



## **Assessment of Overweight, Obesity and the Dietary Habits of Undergraduate Students of Lagos State University**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author WM designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Authors NA and DA managed the analyses of the study including the discussion section. Author DA managed the literature searches and wrote the background to the study. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aims:** To determine the prevalence of overweight, obesity and dietary habits of under graduate students of Lagos State University.

**Study Design:** The study was a descriptive cross-sectional survey.

**Place and Duration of Study:** Lagos State University, Lagos, Nigeria, between June 2016 and July 2016.

**Methodology:** 150 undergraduate students were selected through multistage random sampling. Information on socio-demographic characteristics, dietary habit and physical activity was obtained using structured questionnaire. Weight, height, Percentage Body Fat (PBF), waist and hip circumferences were measured according to standard procedures to compute Body Mass Indices (BMI), Waist Hip Ratio (WHR) and finally determine nutritional status. The data were presented as frequencies, percentages, mean and standard deviations. Chi square was used to test for significant differences and level of significance set at 0.05.

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**Results:** The mean BMI, PBF and WHR of the participants were  $23.4 \pm 2.3 \text{ kg/m}^2$ ,  $23.1 \pm 5.0\%$  and  $0.83 \pm 0.09$ , respectively. Majority of the participants (86.7%) were of normal weight while 8% (10.4% males and 5.5% females) and 5.3% (5.2% males and 5.5% females) were overweight and obese, respectively. Using WHR, more number of students were overweight/obese (34%) compared to BMI (13.3%) and PBF (8.7%), all indicated higher abnormal status among males than females. Few students exhibited poor eating (15%) and physical inactivity (16%) habits. Majority of the students (75.3%) skipped breakfast and the least daily consumed food group was legume/nut group (0.5%). Snacks (42%) and processed (20%) foods were consumed more than roots/tubers (14%) which are staple foods.

**Conclusion:** Central obesity was high among undergraduate students of Lagos State University. Breakfast skipping and low legume meal consumption were major dietary problems. Healthy lifestyle should be promoted among the university students to prevent overweight/obesity and its associated diseases.

*Keywords: Overweight; waist hip ratio; student lifestyles; healthy eating; nutritional status.*

## 1. INTRODUCTION

Overweight/obesity rate has increased over the last decades and is a major health concern among the world's populace, cutting across all groups of age, gender and race [1]. In 2016, 207 million adolescents and 2 billion out of 5.1 billion adults were overweight [2]. About a third of overweight adolescents and adults are obese, contributing to 4 million deaths globally [2]. The increase in prevalence of obesity poses critical global health crisis. Overweight/obesity increases the risk of developing Non-Communicable Diseases (NCDs) such as cardiovascular diseases (heart attacks and stroke often linked with hypertension), elevated cholesterol level, diabetes and certain cancers among others. Apart from affecting quality of life [3], obesity is associated with higher chance of premature death and disability in adulthood [4].

The body mass index (BMI) as a simple nutritional assessment tool has been widely used to classify overweight and obesity but does not differentiate between adiposity and muscularity [5], thus it may underestimate or overestimate obesity in certain individuals. Waist circumference and WHR are considered better measures of obesity associated health risks [6]. The Bioelectrical Impedance Analysis (BIA) device is used for the estimation of percentage body fat in healthy adults. Total body fat values can be used to estimate chronic disease risks [7]; however, it does not describe fat distribution which is strongly related to metabolic disorders. Hence, the assessment of disease risk based on both BMI and waist circumference measures is more useful in predicting disease risk than either measure alone [8].

Globally, the prevalence of chronic diseases including diabetes mellitus, hypertension, cancer among others has increased rapidly. Unhealthy dietary habit and physical inactivity are the major modifiable risk factors of overweight and obesity [9,10]. Rapid urbanization and increased availability of convenience/processed foods have also resulted in the shift of dietary patterns particularly among young adults. Consumption of meals high in fats, free sugars (carbonated soft drinks), salt/sodium but low in fruits, vegetables and other fibre rich food sources such as whole grains is common among students. University students may be exposed to unhealthy eating habits because they are away from home and usually busy with academic activities. Furthermore, high cost of healthy foods and easy accessibility to fast foods contribute to poor nutrition [11]. Breakfast skipping has been reported to be common among university students [12,13,14] and independently predicted obesity [13]. In addition, due to advances in technology, the need for physical activities in work as well as transport and leisure activities has reduced drastically. All these factors contribute to increasing rates of overweight among students. Globally, measures to reduce or end malnutrition particularly overweight/obesity are essential for achieving the diet-related NCD targets by 2025, as well as targets for Sustainable Development Goal (SDG) 2 (end hunger, achieve food security, improve nutrition and promote sustainable agriculture) and SDG 3 (ensure healthy lives and promote wellbeing for all at all ages) by 2030 [1]. The university period represents a critical stage when these young adults develop eating patterns that define permanently, dietary habit in middle and later adulthood. Also, the multiplicity of ethnic, religious and social groups as well as

