumed** | | | | | | |
| Biscuit | 40 | 26.7 | 51 | 26.6 | 91 | 21.06 |
| Buns | 10 | 6.7 | 15 | 7.8 | 25 | 5.79 |
| Cake | 14 | 9.3 | 17 | 14.1 | 41 | 9.49 |
| Burger | 4 | 2.7 | 12 | 6.3 | 16 | 3.70 |
| Fruits | 26 | 17.3 | 21 | 10.9 | 47 | 10.88 |
| Meat pie | 38 | 25.3 | 27 | 14.1 | 65 | 15.05 |
| Others | 14 | 9.3 | 39 | 20.3 | 53 | 12.27 |
| **Response to smoking and reasons** | | | | | | |
| Mates/peers smoke | 0 | 0.0 | 12 | 6.3 | 12 | 12.78 |
| Makes one feel happy | 10 | 6.7 | 30 | 15.6 | 40 | 9.26 |
| Makes one feel on top of the world | 2 | 1.3 | 0 | 0.0 | 2 | 0.46 |
| To find the effect | 0 | 0.0 | 0 | 0.0 | 0 | 0.00 |
| Others | 6 | 4.0 | 0 | 0.0 | 6 | 1.39 |

**Table 4** Responses to the nutrition knowledge/practice questions.

| S/N | | MOUAU | | ABSU | |
|---|---|---|---|---|---|
| | | % Correct | % Incorrect | % Correct | % Incorrect |
| 1 | Knowledge of the diet that provide adequate amount of nutrients | 80 | 30 | 67 | 33 |
| 2 | Knowledge of what an adequate meal should include | 92 | 8 | 91 | 9 |
| 3 | Knowledge of the necessity of eating fruits and vegetables | 86 | 14 | 87 | 13 |
| 4 | Knowledge of why we eat | 51 | 49 | 55 | 45 |
| 5 | Knowledge of what food contains that helps in growth, live well, keep healthy and be happy | 80 | 20 | 83 | 17 |
| 6 | Knowledge on the best source of energy | 75 | 25 | 77 | 23 |
| 7 | Knowledge on the best nutrient for growth | 80 | 20 | 81 | 19 |
| 8 | Knowledge on the bets way to prepare vegetable | 94 | 6 | 92 | 8 |

that most undergraduates ate foods that are readily available and relatively inexpensive. A study conducted among Lebanese university students indicated that their diet was high in fat and they often select fast food due to its palatability, availability and convenience (Yahia *et al.* 2008).

The food frequency result revealed that almost all the food groups that make for adequate diet were fully represented in the meals of most of the respondents on daily

**Table 5** Body mass index (BMI) classification grade.

| BMI (kg/m$^2$) | MOUAU | | ABSU | | Total | Grade* |
|---|---|---|---|---|---|---|
| | Freq | Freq | % | % | N | (G) |
| <16.00 | 0 | 0.0 | 0 | 0.0 | 0 | G3 thinness |
| 16.00-16.99 | 5 | 3.3 | 4 | 2.1 | 9 | G2 thinness |
| 17.00-18.49 | 10 | 6.7 | 13 | 6.8 | 23 | G1 thinness |
| 18.50-24.99 | 115 | 76.7 | 144 | 75.0 | 259 | Normal |
| 25.00-29.99 | 15 | 15.0 | 29 | 15.1 | 44 | G1 obesity |
| 30.00-39.00 | 5 | 3.3 | 2 | 1.0 | 7 | G2 obesity |
| 40 and above | 0 | 0.0 | 0 | 0.0 | 0 | G3 obesity |

