Assessment of Dietary Diversity and Nutritional Status of Young Nigerian Undergraduates

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ABSTRACT

Background: Lack of nutrition information is a serious challenge facing young adults in some countries resulting in their ignorance of the nutritional values of various foods.

Objective: This study determined the dietary diversity of undergraduate students of Alex Ekwueme Federal University Ndufu Alike Ikwo (AEFUNAI).

Methods: Simple random sampling technique was used in selecting 470 students (234 males and 236 females) between the ages of 17-27 years. A pre-tested semi-structured interviewer–administered questionnaire was used to collect socio- demographic information and 24-hour diet recall. Anthropometric data was collected using standard procedures. Dietary diversity (DD) was determined using 14-food group dietary diversity model and terciles were created to categorize individual dietary diversity (low: 1-4; average: 5-9; high: 10-14). Data were analysed using descriptive statistics, ANOVA and Chi-square. Statistical significance was determined at 5% level ($P < 0.05$).

Results: Mean age, height, weight and BMI of respondents were 21.2± 2.5 years, 1.69 ± 0.03m, 64.4 ± 9.2kg and 22.7 ± 3.0kg/m^2 respectively. Obesity was significantly higher in females (22.9%) than males (9.8%), ($P < 0.05$). Dietary diversity scores (DDS) was 5.0 ±2.74, and majority (57.9%) scored low. Food consumption by the respondents was significantly different ($p<0.05$) in two food groups. More males (53.9%) skipped lunch while more females (43.9%) skipped breakfast.

Conclusion: The respondents had low dietary diversity with obesity higher in females than males. Nutrition education on adequate dietary practices is recommended.

Keywords: Dietary diversity, food groups, young Nigerians, undergraduate

INTRODUCTION

Dietary Diversity has been defined as the number of different foods or food groups consumed by the house hold or individual over a given reference period (1). Dietary diversity has been considered as an indicator to reflect nutrient intake adequacy (2). Several studies have shown that diverse foods improved the overall nutritional quality of a diet (3). Since no single food contains all essential nutrients, selection of variety of foods in a diet is considered vital in delivering most nutrients without overeating (4, 5). The more food groups consumed daily the greater the likelihood of meeting nutrient requirement essential for optimal health (6).Studies by (7, 8) have demonstrated the positive association between dietary diversity and nutrient adequacy of the diet. The prevalence of micronutrient deficiency in developing countries may be attributed to their habitual dependency on monotonous and cereal-based choice of diets that are energy dense and

lack diversity, with little or no diary product, fruits and vegetables (7, 9). Therefore, diversity in diet and healthy eating is paramount in meeting the increased nutrient need/requirements of undergraduates, who are among the nutritionally endangered age groups where nutrient deficiency is concerned (10). Dietary diversity scores have been validated for most dietary guidelines and for several age/sex groups as a proxy that measures food security, and of adequate intake of key macro and/or micronutrients in diet (6, 11). Therefore, diversity in the diet is important to meet the requirements for energy and other essential nutrients especially for those who are at risk of nutritional deficiencies.

Development of healthy or unhealthy eating habits during adolescence and early adulthood is one among the key factors that has influence on chronic diseases which tend to stay throughout life (12). These unhealthy habits often lead to malnutrition with the resultant increase in the susceptibility to preventable diseases.

In Nigeria, there is an increase in fast food centers in its urban cities, which has made the youth vulnerable to poor eating habits of consuming "junk foods" (13) which is a major concern (14, 15). University undergraduates have been identified as a vulnerable group for nutrient deficiency due to inadequate food intake and unhealthy dietary habits (16). Many students are often unaware of the nutritional values of the foods they eat (17) which makes them engage in several problematic eating habits which include unhealthy dieting, high intake of fast food, skipping breakfast, inadequate physical activity, low intake of fruits and vegetables, and minimal consumption of dairy products (18, 19, 20). These poor eating habits may likely arise from lack of knowledge of the cumulative effects of their eating habits, lack of adequate fund or diversion of their feeding allowance to other frivolities and so skip some meals (21).

Most undergraduates are likely to be responsible for their diets for the first time away from home, therefore they need guidance on how to make informed dietary choices (22). It is therefore important to pay special attention to dietary patterns of university students, especially undergraduates, and evaluate their dietary diversity. Thus, this study was carried out to identify the dietary diversity, body mass index and nutritional status of undergraduate students in Alex Ekwueme Federal University Ndufu Alike (AEFUNA).

MATERIALS AND METHOD

Study design: This was a descriptive cross-sectional study with random sampling of undergraduate males and females of Alex Ekwueme Federal University Ndufu-Alike, Ikwo (AE-FUNAI).