independence and the types of university environment expose students to diverse food habits. It is important to regularly assess the lifestyle habits, particularly dietary habits of these young adults found in large numbers in tertiary institutions. The university environment presents great opportunity to disseminate information on healthy lifestyle. Enormous work has been done on nutritional assessment of university students. However, information on nutritional status of students of Universities in Lagos is scarce. Therefore, this study aimed to determine the prevalence of overweight and obesity as well as dietary habits of undergraduate students of Lagos State University, Lagos.

## **2. METHODOLOGY**

### **2.1 Study Setting**

The study was carried out at the Lagos State University (LASU), Epe Campus, one of the four campuses of the LASU.

### **2.2 Study Design**

This study adopted descriptive and cross-sectional design.

### **2.3 Study Population**

Undergraduate students of LASU.

#### **2.3.1 Inclusion criteria**

Full time undergraduate students.

#### **2.3.2 Exclusion criteria**

Students living with chronic diseases. Pregnant students.

### **2.4 Sampling Method**

Multistage sampling technique was employed to select a total of 150 undergraduate students. Epe campus was selected out of the four campuses of Lagos State University (LASU) by balloting. Three faculties namely Faculty of Science, Faculty of Engineering and Faculty of Management Sciences were selected through balloting and two departments were then randomly chosen from each faculty resulting in a total of 6 departments.

### **2.5 Data Collection**

A written approval letter was obtained from the school authority and only the students who gave

their consent after due explanation of the purpose of the research participated in the study. A pre-tested structured questionnaire was used to obtain information on socio-demographic characteristics, dietary and other lifestyle habits.

#### **2.5.1 Dietary habit assessment**

Dietary habit questions were centred on WHO 5 keys to healthy diet [15] and other eating habits found among students. The questions were asked on the following habits:

Daily fruit and vegetable intake, fatty (fried, oily snack/foods, fatty meat) and sugary foods (sugary beverage, cakes, chocolate, ice cream), breakfast skipping, fast foods (> 3 times a week) and meal variety ( $\geq 4$  food groups a day). Scores of 1 and 0 were given for good and bad habit respectively. A scoring method was used to determine the food habits status of the respondents. Scores were allocated as follows:

- <40% - Poor (low)
- 40-69%- Fair (moderate)
- $\geq 70\%$ - Good (high)

#### **2.5.2 Physical activity assessment**

Physical activity assessment was based on WHO recommendations for physical activity: 150 minutes of moderate physical activity or  $\geq 75$  minutes of vigorous physical activity throughout the week [16].

Poor activity status-only usual daily activities.

Moderate activity status- daily activities + 75 minutes moderate exercise or 40 minutes vigorous exercise in a week.

Good activity status-daily activities + 75 minutes moderate exercise or 40 minutes vigorous exercise in a week.

### **2.6 Anthropometry**

Weight, height, waist and hip circumferences of the respondents were measured according to the procedure outlined by the World Health Organisation [17]. Participants stood barefooted on the center of the digital scale, minimally dressed with their hands at their sides. Weight measurements were taken in the morning before any meal or drink was ingested. The digital scale was recalibrated with a known weight after every ten measurements. Height was measured with a calibrated wooden rod at the level where the

movable board touches the head while the students stood erect. Weight and height measurements were recorded to the nearest 0.1kg and 0.1 cm (0.01 m) respectively and used to calculate BMI as weight (kg)/height (m<sup>2</sup>). Weight status was determined using WHO BMI classification criteria: underweight (BMI ≤18.5), normal (BMI 18.5-24.99), overweight (BMI 25-29.99) and obesity (BMI ≥ 30) [18].

