



Research article

Dietary factors associated with being overweight and obese among school-going adolescents in Region One, The Gambia

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ABSTRACT

Background: The purpose of this study was to determine the dietary factors associated with being overweight and obese among school-going adolescents in Region One, The Gambia.**Method:** This was a school-based cross-sectional study and 1008 students from eight Senior Secondary Schools in Region one of The Gambia participated in it. Data were collected through questionnaire self-administered method, and weight and height measurements. Using the age and gender-specific cutoff points proposed by World Health Organization, body mass index (BMI) was calculated using the weight and height measures. The data were analyzed using frequencies for underweight, overweight, and obesity, and the association between dietary factors and weight status of participants was determined using the Chi-square test.**Findings:** Out of the 1008 students recruited in the study, 981 of them completed and returned the questionnaires, resulting in a total response rate of 97%. The mean age of the participants was 17.3 years (SD = 1.9) and 385 of them (39.2%) were from grade 10. There were 627 (63.9%) females. The mean BMI for all the students was $20.0 \pm 3.4 \text{ kg/m}^2$. Most of the students ($n = 672$; 68.5 %) had normal body weight, but 226 (23%), 76 (7.7 %) and 7 (0.7%) of them were underweight, overweight and obese respectively. There was a significantly higher number of female students who were overweight ($n = 64$, 10.2%) than their male counterparts ($\chi^2 = 72.336$, $p < 0.001$). The frequency of drinking sugar added juices and full cream milk, eating fish, shrimps, oysters, lobsters, and snacks such as cakes and biscuits were significantly associated with overweight and obesity among the participants ($p < 0.05$). In conclusion, the problem of under-nutrition and over-nutrition co-existed among the students which were associated with poor eating habits.

1. Introduction

Overweight and obesity among adolescents is a global problem (Ulijaszek, 2003). It is a major issue among school-going adolescents in sub-Saharan Africa as shown in recent studies (Muthuri et al., 2014). The most frequent form of malnutrition in Africa used to be under-nutrition but an increase in cases of adolescent overweight and obesity has been reported in many African countries (Muthuri et al., 2014). This may be as a result of Unhealthy eating habits (Shankar and Komala, 2014; Muthuri et al., 2014). Poor dietary practices among adolescents, especially females have been reported and this can have a great impact on their weight status (Al-Hazzaa et al., 2011; Musaiger et al., 2016).

Studies have reported an increased consumption of sugar-sweetened beverages especially soft drink and this has been linked to the rise in overweight and obesity globally (Basu et al., 2013; Woodward-Lopez et al., 2010). However, there are different findings relating to the

consumption of sugar/calorically sweetened beverages/drinks and its association with overweight and obesity. Most of the researchers reported a positive association between high intake of sugar/calorically sweetened beverages/drinks and overweight and obesity (Al-Hazzaa et al., 2012; Nissinen et al., 2009; Olsen and Heitmann, 2009). Furthermore, Hu & Malik in 2010 added that frequent drinking of sugar-sweetened beverages is not only associated with weight gain but also with the risk of developing type 2 diabetes and cardiovascular diseases. On the other hand, Gibsons (2008) argued that the association of sugar/calorie-sweetened beverages/drinks and overweight and obesity only occurs in high-risk groups and from consumption of large amounts, and lacks enough from epidemiological studies.

The consumption of grains, nuts, vegetables, fruits, legumes, poultry, milk and yogurt was also reported to be associated with a decreased incidence of overweight and obesity among adolescents (Abreu et al., 2012; Al-Hazzaa et al., 2012; Matthews et al., 2011). Processed dairy

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products, energy-dense foods, food items high in red meat, processed meat, refined grains, and high-fat-low fiber diet increases the risk of obesity in this age group (Bahreini Esfahani et al., 2016; Jayawardena et al., 2017; Matthews et al., 2011; Santos et al., 2014; Shommo et al., 2014).

Over the past years, undernutrition has been a major public health concern in The Gambia (National Nutrition Survey of The Gambia, 2015). More than a quarter (27%) of adolescent girls aged 15–19 years old was found to be thin in 2014 (The Gambia Bureau of Statistics (GBoS) & ICF International, 2014). The same survey reported 9.1% overweight and obesity in the same age group. Recent studies have shown that overweight and obesity are also a problem amongst urban women. It was reported in 24.1% of this population (National Nutrition Survey of The Gambia, 2015). Factors such as urbanization, wealth, and changes in lifestyles have contributed to the increased occurrence of overweight and obesity (Gambia Bureau of Statistics & ICF International, 2014). Currently, there was no study known to have been done to look at dietary factors that may influence overweight and obesity in school-going adolescents in The Gambia. Therefore, this study that investigated the dietary factors associated with overweight and obesity among school-going adolescents in Region one of The Gambia is timely.