Study area: The study was carried out in Alex Ekwueme Federal University Ndufu-Alike Ikwo (AE-FUNAI), Ebonyi State. The institution is located in Ikwo Local Government Area of Ebonyi State which is about 25 kilometers from the State capital, Abakaliki. The university has a population of about four thousand six hundred and thirty four (4,634) students comprising of 2239 female students and 2395 male students.

Subjects and Sample size: A total of 470 students (234) males and (236) females between 17 to 30 years were randomly selected from the different faculties. The minimum sample size was determined using the simplified formula for proportion (23):

n = N

1 + N (e) 2

Where n is the sample size, N is the population size and e is the level of precision which is $(0.05)2$. Thus; n = 4,634/ 1+4,634 $(0.05)2$ =368.

The sample size was increased to 470 participants because of attrition.

Time and duration of the study: Data collection was carried out from May to June, 2018.

Anthropometric Measurements:
The height was measured to the nearest 0.1cm using a wooden standiometer. The weights of the participants were measured to the nearest 0.1kg using a portable bathroom scale (Hana bathroom scale Model). Individual heights and weights were then used to calculate Body Mass Index (BMI = Weight /Height^2).

The BMI calculated was compared with World Health Organization (24) standard. The BMI of the undergraduate students was classified as follows:

b. (i) Underweight: < 18.5 Kg/m^2
c. -(ii) Normal: 18.5 - 24.9 Kg/m^2
d. (iii) Overweight: 25- 29.9 Kg/m^2
e. (iv) Obesity: 30 and above Kg/m^2

Dietary Assessment: Trained interviewers conducted 24-hour dietary recall with a pre-tested questionnaire to obtain information on the subjects' food intake. Students were asked to

recall all foods and beverages taken in the previous twenty-four hours prior to the interview.

i. Dietary Diversity: Dietary diversity score was assessed from the information collected from the 24-hour dietary recall of the subjects, using a scale of fourteen food groups according to FAO guidelines for measuring individual dietary diversity (11).

ii. Classification of Dietary Diversity Terciles:

Dietary Diversity terciles were derived from the fourteen (14) food groups and categorized into low (1-4), medium (5-9) and high (10-14) dietary diversity Score.

Statistical Analysis: The statistical package for social sciences (SPSS version 17) was used. Data were analysed using descriptive statistics and chi-square. Significant difference was determined at $p < 0.05$

RESULTS

Table 1 shows that the subjects were made up of 234 (49.8%) males and 235 (50.2%) females. The mean age, height and weight males were 21.72 ± 2.80 years, 1.74±0.1m and 66.8± 8.7kg, respectively, while the mean age, height and weight for the females were 20.7± 2.12 years, 1.64 ±0.06m, 62.07 ± 9.75kg, respectively.

Table 2 shows that about 35.5% of males and 36.4% of females received monthly allowance of between ₦1,000 and ₦5,000 and are classified as poor, while 28.2% of males and 27.5% of the females received monthly allowances of #11,000 and above and were considered above average.

Table 3 shows that majority (77.7 %) of the subjects consumed foods from cereal products, 58.3% from white tuber, 47.9 % from other vegetables, 1.5 % from Vitamin A fruits, 6.6% from flesh meat, 14.3% from egg, 81.1% from fish, 50.3% from legumes and nuts and 88.7% ate foods from oils and fats.

Table 1: Distribution of age and anthropometric indices of respondents

Sex		Minimum	Maximum	Mean	Standard deviation
Males					
	Age (years)	17	31	21.7	±2.80
	Height (m)	1.52	1.9	1.7	±0.07
	Weight(kg)	40	93	66.8	±8.65
	BMI (kg/m^2)	15.74	31.6	22.2	±2.42
Females	Age (years)	17	27	20.6	±2.12
	Height (m)	1.49	1.8	1.6	±0.06
	Weight(kg)	42	102	62.1	±9.75
	BMI (kg/m^2)	16.82	43.0	23.2	±3.49

Table 2: Monthly allowances of respondents

Monthly Allowance	Males N (%)	Females N (%)	Total N (%)
₦1,000 - ₦5,000 (Poor)	83 (35.5)	86 (36.4)	169(36.0)
₦6,000-₦ 10,000(Average)	85 (36.3)	85(36.0)	170 (36.2)
₦11,000 & Above (High)	66 (28.2)	65(27.5)	131 (27.9)
TOTAL	234 (100)	236(100)	470 (100)

Table 3: Percentage of food groups consumption among the male and female respondents

