



Research article

Nutritional status and feeding habits of females in public and private Universities in Osun state, Southwestern, Nigeria

Abiodun Victor Ikujeola^{*}, Titilope Susanna Adekoya

Department of Food Science and Technology (Nutrition Unit), Obafemi Awolowo University, Ile-Ife, Nigeria

ARTICLE INFO

Keywords:

Food science
Nutrition
Body mass index
Food intake
Snacking
Skipping meals
Waist-to-hip ratio
Malnutrition
Anthropometric
Food habits

ABSTRACT

This study examined the dietary habits, nutritional status and socio-demographic characteristics of female undergraduates in selected public and private Universities in Osun State, Southwestern, Nigeria.

The anthropometric assessment of selected respondents consisted measurements of height, weight, body circumferences, body mass index and waist-to-hip ratio of respondents. The food frequency questionnaire technique was adopted to evaluate the feeding/dietary habits using well-constructed questionnaires.

The results showed that over 60% of students in both public and private Universities fell within 18.5–24.9 kg/m², the normal weight range of body mass index according to the World Health Organisation classification. From the waist-to-hip ratio result over 60% were not at risk of non-communicable disease. The respondents were fond of snacking (74.9%) and skipping of meals (86.0%) especially breakfast (52.4%). There was a significant difference ($p < 0.05$) in the allowances (pocket money) of students where 33.7% of private University students received over N16,000 as compared to 12% of public University students. There was no significant difference ($p > 0.05$) between the nutritional status of students in public and private Universities.

In conclusion, the nutritional status and the dietary habits/pattern of female undergraduate students are influenced by type of schools and other underlying factors.

1. Introduction

According to World Health Organization about 80% of health issues, like cardiovascular diseases, overweight, obesity, diabetes and cancer are frequently detected and found to have significant influence on human health status. The burden of these chronic diseases is as a result of lifestyle and dietary factors (Perlstein et al., 2016). Thus, it is important to improve dietary intake and life style by taking food containing right nutrients and nutritionally healthy diets to checkmate several adverse medical conditions (Edwards et al., 2010). The lifestyle of students change in several ways after securing admission to higher institutions. The eating pattern is not exempted. Some of the major reasons for this may be connected to the new challenges of life, the freedom to do whatever appeals to them including eating and new experience of living alone for the first time. The set of people gaining admission into higher institutions are adolescent or young adults. Young people are usually inclined to adopt unhealthy dietary habits. Poor feeding habits, such as skipping of meal especially breakfast, low intake of fruits and vegetables, milk, fish and high intake of fast food, sweets, and sugar-sweetened beverages are present in the diets of University students (El Ansari

et al., 2012; Musaiger et al., 2017). Olumakaiye et al. (2010a) and Rodrigues et al. (2017) reported challenging eating habits like skipping of meals (especially breakfast) which leads to higher level of snacking among undergraduates. Qlan (2011) reported that as a result of time constraints, most students may habitually neglect entire meals during the day, and as such resort to late-night binge eating. Some feeding patterns which include meal skipping, snacking (usually on energy dense foods), lopsided and wide use of fast foods appear quite common among young people. Some of these issues have been linked with overweight, obesity and other medical conditions (Thompson-McCormick et al., 2010), which according to West and Cumines (2006) may result from consumption below or above recommended dietary intake.

A girl child is more susceptible to the negative effect of new changes especially as it affect what to cook and eat. Girls are very careful about their stature and look; this group engage in binge eating and anorexia nervosa. At times, some of the girls are weary of cooking and prefer eating snacks a trend that may have adverse effect on their health and wellbeing; and by extension their academic performance. There are various studies (Gower et al., 2008; Olumakaiye et al., 2010b; Qlan, 2011; Likus et al., 2013) on the feeding pattern and nutritional status of

^{*} Corresponding author.

E-mail address: avjenlola@gmail.com (A.V. Ikujeola).

different categories of the population, however, there are scanty information on the comparative study on the differences in the eating patterns and nutritional status of female undergraduates in private and public Universities in Osun state, Southwestern Nigeria. Good knowledge, practices and attitudes regarding diet, lifestyle and weight management must be understood by all stakeholders in the higher institutions. A study that assesses body weight status, eating practices, allowances, socio-demographic status, physical activity levels and the lifestyle habits of undergraduate students will be of advantage. Therefore, the focus of the study is to investigate the feeding pattern/habits and nutritional status of female undergraduates from both private and public Universities in Osun state, Southwestern Nigeria.

2. Materials and methodology

2.1. Study population and inclusion criteria

The study was designed and carried out by focusing private and public female students in Universities domicile in Osun state, Southwestern, Nigeria. The study was carried out in four selected Universities situated in Osun State, Southwestern, Nigeria. These Universities comprised of two public Universities (Obafemi Awolowo University, Ile-Ife and Osun State University, Osogbo campus) and two private Universities (Oduduwa University, Ipetumodu and Redeemers' University, Ede). Participation in the study was made voluntary, anonymous and confidential. Fifty (50) respondents (female undergraduates) were selected from each participating University using convenient simple random sampling procedure. A total of 200 respondents were selected based on the set criteria.

2.2. Approval and ethics regulation

A letter seeking the approval and consent of the respondents was written through the Head, Department of Food Science and Technology, through the Directorate of Students Affairs and sent with the team of interviewers/examiners to various Universities where the exercise was carried out. The protocol and the instruments used were approved by the Department of Food Science and Technology, Obafemi Awolowo University, Ile-Ife Research Committee in line with the approved ethics of the Institutional Research Committee.

The respondents gave their consent and confirmed their readiness to participate before taken part in the exercise.