2. Materials and methods

2.1. Study design and setting

This was a school-based cross-sectional study. It was carried out in eight Senior Secondary Schools in Banjul and Kanifing Municipal Councils, which are located in Region One of The Gambia. Schools in Banjul and Kanifing are under the supervision of the Regional Education Directorate (RED) of Region One. There are 52 Senior Secondary Schools within the Region including French and Arabic schools. Out of the 52 schools, 13 are public and 39 are private schools. According to the RED record office, the region has an enrollment of 21, 684 students (males-10585 and females- 11099) in the 2016/2017 academic year.

2.2. Study period

The study was conducted from the period May to August 2019.

2.3. Eligibility criteria

Only students in English Taught Senior Secondary Schools within Region One who were within the ages of 13–19 years and in grades 10 to 12 (as in the case of public schools) or in forms 3 to 5 (as in private schools) were included in the study. The students who were sick or injured who had special needs such as physical disabilities or chronic illness at the time of data collection were excluded from the study.

2.4. Sample size and sampling technique

The sample size was calculated using Fisher's formula for cross-sectional descriptive study (Charan and Biswas, 2013) and it was 1008 students after adding the 10% expected dropout rate.

A multistage sampling technique was used to select a representative sample for this study as shown below:

Stage 1 – Region 1 was divided into four main clusters and from these clusters two schools (1 public and 1 private) were selected using a random sampling technique, making a total of 8 schools (four public and four private) that were chosen for the study.

Stage 2 – the eight selected schools were divided into 10 to 12 grades (public schools), forms 3 to 5 (private schools), and from each of these grades, two classes were randomly selected, making a total of 48 classes. In The Gambia, grade-system is used to classify students' levels in Public Senior Secondary School from grade 9 to 12 while some private Senior Secondary Schools do use forms 1 to 5 to classify students' level.

Stage 3 – from the 48 selected classes, 21 students (both boys and girls) were randomly selected from each class by using pieces of paper containing the names of all the students in each class, wrapped thoroughly and mixed. The selection was done using balloting with replacement.

2.5. Research tools

The study questionnaire was developed by the researchers who were guided by the research objectives and related literature (Bjelland et al., 2014; Lien et al., 2001). It consisted of two components, namely, demographic information and dietary habits. The first component covered information on demography which included the school grade that the respondents were in during the time of data collection. This was categorized into grades 10, 11, and 12 reflecting the Senior Secondary School class classification of The Gambia. The demographic information section also did assess age, gender, nationality, tribe, number of siblings, and the family type of the respondents. The family-type variable was categorized into extended and nuclear family types. There were eight (8) items in the demographic information section.

The second component was on dietary habit which was further divided into four (4) sub-sections. The first subsection was on the intake of sugar and sweetened beverages which was assessed by the frequency respondents drink soft drinks, locally made juices, Chinese Green Tea, alcohol, and a number of a teaspoon of sugar added to tea, coffee, and other foods daily in the previous month before the data collection period. There were four (4) questions in this section. The frequency of drinking soft drinks, alcohol, and locally made sugar added juices were classified as never or less than one bottle/glass in last month, 1–3 bottles/glasses in last month, 1 bottle/glass per week in last month, 2–4 bottles/glasses per week in last month, 5–6 bottles/glasses per week in last month, 1 bottle/glass per day in last month, 2 bottles/glasses per day in last month and 3 or more bottles/glasses per day in last month (Bjelland et al., 2014). A 500mL bottle/glass was used as a standard to estimate the number of bottles and glasses. The frequency of drinking Chinese Green Tea was grouped into never or less than 1 glass per month, 1–3 glasses per month, 1 glass per week, 2–4 glass per week, 5–6 glass per week, 1 glass per day, 2 glass per day and 3 or more glasses per day (Bjelland et al., 2014). A 50mL glass was used as a standard to estimate the number of a glass of Chinese tea. The number of a teaspoon of sugar added to tea, coffee, and other foods daily was categorized into don't eat sugar, 1–2 teaspoons, 3–4 teaspoons daily, 5–6 teaspoons daily, and 7 or more teaspoons daily.