S/N	Food Groups	Males N (%)	Females N (%)	Total N (%)
1	Cereals	174(74.4)	191(80.9)	365(77.7)
2	Vitamin A vegetables and tubers	18(7.7)	8(3.4)	26 (5.5)
3	White tubers and roots	149(63.7)	125(53.0)	274(58.3)
4	Dark green leafy vegetables	98(42.3)	91(38.6)	189(40.2)
5	Other vegetables	84(35.9)*	141(59.8)*	225(47.9)
6	Vitamin A rich fruits	1(0.4)	6(2.5)	7(1.5)
7	Other fruits	20 (8.6)	28(11.9)	48 (10.2)
8	Organ meat (iron rich)	0 (0.0)	0 (0.0)	0 (0.0)
9	Flesh meat	12 (5.1)	19(8.1)	31(6.6)
10	Eggs	23 (9.8)	44(18.6)	67(14.3)
11	Legumes, nuts and seeds	140(59.8)*	98(41.5)*	238(50.3)
12	Fish	183(78.2)	198(83.9)	381(81.1)
13	Milk and milk products	17(7.3)	29(12.3)	46(9.8)
14	Oil and fats	203(86.8)	214 (90.7)	417(88.7)

Note: N = Numbers, % =Percentage. Calculation for male and female students was based on 234 subjects for males, 236 f0r females while total was based 470 subjects. * Values that are significantly different (p<0.05) between males and females. The fourteen food groups was used for individual dietary assessment (11).

Table 4 shows that Diet diversity scores (DDS) of individual subjects ranged from 1 to 9. The dietary diversity of highest frequency for males and females were 4(24.8%) and (22.5%), while the lowest frequency was 9 (0.4% and 0.4%) food groups respectively (p >0.05). About 57.9% of the participants had low DDS (1-4) while 42.1% had average/medium DDS (5-9), none was on high tercile of 10-14 food groups.

Table 5 shows that the minimum DDS was 1, maximum 9 and mean DDS was 5±2.74 for both male and female students

Table 6 shows that more females (43.9%) skipped breakfast than males (31.2%) while more males (53.9%) skipped lunch than Females (46.0%). More respondents (49.8%) consumed lunch than breakfast (37.7%).

Table 7 shows that majority of the students (76.8%) were within the normal range. About 9.8% of males and 22.9% of the females were overweight (p<.05) while 0.4% and 4.2% of the females were overweight respectively (p<.05)

Table 4: Dietary diversity score and Dietary Diversity Terciles of respondents

Dietary Diversity Score	Males N = 234 (%)	Females N =236 (%)	Total N = 470 (%)	P-value
1	11.1	8.5	4.2	0.64
2	8.6	6.8	3.3	0.60
3	14.5	19.1	7.1	0.45
4	24.8	22.5	10.1	0.62
5	21.4	19.9	8.8	0.86
6	12.8	12.7	5.4	1.00
7	6.0	7.2	2.8	0.77
8	0.4	3.0	0.7	
9	0.4	0.4	0.2	
Dietary Diversity Terciles	Males N (%)	Females N (5)	Total N (%)	
Low	138 (59.0)	134 (56.2)	272 (57.9)	
Average	96 (41.0)	102 (43.2)	198 (42.1)	
High	O	0	0	
Total	234 (100.0)	236 (100.0)	470 (100.0)	

Note: N= Number, %= Percentage, Low (1-4 food groups), Medium (5-9 food groups), High (10-14 food groups).

Table 5: Comparison of dietary diversity scores (DDS) of respondents

Sex	N	Minimum	Maximum	Mean	SD
Males	234	1	9	5	2.74
Females	236	1	9	5	2.74

SD = Standard deviation

Table 6: Meal skipping by respondents

Meal Skipped	Males N (%)	Females N (%)	Total N (%)
Breakfast	73 (31.2)	104 (43.9)	177 (37.7)
Lunch	126 (53.9)	108 (46.0)	234 (49.8)
Dinner	5 (2.1)	6(2.5)	11(2.3)
None	30 (12.8)	18(7.6)	48(10.2)
Total	**234 (100)**	236 (**100**)	**470 (100)**

Note: Sample size for males was 234, females- 236, total- 470, N= Number, %= Percentage

Table 7: Nutritional status of the subjects.

Variable BMI Category	Male N (%)	Female N (%)	Total N (%)
Underweight (<18.5)	11 (4.7)	10 (4.2)	21 (4.5)
Normal weight (18.5- 24.9)	199 (85.0)	162 (68.6)	361 (76.8)
Over weight (25.0-29.9)	23 (9.8)	54(22.9)	77 (16.4)
Obese (30.0-34.9)	1(0.4)	10 (4.2	11 (2.3)
Total	234 (100.0)	234 (100.0)	470 (100)

Note: Sample size for males was 234, females- 236, total- 470, N= Number, %= Percentage

DISCUSSION

Dietary diversity is the number of different food groups consumed over a reference time period not regarding the frequency of consumption (25). It is a proxy used to quantify the nutritional quality of an individual diet as it assesses the risk of nutrient deficiency (6). Nutrient adequacy can only be ensured and increased if individuals keep consuming a wide variety of food groups in their diet, since no single food has it all (4). This study found out that the dietary diversity score of individual respondent ranged from 1-9 food groups which was the same with report of (26) among students in India but lower than the score found by (27) who reported DDS of 2 to 11 in their study of women of reproductive age in South-East Nigeria. No difference was observed in the DDS of the males and females. This in contrast to report by (28) who reported that males had a higher DDS compared to females.