2.3. Data collection method

A questionnaire that was well-structured, pretested and validated was used to collect general information on feeding habits and socio-economic status of subjects. The anthropometric assessment involved the measurements of physical parts of the body such as height, weight, body circumferences (waist, hips, mid arm circumference) while the Food Frequency Questionnaire was used for dietary assessment examining the habitual food intake of subjects in the past one week (Horiuchi et al., 2019).

2.4. Pretesting of questionnaires

The pretesting of questionnaire was carried out to ascertain that all unnecessary/ambiguous issues/questions were excluded. Twenty (20) students from Obafemi Awolowo University, Ile-Ife were selected for the exercise, the choice was based on convenience. One of the things noted was the time taken for filling of questionnaire and anthropometric measurements. The questionnaire was prepared in English language (Haq et al. (2018)).

2.5. Socio-demographic characteristics

The information on socio-demographic characteristics of subjects/respondents such as age, parents' occupation, feeding allowance, family type, parents' educational level, etc. were obtained through well-structured questionnaire.

2.6. Measurement of weight and height

Measurement of body weight was carried out using a pretested scale to the nearest 0.5 kg. This was done with minimal clothing on. The subject/respondent's height was measured using a stadiometer (floor type model Z-T/60 stadiometer, UK). The subject/respondent for height measurement was made to stand erect on bare feet (without shoes) and heels put together, heels, buttocks, and back of head touching the upright rod and height read to the nearest 0.1m according to standard methods (Ambrosini et al., 2009; Horiuchi et al., 2019).

2.7. Determination of body mass index

Body mass index (BMI) was calculated as measured weight (kg) divided by measured height² (m²). BMI is used as marker for nutritional status. BMI less than 18.5 kg/m² is defined as underweight, normal weight is defined as BMI ranging from 18.5 to 24.9 kg/m², BMI value of 25.0–29.9 kg/m² defines overweight, while obesity is defined as BMI of 30.0 kg/m² and above according to WHO classification (Omage and Omuemu, 2018).

2.8. Determination of body circumferences

The mid upper arm circumference of the left arm of each respondent was measured to the nearest tenth of a centimeter using a tape rule. The middle of the upper arm was measured while hanging relaxed at the side of the body. The waist and the hip circumferences were also measured using a tape rule. To measure the waist circumference of each respondent, tape was placed around bare abdomen just above the hip bone. It was ensured that the tape was snug, but not compressed or squeezed on skin and is parallel to the floor (Bruce, 2001). The waist to hip ratio was taken as the proportion of waist to hip measurements.

2.9. Methods for dietary and physical activities assessment

A Food Frequency Questionnaire (FFQ) was used to obtain the diet history of respondents using foods that are usually consumed by citizens of Nigeria. The FFQ contains data of foods consumed by the respondents daily and weekly. Eating practices of University students was also included in the questionnaire. It was modified from the combination of validated questionnaires. The questionnaire considered the frequency of fast food intake, food and drink consumption, fruits and vegetables, meal pattern, snacking habits and so forth. The involvement of respondents on physical activities and their previous day physical activities recall were also inquired from respondents by asking some questions to elicit the required information (e.g type of exercise, duration and frequency of exercise, etc.) (FAO/WHO, 2003; Sedodo et al., 2014).

2.10. Data analysis

Data was analyzed by statistical package for social sciences (Version 20; SPSS Inc., Chicago, IL, USA) (Arkkelin, 2014). Quantitative variables were presented as mean and standard deviation. Qualitative variables were presented as frequency and percentages. Parametric variables were compared between the studied groups using independent sample T-test. Cross-tabulations were performed to compare the responses of the students by school sector. Chi-square tests were used to evaluate the statistical significance of the cross tabulation comparisons. Significance level used was 0.05.

3. Results

3.1. Socio-demographic attributes/characteristics of the respondents

Table 1 shows the socio-demographic data of the students. More than half (63.5%) of the total population was in the age group of fifteen to twenty years (15–20) of age.

There was no significant difference ($p > 0.05$) in the level of literacy of parents from the two educational systems. About 53.8% of mothers and 78.3% of fathers (parents of private school students) compared to 23.6% of mothers and 57.1% of fathers (parents of the public school students) had higher educational certificates. The study also showed that only 39.6% of the mothers of the students in private school were housewives compared to 70.9% of mothers of the public school students. Majority (over 80%) of the female students came from nuclear family. There was significant difference ($p < 0.05$) between the type of families.

A little below average (42.0%) of the female undergraduates from public University received allowances within the range of N1, 000 to N5, 000. Private University students (33.7%) received allowances above N16, 000 compared to 12% of the public University students. There was a significant difference ($p < 0.05$) in the allowances received by the students.

3.2. Weekly food consumption of respondents

Table 2 shows the frequency of food consumption among the female undergraduates in both private and public Universities. Categorizing the

food group into plant origin (vegetable, fruit, fat and cereals (carbohydrates)), beans and animal origin (meat, dairy, egg). It was observed that the consumption rate of the respondents was very low in terms daily consumption of vegetables and fruits where the highest consumption of vegetables and fruits was two times a week; with 28.1% and 28.6% respectively. Private University students recorded higher rate of no intake of vegetables (20.2%) and fruits (23.2%) as compared to public University students 11.0% and 10.0% respectively.