The second subsection was on dairy, oil, and fatty food consumption and it consisted of six (6) questions. Dairy foods and oil/fat intake were measured by the frequency respondent consumed bread spread with butter, mayonnaise, cheese and margarine, fried food, and milk in the month before the data collection period. The frequency was grouped into never in the last month, 1–3 times in last month, once per week in last month, 2–6 times per week in last month, once per day in last month, and more than once per day in last month. The type of milk consumed was classified into skimmed/nonfat milk, semi-skimmed milk, whole/full cream milk, and others. The type of oil ate regularly was grouped into soya bean oil, groundnut oil, palm oil, vegetable oil, and others.

Subsection three of the questionnaire assessed the frequency of carbohydrate and protein intake and it consisted of 10 questions. Carbohydrate and protein intakes were assessed using a frequency from never to more than 4 times a week in the month preceding the data collection period.

Subsection four was made of 7 questions that assessed vegetables, fruits, and snacks intakes using five pre-coded frequencies from never to three times or more per day (Lien et al., 2010).

2.6. Anthropometry measurement

A portable SECA electronic scale (Seca® 813) was used to measure body weight to the nearest 0.1kg and a UNICEF Height Measuring Board was used to measure height to the nearest 0.1cm. The adolescents' weights were measured with light clothing and without shoes. Their heights were measured while they were standing, and without shoes and socks (Rohilla et al., 2014). The heights and weights were measured once immediately after completing the questionnaires by the data collectors to minimize recall bias as in self-reporting. Using the weight and height, body mass index (BMI) was calculated in kg/m^2 , for each adolescent. The BMI were classified using the aged 13–19 years and gender-specific cutoff points proposed by WHO (2007) as follow: overweight (BMI $>+1\text{SD}$; BMI $25 \text{ kg}/\text{m}^2$), obesity (BMI $>+2\text{SD}$; BMI $30 \text{ kg}/\text{m}^2$), normal weight ($-2\text{SD} < \text{BMI} \leq +1$) and underweight (BMI $< -2\text{SD}$) categories according to). The BMI cutoff points for the adolescents' overweight and obesity also reflect the adult cutoff points of a BMI of $25 \text{ kg}/\text{m}^2$ and $30 \text{ kg}/\text{m}^2$ (Rohilla et al., 2014).

2.7. Reliability and validity of research tools

The questionnaire was given to three experts in research and nutrition to review for content and face validity. Items were removed or maintained in the questionnaire based on these experts' recommendations. Also, a pretest was conducted in a separate sample equivalent to 10% of the sample size in a chosen school. The pre-test also consisted of a discussion of whether respondents understood particular words/phrases as intended and a discussion of items identified as complex.

Members of the expert group were also consulted regarding removal or maintaining of items based on the pre-test findings. The study questionnaire had a high reliability (intraclass correlation coefficient: ICC = 0.88; 95% CI: 0.84–0.91) and acceptable validity ($r = 0.62$; $p < 0.001$).

The weighing scale was always adjusted to zero before weighing commenced and small boards were used for scale stabilization.

2.8. Data collection procedure

Fifteen Bachelor of Science (BSc) Nursing Students who had completed their four years training program but were yet to be employed, were identified as data collectors. All the data collectors had a 90 min training on the data collection protocol and also joined the pretest to have an insight into the whole data collection process. Thereafter, the data collectors were divided into two groups and each group went to a separate school. The researchers led the groups during the whole process of the data collection which lasted for one month. Participants were usually assembled during lunch break time in the schools' common halls or individual classes depending on the school authority's decision for the data collection. The self-administered method was used and participants were seated separately from each other to prevent them from copying from each other's responses. The data collectors used to read and explained the questions before allowing the participants to respond to the questionnaires. Thereafter, their weights and heights were measured.

2.9. Data analysis

All data collected on the questionnaire were cross-checked for any errors following each day of data collection. The collected data were entered in an Excel spreadsheet and double-checked for errors before exporting it to SPSS for analysis. The data were analyzed using IBM SPSS Statistics, version 23. The frequencies of the demographic variables were calculated. The BMI of each student was calculated by dividing the weight by the square of average height (kg/m^2). The frequencies of underweight, overweight, and obesity among the participants were calculated. The association between dietary factors and the weight status of the participants was determined using the Chi-square test and the statistically significant level was set at $p < 0.05$.