**Source:** Osisanya *et al.* (2003)

**Table 6** Anthropometric characteristics of respondents.

| Anthropometric measurements | MOUAU | | ABSU | |
|---|---|---|---|---|
| | Male (Mean ± SD) | Female (Mean ± SD) | Male (Mean ± SD) | Female (Mean ± SD) |
| Body weight (kg) | 66.8 ± 9.13 | 57.9 ± 5.73 | 64.8 ± 10.5 | 60.2 ± 9.80 |
| Height (m) | 1.74 ± 0.07 | 1.66 ± 0.07 | 1.70 ± 0.09 | 1.65 ± 0.06 |
| Body mass index (kg/m$^2$) | 22.1 ± 2.68 | 21.1 ± 1.71 | 22.4 ± 2.92 | 22.2 ± 3.03 |
| Mid upper arm circumference (cm) | 29.4 ± 2.54 | 26.8 ± 2.20 | 28.9 ± 4.64 | 28.3 ± 4.55 |
| Triceps (mm) | 8.98 ± 4.26 | 17.9 ± 4.82 | 10.6 ± 5.47 | 19.1 ± 5.40 |
| Biceps (mm) | 4.24 ± 1.37 | 8.00 ± 3.03 | 5.12 ± 2.52 | 8.97 ± 3.85 |
| Subscapular (mm) | 10.8 ± 3.12 | 13.9 ± 3.21 | 12.3 ± 4.73 | 14.5 ± 4.49 |
| Suprailiac (mm) | 8.61 ± 6.36 | 13.8 ± 4.82 | 9.28 ± 5.16 | 14.74 ± 5.31 |
| Body fat (kg) | 19.8 ± 2.78 | 17.63 ± 1.81 | 19.3 ± 3.18 | 18.40 ± 0.00 |
| Lean body mass (kg) | 46.9 ± 6.36 | 40.2 ± 3.92 | 45.5 ± 7.32 | 41.9 ± 6.71 |
| Optimum body weight (kg) | 72.3 ± 6.70 | 64.1 ± 6.58 | 68.6 ± 8.84 | 63.0 ± 6.30 |
| Total body water | 34.3 ± 4.64 | 29.4 ± 2.86 | 33.2 ± 5.35 | 30.64 ± 4.90 |
| Arm muscle diameter (mm) | 6.48 ± 1.42 | 2.81 ± 1.15 | 5.81 ± 1.91 | 2.94 ± 1.35 |

**Table 7** Pearson's correlation coefficient showing the relationship between parental socioeconomic status, food habit and nutritional status.

| | Father's occupation | Mother's occupation | Meal skipping | Snacking | BMI |
|---|---|---|---|---|---|
| Father's occupation | 1 | | | | |
| Mother's occupation | 0.526 | 1 | | | |
| Meal skipping | -0.552 | -0.330 | 1 | | |
| Snacking | 0.304 | 0.461 | 0.264 | 1 | |
| BMI | 0.778* | 0.767* | -0.379 | 0.667 | 1 |

* Correlation coefficient significant ($P < 0.05$)

basis. The consumption of fruits and vegetables by the students was very encouraging. This contrasts the reports of Dewolfe and Shannon (1993); Olumakaiye (2010) that some of the young adults are aware of the underlying message that consumption of great variety of fruits and vegetable are among powerful strategies for preventing chronic disease, but ignore the fact. Consumption of fruits and vegetables among adolescents between the ages of 12 and 19 years has been reported to decrease with age. This trend could be as a result of waning parental influences as adolescents get into tertiary institutions or the problem of easy accessibility to these foods on the university campus (AIHW 2007). In another study, Adu *et al*. (2009) reported low consumption of fruits and vegetables. The high consumption of fruits and vegetables reported in the current study could be because from the nutrition knowledge section most respondents were aware that food is made up of different nutrients needed by the body for growth and development (Osisanya *et al.* 2003). This basic nutrition knowledge may have influenced the food habits of the subjects to an extent. However, the estimation of the adequacy of the nutrient intake of these undergraduates was not included in this study. Knowledge of the right thing to do is a step towards a break through. Sethuraman *et al.* (2006) noted that families are well aware of the special needs of their daughters as they evolve from girls into young women, and want to do the best they can to ensure their health and well being (including nutrition). However, prevailing social and cultural norms and economic constraints hinder their ability to do this. The changing lifestyle of an undergraduate has glaring effect on his/her food habit. As he/she becomes more independent and mobile, he eats less meals at home where there is little guidance on his food choice, share more food with peers, learn more food preferences on his food choice and discard old food habits (Olukamaiye *et al.* 2010). The slight difference in the daily consumption of meat and fish could be as a result of the income level of the students since fish is cheaper than meat.