The study showed a significant difference ($p < 0.05$) in the consumption of dairy and meat intake between the two groups. Private University students who consumed no dairy accounted for 23.2% as compared to 17.9% of public University students and the difference was significant ($p < 0.05$). The consumption of dairy was generally low among students where 28.6% of the total population consumed dairy more than three times. From the results, private University students (33.0%) eat meat more often than students (28.0%) from public University. Consumption of fish was generally low (28.1%). About 35.7% of the respondents consumed more than three eggs in a week. A higher proportion (>70%) of the respondents took water regularly. However, more than half of the whole population consumed soft drinks (76.4%) and little proportion consumed yoghurt (5.5%) or fruit juice (14.6%).

3.3. Dietary habits of the studied sample

Table 3 shows that most students (54.5%) in this study took just two meals per day (67.0% of private University students and 42.0% of public University students) meanwhile about 41.0% of public University

Table 1. Socio-demographic attributes/characteristics of the respondents from public and private universities in Osun state, Southwestern, Nigeria in 2018.

Variable	Type of School				Total No (%)	P value
	Private school		Public school			
	No	%	No	%		
Age range						
15–20	64	64.0	63	63.0	127 (63.5)	0.126
21–25	36	36.0	33	33.0	69 (34.5)	
>25	0	0.0	4	4.0	4 (2.0)	
Educational background of father						
Literate	97	97.0	95	95.0	192 (96.0)	0.470
Illiterate	3	3.0	5	5.0	8 (4.0)	
Educational background of mother						
Literate	98	98.0	94	94.0	192 (96.0)	0.149
Illiterate	2	2.0	6	6.0	8 (4.0)	
Father's occupation						
Government worker	42	44.2	55	55.0	97 (49.7)	0.321
Private worker	34	35.8	24	24.0	58 (29.7)	
Artisan	12	12.6	14	14.0	26 (13.3)	
None	7	7.4	7	7.0	14 (7.2)	
Mother's occupation						
Government worker	48	51.1	54	54.0	102 (52.6)	0.327
Private worker	15	16.0	12	12.0	27 (13.9)	
Artisan	21	22.3	29	29.0	50 (25.8)	
None	10	10.6	5	5.0	15 (7.7)	
Allowance (N)						
1000–5000	22	22.4	42	42.0	64 (32.3)	0.001*
6000–10000	32	32.7	32	32.0	64 (32.3)	
11000–15000	11	11.2	14	14.0	25 (12.6)	
16000 and above	33	33.7	12	12.0	45 (22.7)	
Family type						
Nuclear	93	93.0	80	80.0	173 (86.5)	0.007*
Polygamous	7	7.0	20	20.0	27 (13.5)	

* $p < 0.05$, statistically significant.

Table 2. Distribution of the studied samples according to their weekly food consumption from public and private Universities in Osun state, Southwestern, Nigeria in 2018.

Variable	Type of School				Total No (%)	P value
	Private school		Public school			
	No	%	No	%		
Vegetables/week						
One time	20	20.2	22	22.0	42 (21.1)	0.348
Two times	24	24.2	32	32.0	56 (28.1)	
More than three times	26	26.3	23	23.0	49 (24.6)	
More than six times	9	9.1	12	12.0	21 (10.6)	
None	20	20.2	11	11.0	31 (15.6)	
Fruits/week						
One time	32	32.3	19	19.0	51 (25.6)	0.002*
Two times	23	23.2	34	34.0	57 (28.6)	
More than three times	20	20.2	31	31.0	51 (25.6)	
More than six times	1	1.0	6	6.0	7 (3.5)	
None	23	23.2	10	10.0	33 (16.6)	
Carbohydrates/week						
One time	2	2.1	6	6.0	8 (4.1)	0.036*
Two times	6	6.2	13	13.0	19 (9.6)	
More than three times	30	30.9	39	39.0	69 (35.0)	
More than six times	59	60.8	42	42.0	101 (51.3)	
None	0	0	0	0	0 (0.0)	
Fat/oil/week						
One time	8	8.2	8	8.0	16 (8.1)	0.013*
Two times	18	18.6	24	24.0	42 (21.3)	
More than three times	27	27.8	40	40.0	67 (34.0)	
More than six times	30	30.9	26	26.0	56 (28.4)	
None	14	14.4	2	2.0	16 (8.1)	
Beans/week						
One time	18	18.2	29	29.0	47 (23.6)	0.032*
Two times	20	20.2	29	29.0	49 (24.6)	
More than three times	6	6.1	9	9.0	15 (7.5)	
More than six times	2	2.0	2	2.0	4 (2.0)	
None	53	53.5	31	31.0	84 (42.2)	
Water intake						
1 cup	6	6.2	4	4.0	10 (5.1)	0.003*
1-3 cups	50	51.5	32	32.0	82 (41.6)	
4-6 cups	34	35.1	40	40.0	74 (37.6)	
7cups or more	7	7.2	24	24.0	31 (15.7)	
Drinks apart from water						
Fruit juice	15	15.2	14	14.0	29 (14.6)	0.466
Soft drinks	78	78.8	74	74.0	152 (76.4)	
Hot drinks	3	3.0	4	4.0	7 (3.5)	
Yoghurt	3	3.0	8	8.0	11 (5.5)	
Dairy/week						
One time	11	11.1	14	14.0	25 (12.6)	0.006*
Two times	23	23.2	34	34.0	57 (28.6)	
More than three times	26	26.3	31	31.0	57 (28.6)	
More than six times	16	16.2	16	16.0	32 (16.1)	
None	23	23.2	5	5.0	28 (14.1)	
Meat/week						
One time	8	8.1	19	19.0	27 (13.6)	0.008*
Two times	16	16.2	17	17.0	33 (16.6)	
More than three times	33	33.3	28	28.0	61 (30.7)	
More than six times	29	29.3	13	13.0	42 (21.1)	
None	13	13.1	23	23.0	36 (18.1)	
Type of meat taken						
Red meat (beef)	58	58.6	39	40.2	97 (49.5)	0.008*
White meat (chicken)	14	14.1	30	30.9	44 (22.4)	
Fish	27	27.3	28	28.9	55 (28.1)	

(continued on next page)

Table 2 (continued)

Variable	Type of School				Total No (%)	P value
	Private school		Public school			
	No	%	No	%		
Eggs/week						
One time	18	18.2	8	8.0	26 (13.1)	0.227
Two times	31	31.3	29	29.0	60 (30.2)	
More than three times	32	32.3	39	39.0	71 (35.7)	
More than six times	7	7.1	11	11.0	18 (9.0)	
None	11	11.1	13	13.0	24 (12.1)	

*p < 0.05, statistically significant.

students had three meals per day as compared to 25.0% of private University students.