2.10. Ethical consideration

The study was approved by The Gambia Government/MRC Joint Ethics Committee. However, since the majority of the students at this level were underage, written informed consent forms were sent to all parents or guardians of the participants after seeking permission from the principals and teachers in each school. In addition, verbal consent was taken from the students and it was clearly explained to them that participation in the study was voluntary. Their identities were neither recorded in the questionnaires nor the study report for confidentiality.

3. Results

3.1. Demographic characteristics

The results of demographic characteristics of study participants are described in Table 1. A total of 1008 students were enrolled in the study but 981 of them completed and returned the questionnaires, resulting in a total response rate of 97%. The mean age of the participants was 17.3 ($SD = 1.9$) and most of them ($n = 385$; 39.2%) were from grade 10. There were 627 (63.9%) females. More than ninety percent ($n = 909$) of the students were Gambians and most of them were of the Mandinka ($n = 288$; 29.4%) or Fula ($n = 213$; 21.7%) tribes, respectively. More than half of them reported that they were from nuclear families ($n = 588$; 59.9%).

3.2. Anthropometry characteristics of respondents categorized by gender

Table 2 shows the results of an independent t-test analysis of the anthropometry characteristics of respondents categorized by gender. The male students had a higher mean weight than their female counterparts (56.3kg vs 54.5kg ; $p < 0.020$). The mean height for the whole sample was $1.7 \pm 0.01\text{m}$. Similarly, the male students were significantly taller than the females ($p < 0.001$). Conversely, the average BMI of the students was $20.0 \pm 3.4 \text{ kg}/\text{m}^2$, and it was higher in the females when compared to the males students (20.5 vs. 19.2 ; $p < 0.001$). A Pearson Correlation result showed that the ages of the adolescents were significantly positively related to their weights ($r = 0.12$; $p < 0.01$) and heights ($r = 0.19$; $p < 0.01$) but not with BMI ($r = 0.04$; $p > 0.05$). Weight was also significantly positively correlated with height ($r = 0.42$; $p < 0.01$) and BMI ($r = 0.89$; $p < 0.01$) while height was negatively correlated with BMI ($r = -0.09$; $p < 0.05$).

Students' weight status was classified as underweight, normal weight, overweight and obese. Majority of the students ($n = 672$; 68.5 %) had normal body weight, and 226 (23%) were underweight. However, 76 (7.7 %) and 7 (0.7%) of them were overweight and obese respectively. The number of students aged 13–16 and 17–19 years old was 663 and 318 respectively. Fifty-nine (8.8%) and 24 (7.5%) of the students aged 13–16 and 17–19 years old were overweight or obese respectively. There was no significant association between students' age groups and their weight status. However, underweight was more frequent among the male students than the female ones (37.3% vs 15%). There was a significantly higher number of female students who were overweight ($n = 64$, 10.2%) than their male counterparts ($\chi^2 = 72.336$, $p < 0.001$).

3.3. Dietary habits of study participants

This section describes the dietary habits of participants in the month before the data collection period and is subdivided as follows:

3.4. Sugar and sweetened drinks

The majority of the students ($n = 710$, 72.3 %) reported that they drank soft drinks in the preceding month of the data collection. However, most of them ($n = 231$; 23.5%) reported that they drank only one bottle of soft drink in the month before the data collection period. In contrast, 90.2% ($n = 885$) said that they drank a sugar added juice and 246

Table 1. Demographic characteristics of students from public and private schools in The Gambia (n = 981), 2019.

Demographic characteristics	Frequency (n)	Percent (%)
Grade		
Grade 10	385	39.2
Grade 11	278	28.3
Grade 12	318	32.4
Gender		
Male	354	36.1
Female	627	63.9
Nationality		
Gambian	909	92.7
Non-Gambian	72	7.3
Tribe		
Mandinka	288	29.4
Wolof	156	15.9
Jola	137	14.0
Fula	213	21.7
Others	187	19.1
Number of siblings		
No sibling	76	7.7
1-2 siblings	164	16.7
3-4 siblings	325	33.1
5 or more siblings	416	42.5
Whom they live with		
Both parents	515	52.5
Mother only	217	22.1
Father only	32	3.3
Others	217	22.1
Type of family		
Nuclear	588	59.9
Extended	393	40.1

Table 2. Anthropometry measurements of students from public and private schools in The Gambia categorized by gender, 2019 (n = 981).