Waist (in between the lowest rib and the superior border of the iliac crest) and hip (at the widest diameter of the hip) circumferences were taken to the nearest 0.01cm with non-stretchable tape while the respondents placed crossed arms on opposite shoulders. Waist-Hip Ratio (WHR) was categorized as follows:

Parameter	Low risk	Moderate risk	High risk
WHR (Male)	<0.9	0.9 to 0.99	>1
WHR (Female)	<0.8	0.8 to 0.89	≥ 0.9

Percentage Body Fat (PBF) was measured with hand held body composition monitor by Lloyds Pharmacy Limited (0.7165 X-R7) and classified as obesity 26% and above (men), 32% and above (women). Data analysis was carried out using the Statistical package for social sciences (SPSS) version 20.0. Data was presented as frequencies, percentages, mean and standard deviations. Chi square was used to test for significant differences and level of significance set at 0.05.

### 3. RESULTS AND DISCUSSION

Information displayed in Table 1 shows that 77 (51.3%) males and 73 (48.7%) female took part in the study and majority of them (91.3%) came from monogamous homes. Greater proportion of the participants (60%) fell within the age range of 15 to 20 years. This represents a critical transition period with clearly defined gender motivated actions and characteristics modified by academic environment.

The mean BMI, PBF and WHR of the participants were 23.4± 2.3kg/m<sup>2</sup>, 23.1 ± 5.0 % and 0.83±0.09 cm, respectively (Table 2). The weight status of the students is shown in Table 3. None of the respondents was underweight. Anthropometric assessment of the students revealed prevalence rate of 8% (12) overweight and 5.3% (8) obesity (Table 3). These rates were lower than the rates reported among Kuwait students (29.5%, 12.7%) [19], Chinese students (18.3%, 6%) [20] and British students (15.2%,

5.2%) [21]. The reason could be the difference in the periods these surveys were undertaken. The current study was conducted towards the end of the semester when the rigors of academic activities might have affected weight. Niba et al. [13], Ejike and Ijeh [22] and Chukwunonso et al. [3] also reported higher prevalence of 20.7% and 17% overweight/obesity respectively compared to 13.3% detected in this study. A similar research carried out among undergraduate students in a private university recorded a higher rate of overweight (14%) and slightly higher obesity rate (6%) [14]. The higher rates might be attributed to assumed better socio-economic privileges enjoyed by the students in private universities. However, another study discovered a lower prevalence rate of overweight among American adolescents whose parents were highly educated and earned large incomes compared to African American adolescents [23]. Another study in Brazil reported that mean BMI among adolescents from smaller households were greater than that of larger households [24]. This implies that students from smaller families were likely to be more overweight than students from larger families. Family distribution of resources including allowances and food depends largely on family size. In the present study, about 83.3% of students come from households with more than four persons and 76.7% of the respondents have above three siblings. Thus, the lower prevalence of overweight and obesity recorded in this study could be attributed to larger families.

Overweight/obesity prevalence was also determined using percentage body fat and waist hip ratio (Table 4). It was discovered that using WHR, more number of students were observed to be overweight/obese (34%) compared to BMI (13.3%) and PBF (8.7%). The three variables indicated higher abnormal status among males than females. The prevalence of above normal waist-hip ratio was high. High waist-hip ratio depicts central obesity. This implies that these students may be at high risk of developing chronic diseases such as type 2 diabetes and cardiovascular diseases [6].

The prevalence of overweight/obesity (15.6% male and female 11%) was more common in the male population than the female population. This finding was replicated when percentage body fat (10.4% male, 6.8% female) and waist-hip ratio (44.2% male, 23.3% female) criteria were used. This is in tandem with a study done in Autonomous University of San Luis Potosi (UASLP) where the prevalence of

**Table 1. Demographic characteristics of the respondents**

Demographic characteristics	Frequency	Percentage
<b>Sex</b>		
Male	77	51.3
Female	73	48.7
<b>Age group</b>		
15 - 20	90	60.0
21 and above	60	40.0
<b>Religion</b>		
Christian	132	88.0
Islam	15	10.0
Traditionalist	3	2.0
<b>Household size</b>		
2-3	18	12
4-5	62	42
6-7	63	41.3
8 and above	7	4.7
<b>Number of siblings</b>		
1-2	35	23.3
3-5	76	50.7
6 and above	39	26.0