Of the whole population, more than half (86.0%) of the female students skipped meals particularly breakfast (52.4%). However, there was a significant difference ($p < 0.05$) between skipping of meals in the two groups. Most students (74.9%) engaged in snacking between meals and took at least one snack per day (46.1%). However, there was a significant difference ($p < 0.05$) in the frequency of snacking between students in private and public Universities.

About 83.8% of private University students had snacks between their meals as compared to 66.0% of public University students which may be due to the fact that private University students receive higher allowances. A significant difference ($p < 0.05$) was observed in the type of food consumed by the two groups; public University students (87.0%) consumed homemade food mostly as compared to private University students (59.0%) while 20.0% of private University students consumed fast food as compared to 13.0% of public University students.

A significant difference ($p < 0.05$) was also observed in the number of students who cook; students who do not cook were more amongst the private University students (49.0%) as compared to public University students (3.0%) who made their meals themselves. Also private University students bought food from school canteen or cafeteria more often (78.8%) as compared to 31.0% of public University students and these differences were also significant ($p < 0.05$). A large proportion (97.0%) of the whole population did not smoke and 90.5% do not take alcohol.

3.4. Physical activity and lifestyle

The study showed that 47.5% of the students engaged in regular exercises. Table 4 shows that there was a significant difference ($p < 0.05$) in the levels of physical activities between the two institutions. Most of the public University students (56.0%) performed other activities such as jogging, swimming, etc. as compared to 39.0% of private University students.

A significant difference ($p < 0.05$) was observed in the influence of reading on food choices between the two groups; reading had a strong and important influence in the choice of food of private University students (53.0%) unlike in public University students (35.0%). There was no significant difference ($p > 0.05$) in the perception of female undergraduates about their figure/stature. More than half (73.0%) of the whole population thought they were at about the right weight which was impressive. Most of the female students (83.0%) go to bed late and get up early (81.5%) indicating that they do not get enough sleep.

3.5. Anthropometric measurements

The mean body mass index (BMI) (Table 5) of private University students was $22.20 \pm 3.49 \text{ kg/m}^2$ while that of public University was $21.87 \pm 4.15 \text{ kg/m}^2$ and there was no significant difference ($p > 0.05$) between the groups. Over 60% of the respondents were within the normal range of BMI, 16% were overweight and 4% were obese in the private institution while the record in the public institution was not

significantly different ($p > 0.05$) (Table 5). The average mid-arm circumference (MAC) (Table 5) was $26.38 \pm 3.25 \text{ cm}$ for private University students and $26.65 \pm 3.87 \text{ cm}$ for public University students. Over 60% had a normal MAC, 12 and 10% of the respondents were overweight and obese respectively for public institution. While the average waist-to-hip ratio (Table 5) for private University and public University were 0.77 ± 0.45 and 0.78 ± 0.46 respectively.

4. Discussion

The age of female undergraduate students range between 17-27 years in both educational sectors. This is similar to the findings of Omage and Omuemu (2018) where the largest proportion (41.0%) of the studied population belonged to the 19–21 years age group and the lowest proportion (4.5%) belonged to the students in the age group of >28 years age group. Moreover, study by Al-Shehri et al. (2017) revealed that above 50% of undergraduate students are within the ages of 21 and 23 years while less than 35% fell within 17 and 20 years age group. This trend may be attributed to the fact that most graduates from secondary school seek admission to University shortly after their graduation. University students (undergraduates), within the age range of 17–30 years constitute a large proportion of the total population in every country.

In the Southwestern, Nigeria where the Universities are located there is general awareness about education and high value is placed on education. Most of the parents from both sectors were well informed about education. Most of them are literate having more than secondary school certificate. According to similar study by Omage and Omuemu (2018) above 70% respondents' mothers had tertiary level of education and less than 3% had no formal education. An average parent has a target of University education for their wards/children either at private or public school.

The nature of employment/job of parents is a function of educational background and knowledge/skills acquired. This is inconsistent with results of a survey carried out by Amirat et al. (2013) where a significant difference ($p < 0.05$) was observed between parents of students from public and private schools. Amongst the respondents' parents less than 10% were not gainfully employed. Source of good income is necessary for financing education of a girl child at higher institution in Nigeria because of high cost of living.

Polygamous homes indicate larger family sizes which may be the reason for smaller allowances among the undergraduates from public institution. Bigger family size is an indication of more commitment, may be one of the reasons why students from polygamous homes attend public Universities where expenses are likely to be minimised. This agrees with the reports of the findings by Amirat et al. (2013) where large family sizes indicated low income earners among parents of children in public schools.

The allowances given to female students was higher as observed amongst the private students. This is expected because most of their needs are made compulsory to be bought in school, unlike in the public institutions where students may be at liberty to bring some of the items from home or improvised as the case may be. The available fund also

Table 3. Distribution of the studied samples according to their dietary habits from public and private Universities in Osun state, Southwestern, Nigeria in 2018.