Variables	Total N = 981 Mean (SD)	Male N = 354 Mean (SD)	Female N = 627 Mean (SD)
Age (years)	17.3 (1.9)	17.5 (2.1)	17.2 (1.7)
Weight (kg)	55.2 (10.2)	56.3 (9.9)	54.5 (10.3)
Height in (m)	1.7 (0.1)	1.7 (0.1)	1.6 (0.1)
BMI (kg/m ²)	20.0 (3.4)	19.2 (2.8)	20.5 (3.6)

Statistical analysis by t-test on differences between the genders: Age - $t = 2.357$, $p = 0.019$; Weight - $t = 2.324$, $p = 0.020$; Height - $t = 17.018$, $p < 0.001$; BMI - $t = 5.836$, $p < 0.001$.

(25.1%) reported drinking at least one bottle of it per day in the month preceding. More than 90% (n = 913, 93.1%) of the students do not drink alcohol. However, as shown in Table 3, only the frequency of drinking sugar-added juices was significantly associated with overweight and obesity among the participants ($p < 0.05$).

3.5. Dairy foods and oils eating habits among participants

Most of the students (n = 372, 37.9%) eat bread spread with mayonnaise at least once a day. Almost half of the students (n = 425, 43.3%) said they do not know the different types of milk but 244 (24.9%) used whole or full cream milk. On the other hand, 393 (40.1%) eat fried food daily. The type of milk often used (specifically full cream milk) was significantly associated with overweight and obesity among the students ($\chi^2 = 20.301$, $p < 0.05$).

3.6. Association between eating habit of cereals, tubers, and noodles and overweight and obesity

The frequency of eating carbohydrates was very common among the students. Those that ate foods from cassava and potato more than four times per week were 247 (25.2%) and those that ate it two to four times per week were 223 (22.7%). A high number of the students reported eating food from rice, maize, etc. (n = 453, 46.2%; n = 201, 20.5%) more than four times a week and two to four times a week respectively. Eating spaghetti was also common among the participants as 22.7% of them reported eating spaghetti two to four times a week and 17.9% ate it more than four times a week. However, there was no significant association between the frequency of eating these carbohydrates and overweight and obesity among the participants.

Table 3. Association between sugar and sweetened drinking habits and overweight and obesity among students in public and private schools in The Gambia, 2019.

Frequency of taking sugar/sweetened drinks	n (%) n = 981	Underweight or normal weight n = 898	Overweight or obesity n = 83	p-value
Number of bottles/glasses of soft drink taken in a month				0.238
Do not consume	271 (27.6)	248 (27.6)	23 (27.7)	
1 bottle/glass in last month	231 (23.5)	221 (24.6)	10 (12.0)	
1 bottle/glasses per week	132 (13.5)	121 (13.5)	11 (13.3)	
2-4 bottles/glasses per week	122 (12.4)	110 (12.2)	12 (14.5)	
5-6 bottles/glasses per week	57 (5.8)	49 (5.5)	8 (9.6)	
1 bottle/glass per day	109 (11.1)	96 (10.7)	13 (15.7)	
2 bottles/glasses per day	42 (4.3)	38 (4.2)	4 (4.8)	
3 or more bottles/glasses per day	17 (1.7)	15 (1.6)	2 (2.4)	
Number of bottles/glasses of sugar added juice taken in a month				0.020
Do not consume	96 (9.8)	89 (8.9)	7 (8.4)	
1 bottle/glass in last month	111 (11.3)	106 (11.8)	5 (6.0)	
1 bottle/glass per week	86 (8.8)	76 (8.5)	10 (12.0)	
2-4 bottles/glasses per week	192 (19.6)	186 (20.7)	6 (7.2)	
5-6 bottles/glasses per week	103 (10.5)	93 (10.4)	10 (12.0)	
1 bottle/glass per day	246 (25.1)	217 (24.2)	29 (34.9)	
2 bottles/glasses per day	92 (9.4)	84 (9.4)	8 (9.6)	
3 or more bottles/glasses per day	55 (5.6)	47 (5.2)	8 (9.6)	
Number of bottles/glasses of alcohol taken in a month				0.307
I don't drink alcohol	913 (93.1)	840 (93.5)	73 (87.9)	
1 bottle/glass in last month	32 (3.3)	28 (3.1)	4 (4.8)	
1 bottle/glass per week	14 (1.4)	12 (1.3)	2 (2.4)	
2-4 bottles/glasses per week	2 (0.2)	2 (0.2)	0 (0.0)	
5-6 bottles/glasses per week	11 (1.1)	7 (0.8)	4 (4.8)	
1 bottle/glass per day	3 (0.3)	3 (0.3)	0 (0.0)	
2 or more bottles/glasses per day	6 (0.6)	6 (0.7)	0 (0.0)	

Statistical analysis by chi-square test: soft drink intake by weight classification, 18.511; sugar added local juice intake by weight classification, 25.765; alcohol intake by weight classification, 16.193.