**Table 2. Mean anthropometric parameters of the participants**

Variables	Male (n=77)	Female (n=73)	All (n=150)
BMI (kg/m <sup>2</sup> )	23.6 ± 2.6	23.2 ± 2.0	23.4 ± 2.3
Weight (kg)	72.8 ± 9.1	68.8 ± 8.0	70.7 ± 8.8
Height (m)	1.75 ± 0.01	1.72 ± 0.01	1.73 ± 0.01
PBF (%)	20.8 ± 4.7	25.5 ± 4.2	23.1 ± 5.0
WHR (cm)	0.88 ± 0.08	0.78 ± 0.05	0.83±0.09

*PBF, the percentage body fat; WHR, Waist-hip ratio*

**Table 3. The Classification of the nutritional status of the respondents using BMI**

Nutritional status BMI (kg/m <sup>2</sup> )	Male n (%) (n=77)	Female n (%) (n=73)	Total n(%) (n=150)	P value
Normal weight (BMI 18.5-24.9)	65 (84.4)	65 (89.0)	130 (86.7)	0.232
Overweight (BMI 25-29.9)	8 (10.4)	4 (5.5)	12 (8.0)	
Obesity (BMI >30)	4 (5.2)	4 (5.5)	8 (5.3)	
Total	77(100)	73(100)	150(100)	

**Table 4. Nutritional status by gender based on BMI, PBF and WHR cut-off values**

Nutritional status	BMI		PBF		WHR	
	Male n=77	Female n=73	Male n=77	Female n=73	Male n=77	Female n=73
Normal	65 (84.4)	65 (89.0)	69 (89.6)	68 (93.2)	43 (55.8)	56 (76.7)
> Normal	12 (15.6)	8 (11.0)	8 (10.4)	5 (6.8)	34(44.2)	17 (23.3)

*BMI, the Body Mass Index, PBF, the Percentage Body Fat; WHR, Waist Hip Ratio  
Values in brackets are percentages*

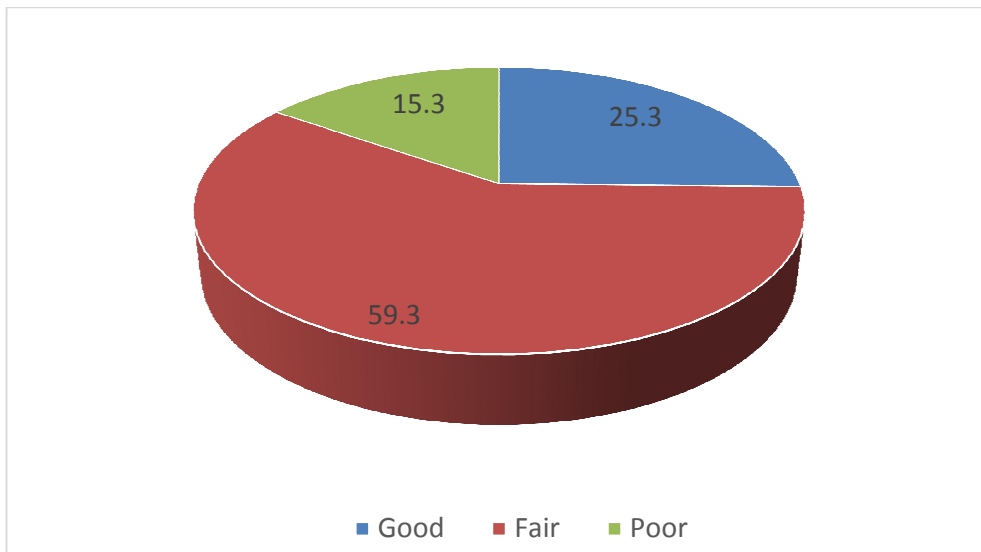
overweight/obesity was 28.3%, with a higher prevalence in the males (36.8%) than females (24.6%) [25]. Similar finding was also reported among Iranian students (13.4% male, 10.7% female) [12] and Malaysian students (24.5%,

18.2%) [26]. Kuan et al. [27] observed that females were more concerned about maintaining body weight and body shape than males. Sprake et al. [21] reported that female students favoured a 'vegetarian' diet, which is lower in calories