More females (43.9%) skipped breakfast than males (31.2%).This result is consistent with the reports of (28, 29) who found that more females skipped breakfast than males in their study of dietary assessment of undergraduates in Southern Nigeria and nursing students in Egypt respectively. Umeh-Idika, and Chimechefulam (30) in their study on students in Umudike reported that the major factors that made students skip meals were habit formed about foods. Lack of time, insufficient money, health conditions, the presence of convenience foods.

The mean dietary diversity Score for the students was 5 ± 2.74 out of 14 food groups which was poor. This result is similar to the study by (26) among students in India and (31) and (32) among undergraduates and rural women respectively and (33) in six Nigerian states. This is in contrast to findings of (27) and (34) who reported higher DDS in women in South-East Nigeria and Osun States respectively. About 57.9% ate between 1-4 foods groups per day. The skipping of breakfast and lunch by 37.7% and 49.8% of the respondents respectively must have contributed to the low DDS. This is similar to the results obtained by (31) in his study among undergraduates in South-west Nigeria who attributed the low DDS of students to absence from home and their parents. This poor dietary diversity score observed among the students could be attributed to lack of time to prepare or eat food due to tight lecture schedules and poor income because 72.4% of the students received #10,000.00 ($27.7) and below as their monthly allowance under the harsh economic condition in Nigeria now. The result of this study corroborated to a study carried out in Tanzania which reported low consumption of food groups due to financial constraint (4).

Fats and oil, fish and cereals were the most consumed food groups by the respondents while flesh meat, Vitamin A rich fruits and organ meat, were the least consumed food groups. The meal pattern of the respondents obtained in this study is consistent with the findings of (35, 34) who reported low intake of fruits, dairy, meat and vegetables in their studies. Herrador et al. (36) in their study among school age children in Ethiopia found out that rural settlement was the cause of low consumption of foods from animal sources. This could be true of this study because the location of AE-FUNAI is in the rural area of Ikwo local government area of Ebonyi State where market day comes up every four days. Financial constraints can also be a factor because organ meat is generally more expensive than fish and flesh meat.

There was significant difference (p<0.05)

between males and females in their consumption of only two food groups (other vegetable, legumes nuts and seeds) but there was no significant difference ($p>0.05$) in DDS between male and female and in their consumption of the remaining twelve food groups. Dietary fibre from cereals, rather than fruits or vegetables, has been reported to be more protective against the development of several chronic diseases (37, 38).Low consumption of fruits and vegetables is among the top ten risk factors selected for global mortality and has been reported to cause approximately 1.7 million deaths globally (39).

The university environment plays a role in altering dietary habits of students due to academic workload (30). The fact that they are away from their homes and parents due to studies make them responsible to eat and prepare their own meals.

Overweight and obesity prevalence were significantly higher among the female undergraduates than male undergraduates ($p< 0.05$). The result corroborates with the results of Sedodo et al., (31) and (40) who reported higher over weight and obesity in girls than boys in their study in South West Nigeria and University of Nigeria respectively but in contrast to the study carried out by (41) in Indian university and (42) in Kerbala, Iraq who reported a higher proportion of obesity and overweight in male students than females. Overweight and obesity are increasingly observed among young people because of the effect of high intake of fast foods (43). Obesity in combination with low consumption of fruits and vegetables, low dietary score and the dependency on fats and oil as the most preferred source of energy by the respondents might increase the risk of developing heart diseases if not corrected (44). Promotion of good nutritional knowledge, healthy eating habits as well as healthy life style may contribute significantly in reducing the prevalence of obesity among young students. Universities can provide an ideal environment for reaching out to a large number of young adults through nutrition education programs that may positively impact students' eating habits

Conclusion: Dietary diversity is poor among young Nigerian undergraduates. To improve the dietary diversity, efforts should focus on increase in monthly allowance and nutrition education.

Conflict interest
The authors declare that there are no conflict of interests.

Consent for publication
Consent for publication is not necessary because this manuscript does not have personal data like individual details, images or videos.

Data and material availability
We declare that the data and material for this manuscript are available.

Ethics approval and consent to participate
Ethical clearance was given by Alex Ekwueme Federal University Ndufu Alike Ethics Committee. The purpose of the study was explained to the students who gave their consent and also dully filled the informed consent forms. Participants (students) were informed of their freedom to withdraw or refuse to take part in the study without prejudice.

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