3.7. Association between plant and animal proteins eating habits and overweight and obesity among students

Foods from animal, plant, and seafood proteins were also consumed by participants (Table 4). On average, 26.2% (n = 257) of the participants reported eating beans or groundnut once a week and 35.2% (n = 345) said that they ate chicken, duck, or turkey two to four times a week. The consumption of eggs two to four times per week was practiced by 28.8% (n = 283) of the participants whilst the consumption of fish with the same frequency was done by 39.8% (n = 386). Most of the students (n = 428, 43.6%) said that they did not eat seafood such as shrimps, oysters, and lobsters in the month before the data collection period. Besides, the intake of meat from beef, mutton, or lamb was not common. The frequencies of eating fish and seafood such as shrimps, oysters, and lobsters were significantly and negatively associated with overweight and obesity among the participants ($p < 0.05$). That is, as the frequency of eating fish, shrimps, lobsters, and oysters increases, the frequency of overweight and obesity decreases among the students.

3.8. Vegetables and fruits eating habits and overweight and obesity among participants

Fruits and vegetables were not frequently consumed by participants. Only 386 students (39.3%) ate vegetables more than four times a week and 302 (30.8%) ate vegetables two to four times a week. The same trend was observed in fruit consumption, 28.3% (287) ate fruits more than four times per week and 285 (29.1%) ate fruits two to four times per week. There was no significant association between vegetable and fruit-eating habits and overweight and obesity among the students.

3.9. Snacks eating habits and overweight and obesity

Many of the participants ate sweets such as candy two to four times a week (n = 326, 33.2%) and 253 (25.8%) of the participants ate sweets more than four times per week. More than half of them (n = 563; 57.4%) reported eating biscuits or cakes as snacks in the month before the data collection period. However, the frequency of eating biscuits and cakes was significantly associated with overweight or obesity among the students ($\chi^2 = 24.633$, $p = 0.017$).

4. Discussion

This study was designed to determine the prevalence of overweight and obesity and examine the association between dietary factors and overweight/obesity among school-going adolescents in The Gambia. Most of the students had normal body weight. However, this study found a double burden of underweight and overweight/obesity among the students. The prevalence of underweight was higher than that of overweight and obesity. There was a significantly higher number of female students who were overweight than their male counterparts. The frequency of drinking sugar added juices and full cream milk, eating fish, shrimps, oysters, lobsters, and snacks such as cakes and biscuits were significantly associated with overweight and obesity among the participants.

This study finding is similar to the findings of the study done on university students in Malaysia (Gan et al., 2011). It is also partly in agreement with a report from a study conducted by Waweru and Marete (2016) on the relationship between eating habits and BMI of students in Mount Kenya University, Rwanda that showed the prevalence of underweight (14%) to be higher than that of obesity (1%) but lower than

Table 4. Association between protein eating habits and over-weight and obesity among students in public and private schools in The Gambia, 2019.