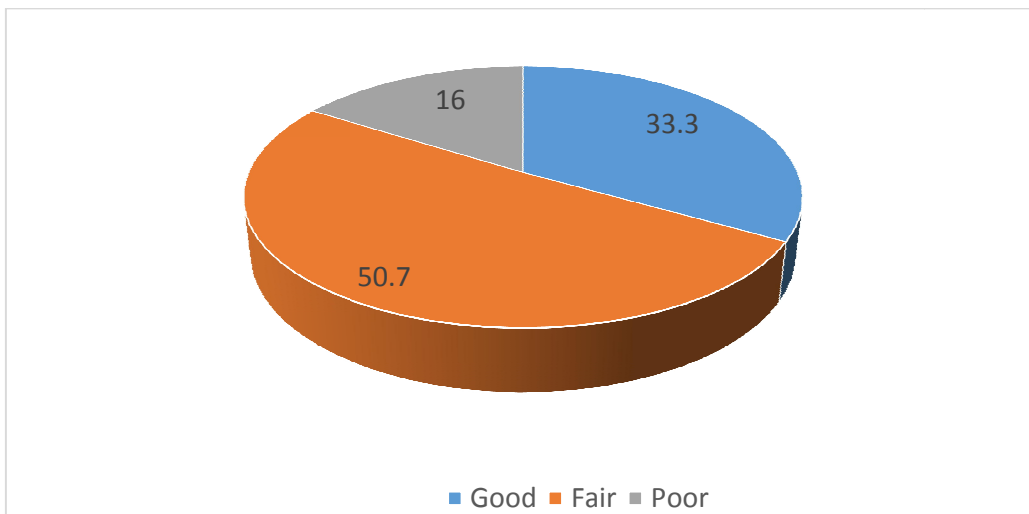
while male students preferred 'convenience, red meat and alcohol' diet. It was also observed in this study that more females skipped meals than males. However, lower prevalence of overweight and/or obesity among males were recorded in some surveys among Nigerian [3], Cameroun [13] and Chinese [28] university students as well as among students of Mu'tah University, Jordan [29].

Majority (59.3%) of the total population had fair eating habits while 15.3% (23) students had poor eating habits (Fig. 1). Unhealthy lifestyle may be acquired during university life because some of these teenagers and young adults might not

have taken full responsibility of making healthy choices. These habits may lead to overweight which has been identified as a major contributing factor to incidence of chronic diseases later in life [30]. However, in the population under study, only 15% and 16% had poor eating habit and physical inactivity status, respectively (Figs. 1 and 2). This probably explains why majority of the students were of ideal weight (86.7%). Yahia et al. [31] reported that students having greater nutritional knowledge consumed less unhealthy fats and cholesterol. Nutritional knowledge has increased tremendously as a result of information technology. Information on healthy lifestyle is continuously shared through social media.



**Fig. 1. Dietary habits of the respondents**



**Fig. 2. Physical activity level of the respondents**

Food frequency chart displays the weekly consumption of major food groups among these students (Fig. 3). Cereals were more regularly consumed (42%) than roots and tubers (14%). The most regularly consumed food was meat/fish (60%) followed by cereals (42%) and snacks (42%), fruits/vegetable (36%) and milk/milk products (35%). The least daily consumed food group among the students was legume/nut group (0.5%) and about 44% of the students reported never eating legume based meals. Beans meal

preparation consumes more energy and time compared to cereals, roots and tubers. Consumption of fruits and vegetables was poor. Low consumption of fruits and vegetables was also found among Nigerian [32,14], Camerounian [13], Saudi Arabian [33], Croatian [34] and Chinese [28] students. The poor consumption of fruits could be attributed to unavailability of fruit and vegetable vendors. The high cost of fruit and vegetables could be another cause of low consumption [35]. Processed foods (20%) were