The majority in the normal BMI grade could be as a result of consistent work load/activities these students are exposed to. However, the mean BMI value for females was slightly lower than that of the males. This agrees with the report of Asinobi and Nwankwo (2010) that the mean deviation of the adolescent girls they studied were not within normal growth range. However, this is in contrast to the findings of the International Center for Research on Women (ICRW) in Nepal which reported that body mass indices increased substantially more during the adolescent years for girls (converging towards the 50$^{th}$ percentile of the NCHS reference) than for boys (5$^{th}$ percentile) with substantial increase above 5$^{th}$ percentile after 16 years of age (Kurz 1996).

The weight and height of the males were higher than the females, while the total fat for the females were higher than that of the males. This had been reported by Heald and Gong (1999) that adolescent boys generally build more muscle mass and gain weight at a faster rate, have a larger skeleton and deposit less fat than girls. These could be as a result of the sexual dimorphism between males and females, indicating that the differences in sex hormones could be responsible for fat deposition. Although both adolescent males and females gain significant weight, gender-related differences exist with respect to the rate, quantity, composition and distribution of tissues (Qlan 2011). During adolescence, boys tend to gain more weight at a faster rate and their skeletal growth continues for a longer time than that of the adolescent girls. Girls deposit relatively more total fat; boy deposit more muscle mass. Boys become leaner and paradoxically increase the number of actual adipose tissue cells while decreasing the percentage contribution of fat to

total body mass. Girls have a steep rate of increase in actual fat deposition as well as increased percentage of fat to total body mass with increased lean body mass (Qlan 2011). These difference have a decisive influence on variation in nutritional requirement for both males and females (Onimawo and Cole 2002). However, Adams and Rini (2007) in their study reported that women usually over- eat more than men during times of high stress. Economos (2006) showed that when academic stressors were at a higher level in females, this tended to increase their food consumption. All this may have contributed to the higher total fat reported in this study for the females due to academic stress they are exposed to as students.

Generally MOUAU males were taller and heavier than the ABSU males, MOUAU females were taller than ABSU females. This could be because MOUAU is a federal university with the student's strength covering different parts of the country that may have varying body builds, while ABSU is a state university and most of the students could be from Abia State and surrounding environments.

The correlation between parental socio-economic status and food habits were not significant ($P > 0.05$) (**Table 7**). This could be as a result of formed habits by these students. These habits do not really depend on income level, that is to say, irrespective of their parental occupations and income, these students may prefer snacks to food or even loose appetite as a result of stress or ill health. This could lead to meal skipping (West and Cumines 2006). In a 2010 study, 59% of students polled in a Massachusetts post-secondary institute reported having developed worse eating habits since entering college (Freedman and Connors 2010). Skipping breakfast has been reported to be associated with a high BMI (de Jong *et al.* 2009; Pearson *et al*. 2009; Thompson-Mccormick 2010). Studies that looked on effect of stress on eating habits have shown that the level of the stressor has an impact on the individuals eating habits (Torres and Nowson 2007). Also the correlation between food habits and body mass index (BMI) were not significant ($P > 0.05$) (**Table 7**). This could be as a result of snacking to make up for the skipped meals. The snacks consumed replaced the meals and may have added to the nutrient intake of the students but could not be said to be adequate for the body because of the nutrient composition of these snacks. However, there was significant difference ($P > 0.05$) in the relationship between the parental socioeconomic status and body mass index (BMI). This showed that parental occupation had an effect on BMI. This could be because most of the students get their foodstuff from their homes. Sethuraman *et al.* (2006) had noted this. Also, these students go home during holidays and some during weekends where they may have been given adequate food that may have influenced their body mass index.

## CONCLUSION

The study revealed that majority of these undergraduates was classified in the normal body mass index (BMI) group. The mean BMI for males were higher than the females. Habits involving consumption of fruits and vegetable were found to be encouraging among the subjects. Their nutrition knowledge score was quite high; this had an effect on their food habits to an extent. However, financial inadequacy and probably time constraint if not checked could ultimately affect the nutritional status of these students in future. More research should be carried out to assess the nutrient intake of this age group to determine adequacy of their intake.

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