Variable	Type of School				Total No (%)	P value
	Private school		Public school			
	No	%	No	%		
No of meals per day						
One	7	7.0	9	9.0	16 (8.0)	0.002*
Two	67	67.0	42	42.0	109 (54.5)	
Three	25	25.0	41	41.0	66 (33.0)	
More than three	1	1.0	8	8.0	9 (4.5)	
Do you skip any meal?						
Yes	94	94.0	78	78.0	172 (86.0)	0.001*
No	6	6.0	22	22.0	28 (14.0)	
Meal skipped						
Breakfast	58	59.2	41	45.1	99 (52.4)	0.106
Lunch	35	35.7	42	46.2	77 (40.7)	
Dinner	4	4.1	3	3.3	7 (3.7)	
None	1	1.0	5	5.5	6 (3.2)	
Breakfast before going for lectures						
Yes	39	39.4	53	53.0	92 (46.2)	0.054
No	60	60.6	47	47.0	107 (53.8)	
Snacks between meals						
Yes	83	83.8	66	66.0	149 (74.9)	0.004*
No	16	16.2	34	34.0	50 (25.1)	
No of snacks per day						
One snack	44	52.4	26	38.2	70 (46.1)	0.156
Two snacks	30	35.7	33	48.5	63 (41.4)	
Three snacks	6	7.1	8	11.8	14 (9.2)	
More than three snacks	4	4.8	1	1.5	5 (3.3)	
Type of food mostly taken						
Homemade food	59	59.0	87	87.0	146 (73.0)	0.000*
Fast food	20	20.0	13	13.0	33 (16.5)	
Food made outside home	21	21.0	0	0.0	21 (10.5)	
Do you cook?						
Yes	51	51.0	97	97.0	148 (74.0)	0.000*
No	49	49.0	3	3.0	52 (26.0)	
Do you buy food from school cafeteria?						
Yes	78	78.8	31	31.0	109 (54.8)	0.000*
No	21	21.2	69	69.0	90 (45.2)	
Do you smoke?						
Yes	4	4.0	2	2.0	6 (3.0)	0.407
No	96	96.0	98	98.0	194 (97.0)	
Alcohol intake						
Yes	12	12.0	7	7.0	19 (9.5)	0.228
No	88	88.0	93	93.0	181 (90.5)	

*p < 0.05, statistically significant.

influence or determine the feeding intake of the students, the more the money the better the choice of food. This is in line with the studies of [Adegun \(2013\)](#) and [Omaga and Omuemu \(2018\)](#), which concluded income and educational background of the parents significantly influence nutritional status of their wards.

Legumes, fruit and vegetables are good sources of soluble fibre, micronutrients, variety of phytochemicals which can act as scavenger of free radicals, improving the performance of the liver detoxification enzyme systems and subduing cancer cell initiation and/or proliferation thereby protecting against cardiovascular disease (CVD), type 2 diabetes and cancer which are non-communicable diseases (NCDs) ([World cancer research, 2007](#); [Van den Berg et al., 2013](#)). According to the report of [Al-Riyami and Afifi \(2003\)](#), the typical University student diet is low in fruits and vegetables but high in fat. Respondents of this study complained of defecation on eating fruits and vegetables. This may indicate

that the respondents cannot properly digest fruit and vegetable and as such it causes excessive defecation which may indicate health risk. The higher rate of intake of fruits and vegetables by public University students may be because most public University students prepare their meals and they have free or cheap access to fruits and vegetables.

The problem of lactose intolerance may account for the reduced level of consumption of dairy products by University students another factor may be cost of dairy products. This result is similar to studies by [Krzych \(2004\)](#) and [Likus et al. \(2013\)](#) who reported decline in consumption of milk and dairy products among University students.

The trend in meat consumption may be associated with the high allowances given to students in private Universities. More consumption of fish rather than red meat is advisable to undergraduate students as fish is endorsed as a part of a healthy diet ([Piepoli et al., 2016](#)) and is considered to be a key component of a cardio-protective diet ([Mozaffarian et al.,](#)

Table 4. Distribution of the respondents according to their physical activity and lifestyle from public and private Universities in Osun state, Southwestern, Nigeria in 2018.

Variable	Type of School				Total No (%)	P value
	Private school		Public school			
	No	%	No	%		
Do you perform other activities e.g. jogging, swimming etc.?						
Yes	39	39.0	56	56.0	95 (47.5)	0.016*
No	61	61.0	44	44.0	105 (52.5)	
How often do you perform these activities?						
Less than 1 h	19	47.5	29	49.2	48 (48.5)	0.321
1–3 h	19	47.5	21	35.6	40 (40.4)	
3–6 h	1	2.5	7	11.9	8 (8.1)	
More than 6 h	1	2.5	2	3.4	3 (3.0)	
Walking to lecture halls						
Not often	18	18.0	47	47.5	65 (32.7)	0.000*
Often	48	48.0	35	35.4	83 (41.7)	
Always	34	34.0	17	17.2	51 (25.6)	
Hours spent on reading						
Less than 1 h/day	9	9.7	4	4.5	13 (7.2)	0.404
1–2 h/day	32	34.4	33	37.5	65 (35.9)	
More than 2 h/day	52	55.9	51	58.0	103 (56.9)	
Influence of reading on food choice						
Strong and important influence	53	53.0	35	35.0	88 (44.0)	0.027*
Average influence	33	33.0	50	50.0	83 (41.5)	
No influence	14	14.0	15	15.0	29 (14.5)	
Perception about figure						
Too fat	12	12.0	12	12.0	24 (12.0)	0.923
Too thin	16	16.0	14	14.0	30 (15.0)	
About the right weight	72	72.0	74	74.0	146 (73.0)	
Do you go to bed early?						
Yes	13	13.0	21	21.0	34 (17.0)	0.132
No	87	87.0	79	79	166 (83.0)	
Do you normally get up early?						
Yes	82	82.0	81	81.0	163 (81.5)	0.856
No	18	18.0	19	19.0	37 (18.5)	

*p < 0.05, statistically significant.