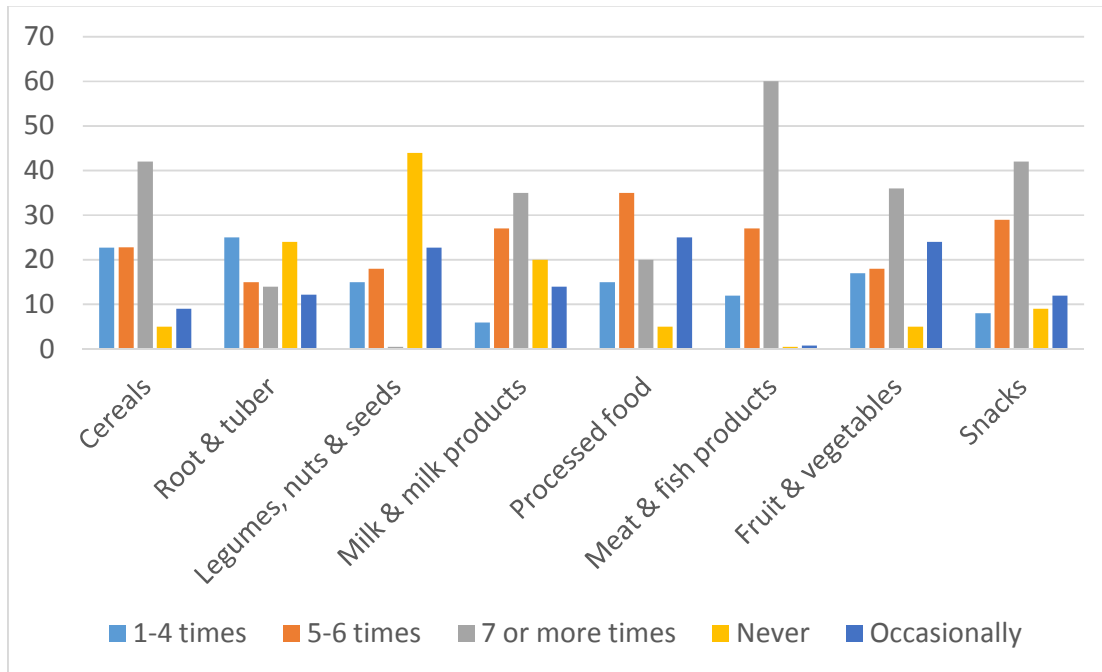


Fig. 3. Weekly food consumption pattern of the respondents

Table 5. Lifestyle habit of the respondents

Food habits	Frequency	Percentage
<b>Alcohol consumption</b>		
Yes	25	16.7
No	125	83.3
<b>Smoking habit</b>		
Yes	8	5.3
No	142	94.7
<b>Skipping meals</b>		
Yes	125	83.3
No	25	16.7
<b>Which meals do you skip?</b>		
Breakfast	113	75.3
Lunch	29	19.3
Dinner	8	5.3
<b>Taking breakfast before school</b>		
Yes	45	30.0
No	105	70.0

consumed more than roots/tubers (14%). It is worthy to note that snacks (42%) were consumed as much as cereal (42%) and more than roots/tubers (14%) which are staple foods. Other studies have recorded high snack and fast food consumption among students [12,14,26].

Majority of the students (75.3%) skip breakfast while about 94.6% of these students regularly eat dinner (Table 5). Furthermore, alcohol intake and cigarette smoking were not common among the students. About 83% skip meals particularly breakfast (75%). This habit has been reported by several researchers and linked to lack of time, dislike to eat food early and oversleeping among other factors [36]. Early morning lectures may be a strong contributing factor to breakfast skipping among university students. Breakfast consumption may influence memory, psychological function and academic performance positively [37]. According to Niba et al. [13], skipping or rarely eating breakfast was an independent predictor of overweight/obesity. A study in Pakistan discovered that breakfast skipping led to obesity because appetite might have increased during next meal leading to more food intake [31]. In contrast, an Iranian study found that underweight was common among those who skipped breakfast [12]. This was attributed to standard portions of lunch served by school canteens regardless of whether breakfast was taken or not.

#### 4. CONCLUSION

There was high prevalence of overweight/obesity among the students using waist hip ratio particularly among the male undergraduate students of LASU indicating that an appreciable number of the students are centrally obese. Breakfast skipping and poor legume meal consumption were major dietary problems. Consumption of fruits and vegetables was poor while snacks were consumed at the same frequency as cereals. Furthermore, snacks and processed foods were consumed more than roots/tubers which are staple foods. Gender based measures on healthy lifestyle should be promoted among the university students. Further studies are required to ascertain the best tool for diagnosing overweight and obesity among male and female adolescents.

#### CONSENT

A written approval letter was obtained from the school authority and only the students who gave

their consent after due explanation of the purpose of the research participated in the study.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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