Frequency of taking proteins	n (%) n = 981	Underweight or Normal weight n = 898	Overweight or obesity n = 83	p-value
Ate beans, groundnut, or cashew				0.262
Never in last month	101 (10.3)	90 (10.0)	11 (13.3)	
1-3 times in last month	200 (20.4)	182 (20.3)	18 (21.7)	
Once per week	257 (26.2)	235 (26.2)	22 (26.5)	
2-4 times per week	239 (24.4)	221 (24.6)	18 (21.7)	
More than 4 times per week	184 (18.8)	170 (18.9)	14 (16.9)	
Ate chicken, duck, or turkey				0.471
Never in last month	78 (8.0)	69 (7.6)	16 (19.3)	
1-3 times in last month	164 (16.7)	154 (17.1)	26 (31.3)	
Once per week	204 (20.8)	182 (20.3)	22 (26.5)	
2-4 times per week	345 (35.2)	319 (35.5)	10 (12.0)	
More than 4 times per week	190 (19.4)	174 (19.4)	9 (10.8)	
Ate eggs boiled or fried				0.142
Never in last month	141 (14.4)	130 (14.5)	11 (13.3)	
1-3 times in last month	210 (21.4)	199 (22.2)	11 (13.3)	
Once per week	198 (20.2)	177 (19.7)	21 (25.3)	
2-4 times per week	283 (28.8)	263 (29.3)	20 (24.1)	
More than 4 times per week	149 (15.2)	129 (14.4)	20 (24.1)	
Ate beef, mutton, or lamb				0.214
Never in last month	244 (24.9)	229 (25.5)	15 (18.1)	
1-3 times in last month	263 (26.8)	241 (26.9)	22 (26.5)	
Once per week	209 (21.3)	185 (20.6)	24 (28.9)	
2-4 times per week	186 (19.0)	173 (19.3)	13 (15.7)	
More than 4 times per week	79 (8.1)	70 (7.8)	9 (10.8)	
Ate fish				0.004
Never in last month	47 (4.8)	348 (38.8)	38 (45.8)	
1-3 times in last month	71 (7.2)	365 (40.6)	25 (30.1)	
Once per week	87 (8.9)	78 (8.7)	9 (10.8)	
2-4 times per week	390 (39.8)	68 (7.6)	3 (3.6)	
More than 4 times per week	386 (39.3)	39 (4.3)	8 (9.6)	
Ate seafood such as shrimps, oysters, lobsters				0.044
Never in last month	428 (43.6)	397 (44.2)	31 (37.3)	
1-3 times in last month	162 (16.5)	144 (16.0)	18 (21.7)	
Once per week	185 (18.9)	167 (18.6)	18 (21.7)	
2-4 times per week	112 (11.4)	107 (11.9)	5 (6.0)	
More than 4 times per week	94 (9.6)	83 (9.2)	11 (13.3)	

Statistical analysis by chi-square test: beans, groundnut or cashew intake by weight classification, 12.355; chicken, duck or turkey intake by weight classification, 6.181; eggs intake by weight classification, 14.355; beef, mutton, and lamb intake and weight, 13.746; fish intake and weight, 29.186; seafood intake and weight, 17.968.

that of overweight (20%). The overall prevalence of overweight and obesity was 7.9%, of which 5.8% were overweight and 2.1% were obese. Although the adolescents in the [National Nutrition Survey of The Gambia \(2015\)](#) were not specifically all school-going adolescents, the frequency of overweight and obesity of 6.9% and 2.2 % respectively are similar to the findings in this study. In addition, the prevalence of overweight and obesity found among adolescents in this study is comparable to the report of a study conducted in sub-Saharan Africa (SSA) in 2014 in which the prevalence of overweight was 10.6% and obesity was 2.5% ([Muthuri et al., 2014](#)). [Otemuyiwa and Adewusi \(2012\)](#) reported similar findings among undergraduate students in two universities in southwestern Nigeria. In contrast, studies conducted in Ghana and Uganda ([Peltzer and Pengpid, 2011](#)) found a higher prevalence of overweight (13.6%) but a lower prevalence of obesity (1.4%) among adolescents than that of this study. A Canadian survey among youth also reported a higher level of overweight and obesity (29% and 9% respectively) ([Shields, 2008; Tremblay et al., 2012](#)). Also, a meta-analysis for childhood obesity studies done in the USA found much higher obesity as 18.4% ([Ogden et al., 2012](#)). These differences could be a result of socio-cultural disparities,

which may affect the lifestyle, food habits, and health behavior of the students.

There was no statistically significant association between the students' age groups and their BMI status. This may be due to the reason that adolescents in the same age-group but different sexes have different BMI interpretations. The lack of association may be also due to the cross-sectional design of the study or even because there is no association.

However, in the Australian National Children's Nutrition and Physical Activity Survey ([Commonwealth Scientific Industrial Research Organisation, 2007](#)), 25% of boys and 30% of girls aged 9- to 13-year-olds and 25% of boys, and 23% of girls aged 14- to 16-year-olds were overweight or obese using the IOTF criteria but a result of testing the significant association between the age groups and BMI was not reported.