Table 5. Body mass index (BMI), Mid Arm Circumference (MAC) and waist to hip ratio of respondents from public and private Universities in Osun state, Southwestern, Nigeria in 2018.

Body Mass Index (BMI)						
School sectors [no of respondents]	Underweight n [%]	Normal n [%]	Overweight n [%]	Obese n [%]	Total n [%]	P Value
Private [100]	13 [13]	67 [67]	16 [16]	4 [4]	100 [100]	0.565
Public [100]	17 [17]	68 [68]	10 [10]	5 [5]	100 [100]	
Total [200]	30 [15]	135 [67.5]	26 [13]	9 [4.5]	200 [100]	
Mid Arm Circumference (MAC)						
School sectors [no of respondents]	Underweight n[%]	Normal n[%]	Overweight n[%]	Obese n[%]	Total n[%]	P Value
Private [100]	17 [17]	67 [67]	6 [6]	10 [10]	100 [100]	0.527
Public [100]	16 [16]	62 [62]	12 [12]	10 [10]	100 [100]	
Total [200]	33 [16.5]	129 [64.5]	18 [9]	20 [10]	200 [100]	
Waist to hip ratio						
School sectors [no of respondents]	Excellent n [%]	Good n [%]	Average n [%]	At risk n [%]	Total n [%]	P Value
Private [100]	32 [32]	52 [52]	11 [11]	5 [5]	100 [100]	0.108
Public [100]	21 [21]	53 [53]	22 [22]	4 [4]	100 [100]	
Total [200]	53 [26.5]	105 [52.5]	33 [16.5]	9 [4.5]	200 [100]	

*p < 0.05, statistically significant.

2011). The major staples in Nigeria are very high in carbohydrates. Most of the students were brought up with some of the local staples. However, other studies by Trafalska and Grzbowski (2003) and Likus et al. (2013) reported a low consumption of carbohydrates among University students. The high rate of carbohydrate consumption among students in this study may be due to prevalence of cereal grains and tubers in the country.

Food habits are otherwise known as dietary habits which are the food choices preferred by individuals in their daily life. It is formed based on certain factors such as finance, availability of foodstuff, health status, nutrition education, time available to cook, seasonality of food, etc. which determines the number of times one eats. Students are often burdened with academic rigors which may keep them from food. This observation is similar to the outcomes of a study carried out by Achinihu (2009) among University students in South-Eastern states of Nigeria. In terms of feeding pattern/habits, University students usually do not follow healthy feeding habits (Al-Riyami and Afifi, 2003).

Skipping of meals is a prevalent practice among undergraduates (Hayda and Maria, 2007; Moy et al., 2009; Kurubaran et al., 2012; Juan et al., 2013). The reason why students skip meal can be caused by psychological and socioeconomic differences related to University life. Although breakfast (the first meal of the day) is very important for the health and well-being of the body, students may not be able to take it, as they are always in a hurry to go for their classes/lectures. More than half the population (53.8%) did not take breakfast before going for lectures. The report of Cayres et al. (2018) showed that adolescents who regularly eat breakfast presented lower body fatness free of physical activity, whereas trunk fatness decreased in adolescents who improved physical activity.

The student style of living encourages snacking in between meals. Some students engage in this act due to laziness, lack of cooking facilities, academic engagements, etc. A high rate of snacking such as in the studied sample has also been found among undergraduates in similar studies by Doaa and Amany (2017), possibly to enable them cope with the calories needs of the body as they go about their normal academic rigors. In females, the issue of figure is a serious one and this prompt them to skip meal so that they will not unnecessarily add weight. Both categories of students engaged in snacking and skipping of meals. There was no significant difference ($p > 0.05$).

Previous studies had established the link between enhanced physical activity and lowering the risk of obesity among University students (Gomez et al., 2012). Undergraduate students are youths, dynamic and active. This account for their drive to engage in one physical activity or the other. Most of them, due to the proximity of lecture halls to their hostels/hall of residence in the different school sectors, trek to lecture rooms and laboratories. In private schools, the lecture halls are closer unlike in public schools where places of residence and lecture halls are far apart. Some institutions create avenue for recreation and physical fitness to enhance physical activity.

For individuals' well-being sleep is very important. Many people do not have adequate/enough sleep, and many experience sleeplessness. In most cases, adults that are healthy require an average of 8 h of sleep every night (Al-Shehri et al., 2017). Undergraduates may not have enough sleep due to health condition/issue or academic assignments.

The BMI is used to identify the wellness of populace with respect to their nutritional status. The classifications of BMI according to WHO as reported Onage and Omuemu (2018) are BMI less than 18.5 kg/m^2 is classified as underweight, normal weight is defined as BMI of $18.5\text{--}24.9 \text{ kg/m}^2$, when BMI exceeds 25 kg/m^2 , the individual is said to be overweight, while BMI of 30.0 kg/m^2 and above poses health risks and is classified as obesity. Imbalance eating pattern and lack of adequate exercise can account for underweight or overweight. That the results showed over 60% of the respondents to be within the normal weight is an indication that the students despite all odds are still healthy. The mid arm circumference (MAC) follow similar trend as BMI. However, there were some of the respondents who were at both extremes - underweight and overweight. The observation may be as result of economic hardship

which may accounts for imbalance/inadequate intake of food. There was no significant difference ($p > 0.05$) between these groups. Yahia et al. (2016) showed in the study carried out among students in Central Michigan University, USA that most female undergraduates have healthy weight.

Different measures that reflect abdominal adiposity, such as waist-hip ratio (WHR), waist circumference and waist-height ratio, have been advocated as being superior to BMI in predicting CVD risk (WHO, 2011). In females, WHR of <0.71 , $0.71\text{--}0.77$, $0.78\text{--}0.82$, >0.82 are regarded as low, moderate, high and very high risk respectively for age range between 20 and 29 years. A high WHR that is classic apple shape (larger waist) is linked with a greater risk of health problems such as certain non-communicable disease. Most of the female undergraduates in this study were within the age range. Most of them are not at risk of non-communicable diseases (NCDs). However, about 5% need to watch their diets and may have to engage in regular exercises to avoid or reduce health risk (WHO, 2011; Zhang et al., 2017).

5. Conclusion

The study concluded that the dietary pattern/habits and the nutritional status of female undergraduate students are influenced by type of school and other underlying factors. Most of the students engaged in snacking and skipping of meal especially breakfast. Students in private Universities receives more allowances than their counterparts in public schools. Over half of the respondents were within the normal weight and not at risk of non-communicable disease. School feeding and nutrition education should address the specific needs of underweight, overweight and obesity among the students.

Declarations

Author contribution statement

Abiodun V. Ikujenlola: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Titilope S. Adekoya: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgements

The authors are grateful to the Department of Food Science and Technology, Obafemi Awolowo University, Ile-Ife for providing the facilities for the survey programme. Also all participating institutions and the respondents are appreciated for their contributions to the success of the study.

References

- Achinihu, G., 2009. Nutritional status of university students in south eastern state of Nigeria. *J. Res. Nat. Dev.* 7, 2.