The frequency of overweight and obesity was found to be higher in girls than boys in this study. Similar findings have been noted by various investigators in The Gambia ([Gambia Bureau of Statistics, 2014; National Nutrition Survey of The Gambia, 2015](#)) and in sub-Saharan Africa ([Micklesfield et al., 2013; Muthuri et al., 2014; Peltzer and Pengpid, 2011; Sartorius et al., 2015](#)). On the contrary, findings of studies

conducted in India and China indicated a higher percentage of overweight and obesity in boys (Bhargava et al., 2016; Gupta et al., 2011; Song et al., 2013). The possible reason for the higher rate of overweight and obesity in girls in this study could be related to the fact that the Gambia culture encourages boys to participate in energy spending activities such as playing football, volley ball, athletics etc, while girls are expected to be helping in the house chores or doing indoor games. Besides, during the adolescence period, there is usually an increase in fatness among females but an increase in muscle and bone mass in males leading to decrease in their fatness (Rohilla et al., 2014).

A quarter of the student participants reported taking at least one bottle of sugar-sweetened beverages and full cream milk per day and 40% of them consumed fried food daily. There was a significant association between the frequency of consumption of beverages, fried foods, full cream milk, biscuits/cakes with overweight and obesity among the students. The daily consumption of biscuits/cakes and sweets was high. The eating habit of the students in this student reflects the lack of school food programmes for students in the urban areas and the Gambian diet. Most of the people in the Gambia eat three main meals per day (i.e., breakfast, lunch, and dinner) with snacks in between. However, many of the students in this country buy their breakfast and lunch from the schools' food vendors because the timing of these meals usually finds them at school. Fried foods, full cream milk, biscuits/cakes, and soft drinks are sold by street vendors, shops and school canteens and can be easily available to students in the urban areas of the Gambia. This may be the cause of the high frequency of consumption of these foodstuffs observed in this study. The frequent consumption of fried foods, sweets/chocolates, sugar-sweetened beverages, and cakes were reported to be associated with overweight and obesity among University students in Urban Cameroun (Niba et al., 2017). The frequency of consuming snacks per week was also found to be associated with overweight and obesity among undergraduate students in Rwanda (Waweru and Marete, 2016). The less frequent consumption of fruits, vegetables, and animal proteins such as beef, eggs, chicken, oysters, and lobsters among the students in the current study could be explained by the high prices of these foodstuffs in the Gambia. In addition, it is not a common practice in The Gambia for people to eat raw vegetables and fruits with their main meals. Fish was commonly eaten and was associated with overweight and obesity. Likewise, the consumption of cereals such as rice and maize was also common but not associated with overweight and obesity. High consumption of calorie foods among Omani adolescents did not prevent them from maintaining normal weight status (Kilani et al., 2013). The unhealthy dietary habit found among students in this study is typical of the student population in Africa such as in Cameroun (Waweru and Marete, 2016) and Nigeria (Otemuyiwa and Adewusi, 2012).

4.1. Limitations and strengths of the study

The study participants participated voluntarily which might lead to a selection bias. Dietary habits were reported by participants but not observed and this might lead to recall bias. The result of this study cannot be generalized to all the students in the Gambia because only the students from one out of the six administrative regions of the country participated in the study. The study used a cross-sectional design, hence cause and effect could not be measured. Additionally, the level of physical activity of the study participants was not assessed but it can have effect on their weight status. The strengths of this study include that the confounding effect of socioeconomic status on weight status of the participants was reduced by including students from different schools (public and private) and socioeconomic backgrounds. Students in private schools in The Gambia are usually of a higher socioeconomic background compared to those in public ones. This is as a result of the higher tuition fees in private than public schools in The Gambia.

4.2. Summary and conclusion

Most of the students in this study have normal weights. However, nutritional problems such as underweight, overweight, and obesity were found among them. Overweight and obesity were more frequent among female students than their male counterparts. Overweight and obesity among the students were associated with their frequency of consumption of beverages, fried foods, full cream milk, and biscuits/cakes.

In conclusion, the problem of undernutrition and overnutrition co-existed among the students which were associated with poor eating habits.

4.3. Recommendations

The students should be encouraged to adopt healthy dietary practices. There is a need to increase their awareness of the known role of overweight and obesity in the development of chronic diseases such as diabetes, hypertension, and heart failure. This can be done by integrating nutritional education as a core subject taught in the Senior Secondary Schools of The Gambia. There is a need to determine the prevalence of overweight and obesity among the adolescent and youth population nationally to be able to advocate for resources to address the conditions. The determinants of healthy eating habits among adolescents in The Gambia should be investigated.

Declarations

Author contribution statement

Haddy Tunkara-Bah: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Haddy Jallow Badjan: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data.

Thomas Senghore: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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