- Adegun, O.A., 2013. Practices of child labour among parents in Ekiti state, Nigeria. *J. Educ. Pract. USA* 4 (14), 1–6. Food habits.
- Al-Riyami, A.A., Afifi, M.M., 2003. Prevalence and correlates of obesity and central obesity among Omani adults. *Publ. Med. J.* 24 (6), 641–645.
- Al-Shehri, H.M., Al-Qahtani, A.M., Shaikh, I.A., Hassan, M.A., Al-Qahtani, N.S., Al-Qahtani, A.M., Alzahr, A.M., Alabas, M.A., 2017. Assessment of lifestyle and eating habits among undergraduate students in Najran University, Najran, Saudi Arabia. *Int. J. Med. Sci. Publ. Health* 6 (3), 638–646.
- Ambrosini, G.L., Oddy, W.H., Robinson, M., O'Sullivan, T.A., Hands, B.P., de Klerk, N.H., 2009. Adolescent dietary patterns are associated with lifestyle and family psychosocial factors. *Publ. Health Nutr.* 12, 1807–1815.
- Amirat, A.E., Hanan, M.M., Yousria, E.H., 2013. Comparative study of nutritional status and dietary habits of children from public and private primary schools in Zagazig city, Egypt. *J. Nurs. Health Sci.* 3 (1), 47–52.
- Arkkelin, D., 2014. *Using SPSS to Understand Research and Data Analysis. Psychology Curricular Materials. Book 1.* http://scholar.valpo.edu/psych_oer/1.
- Bruce, C., 2001. *Anthropometric indicators measurement guide. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington DC.*
- Cayres, S.U., Urban, J.B., Fernandes, R.A., 2018. Physical activity and skipping breakfast have independent effects on body fatness among adolescents. *J. Pediatr. Gastroenterol. Nutr.* 67 (5), 666–670, 2018 Nov.
- Doaa, M.G., Amany, A.S., 2017. Obesity and eating habits among university students in Alexandria, Egypt: a cross sectional study. *World J. Nutr. Health* 5, 3.
- Edwards, J.S., Hartwell, H.L., Brown, L., 2010. Changes in food neophobia and dietary habits of international students. *J. Hum. Nutr. Diet* 23, 301–311.
- El Ansari, W., Stock, C., Mikolajczyk, R.T., 2012. Relationships between food consumption and living arrangements among university students in four European countries—a cross-sectional study. *Nutr. J.* 11, 28.
- FAO/WHO, 2003. *Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint FAO/WHO Expert Consultation. WHO Technical Report Series No. 916. FAO/WHO, Geneva.*
- Gomez, M.C., Romaguera-Bosch, D., Tauler-Riera, P., Bannasar-Veny, M., Pericas Beltran, J., Martinez-Andreu, S., 2012. Clustering of lifestyle factors in Spanish university students: the relationship between smoking, alcohol consumption, physical activity and diet quality. *Publ. Health Nutr.* 15 (11), 2131–2139.
- Gower, B.H., Hand, C.E., Crooks, Z.K., 2008. The relationship between stress and eating in college aged students. *Undergr. Res. J. Hum. Sci.* 1–9. Resources Huntington University.
- Haq, I., Zahula, M., Li, Min, Huang, Xiaojia, Jiang, Pan, Zeb, Falak, Wu, Xiaoyue, Feng, Qing, Zhou, Ming, 2018. A comparative study of nutritional status, knowledge attitude and practices (KAP) and dietary intake between international and Chinese students in Nanjing, China. *Int. J. Environ. Res. Publ. Health* 15 (9), 1910.
- Hayda, J.A., Maria, C.F., 2007. Food behavior in student residence halls: a setting for health promotion. *Rev. Saude Publica* 41 (2).
- Horiuchi, Y., Kusama, K., Sar, K., Yoshiike, N., 2019. Development and validation of a food frequency questionnaire (FFQ) for assessing dietary macronutrients and calcium intake in Cambodian school-aged children. *Nutr. J.* 18, 11.
- Juan, S., He, Y., Zhiyue, L., Yan, W., Jiang, B., Yanyan, W., Ying, Y., 2013. Factors associated with skipping breakfast among Inner Mongolia Medical students in China. *BioMed Central Publ. Health* 13, 42.
- Krzych, L., 2004. An attempt at evaluation of medical students' lifestyle. *Zdr Publishing. Poland* 67–70.
- Kurubaran, G., Sami, A., Ahmad, M.Q., Al-Abad, A.A., Rizal, A.M., Syed, M.A., 2012. Social and psychological factors affecting eating habits among University students in a Malaysian medical school: a cross-sectional study. *Nutr. J.* 11, 48.
- Likus, W., Milka, D., Bajor, G., Jachacz-Lopata, M., Dorzak, B., 2013. Dietary habits and physical activity in students from the Medical University of Silesia in Poland. *Rocz. Panstw. Zakl. Hig.* 64 (4), 317–324.
- Moy, F.M., Johari, S., Ismail, Y., Mahad, R., Tie, F.H., Ismail, W.M., 2009. Breakfast skipping and its associated factors among undergraduates in a public university in Kuala Lumpur. *Malays. J. Nutr.* 15 (2), 165–174.
- Mozaffarian, D., Appel, L.J., Van Horn, L., 2011. Components of a cardio-protective diet: new insights. *Circulation* 123, 2870–2891.
- Musaiger, A.O., Awadhalla, M.S., Al-Mannai, M., AlSawad, M., Asokan, G.V., 2017. Dietary habits and sedentary behaviors among health science University students in Bahrain. *Int. J. Adolesc. Med. Health* 29.
- Olumakaiye, M.F., Atinmo, T., Olubayo-Fatiregun, M.A., 2010a. Food consumption patterns of Nigerian adolescents and effect on body weight. *J. Nutr. Educ. Behav.* 42 (3), 144–151.
- Olumakaiye, M.F., Ogbimi, G.E., Ogunba, B.O., Soyeb, K.O., 2010b. Snacking as a contributor to overweight among Nigerian Undergraduate Students. *Niger. J. Nutr. Sci.* 31 (2), 76–80.
- Omaga, K., Omuemu, V.O., 2018. Assessment of dietary pattern and nutritional status of Undergraduate students in a private university in southern Nigeria. *Food Sci. Nutr.* 1, 1–8.
- Perlstein, R., McCoombe, S., Shaw, C., Nowson, C., 2016. Medical students' perceptions regarding the importance of nutritional knowledge and their confidence in providing competent nutrition practice. *Publ. Health* 140, 27–34.
- Piepoli, M.F., Hoes, A.W., Agewall, S., Albus, C., Brotons, C., Catapano, A.L., Cooney, M.T., Corra, U., Cosyns, B., 2016. European Guidelines on cardiovascular disease prevention in clinical practice. *Eur. Heart J.* 37, 2315–2381.
- Qlan, F., 2011. *Food and Exercise and Academic success. Post a comment. Tripple Helix online.* www.drugswell.com. (Accessed 27 July 2018).
- Rodrigues, P.R.M., Luiz, R.R., Monteiro, L.S., Ferreira, M.G., Gonçalves-Silva, R.M.V., Pereira, R.A., 2017. Adolescents' unhealthy eating habits are associated with meal skipping. *Nutrition* 42, 114–120 e1.
- Sedodo, N.S., Akinlotan, J.V., Akinlua, O., Abosedo, O.P., Isaac, O.S., 2014. Dietary Diversity score and nutritional status of undergraduates in south west Nigeria. *J. Obes. Weight Loss Ther.* S4, 3.
- Thompson-McCormick, J.J., Thomas, J.J., Bamivaliku, A., Nishakhan, A., Becker, A.E., 2010. Breakfast skipping as a risk correlate of overweight and obesity in school going ethnic Fijian adolescent girls. *Asia Pac. J. Clin. Nutr.* 19 (3), 372–382.
- Trafalska, E., Grzybowski, A., 2003. The dietary habits and nutritional behaviour of students of the medical university of Lodz. *Now. Lek.* 72 (2), 120–123.
- Van den Berg, V.L., Abera, B.M.M., Nel, M., Walsh, C.M., 2013. Nutritional status of undergraduate healthcare students at the University of the Free State. *S. Afr. Fam. Pract.* 55 (5), 445–452.
- West, G.P., Cumines, L., 2006. *Adolescent Eating Habits. Health Matters. Ninemsn Publishers Ltd, London.*
- World Cancer Research Fund, American Institute of Cancer Research, Food, 2007. *Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective. AICR, Washington.*
- World Health Organization, 2011. *Waist circumference and waist-hip ratio: report of a WHO expert consultation Geneva, 8–11 December 2008.* www.who.int.
- Yahia, N., Wang, D., Rapley, M., Dey, R., 2016. Assessment of weight status, dietary habits and beliefs, physical activity, and nutritional knowledge among University students. *Pers. Publ. Health* 136 (4), 231–244.
- Zhang, M., Cai, H., Bao, P., Xu, W., Qin, G., Shu, X.O., Zheng, Y., 2017. Body mass index, waist-to-hip ratio and late outcomes: a report from the Shanghai Breast Cancer Survival Study. *Sci. Rep.* 7 (1), 6996.