Dietary Pattern and Prevalence of Overweight and Obesity among Undergraduates of Federal University of Agriculture, Abeokuta.

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ABSTRACT

Background: *Physical inactivity and unhealthy dietary habits are among the main behaviors that potentially have adverse effects on weight status in young adulthood and consequently, the future health of adults.*

Objective: *The study investigated the dietary pattern and prevalence of overweight and obesity among undergraduate students at the Federal University of Agriculture, Abeokuta.*

Methods: *This study was cross-sectional and descriptive survey in design. A multi-stage sampling technique was used to select 300 respondents. Instruments for data collection were questionnaires including 24-hour dietary recall, food frequency questionnaires, global physical activity questionnaires, and anthropometric tools. Height, weight, waist, and hip circumference were computed to determine the respondents' body mass index and waist-to-hip ratio respectively. Descriptive statistics were carried out on data collected with SPSSV20.0.*

Result: *Respondents were between ages 16-29 years with mean and standard deviation age, height, weight, and BMI as 21.46years±2.30, 1.69m±0.08, 64.82kg±10.29 and 22.62kg/m2±3.48 respectively. The proportion of underweight, normal-weight, overweight, and obese were 9.7%, 69.0%, 18.3%, and 2.9% respectively. 26.0% of respondents had abdominal obesity. 60.7% engaged in high physical activities. 25.6%, 10.7%, and 63.7% had inadequate, adequate, and excess energy/calorie intake relative to RDA. Cumulative weekly most consumed foods were pasta, sugar, biscuits, garri, etc., and low intake of fruits and legumes.*

Keywords: Dietary pattern, Prevalence, Overweight, Obesity and Undergraduates.
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INTRODUCTION

Overweight and obesity are global problems that keep increasing at disturbing rate [1]. Overweight and Obesity contributes directly to incident cardiovascular risk factors, including dyslipidemia, type 2 diabetes, hypertension, and sleep disorders [2]. In addition, the compromised quality of life and reduced life expectancy arising from overweight and obesity are related to coronary heart disease, stroke, asthma, and several cancers [3]. According to (WHO 2021), at least 2.8 million adults die each year because of being overweight or obese [4].

Diet is a very important factor in the pathogenesis of overweight and obesity [5]. Poor feeding habits, such as skipping meals, especially breakfast, low intake of fruits and vegetables, milk, and fish, and high intake of fast food, sweets, and sugar-sweetened beverages are present in the diets of University students [6]. Some feeding patterns which include meal skipping, snacking (usually on energy-dense foods), and lopsided and wide use of fast foods appear quite common among young people, some of which have been linked with overweight, obesity, and other medical conditions, which may result from consumption below or above recommended dietary intake [6]. Common barriers to healthy eating among undergraduates were time constraints, unhealthy snacking, convenience of high-calorie food, stress, high prices of healthy

food, and easy access to junk food [7].
Some students see poor dietary patterns as temporary and a means of survival, with the feeling that academic pursuit is their primary purpose in school, as a result of this, pay little attention to healthy eating and diets [8]. At present, there is limited data from the southwestern region of Nigeria on the magnitude of overweight and obesity and dietary patterns among young adults, and this is a significant gap in knowledge. Generally, young adults are often presumed healthy and are therefore rarely the subjects of obesity research (as opposed to children, adolescents, and the elderly), if left unchecked, which will constitute future risks for associated non-communicable diseases among undergraduates [9].
Assessing dietary patterns and the prevalence of overweight and obesity among the Federal University of Agriculture, Abeokuta Undergraduates can provide data and serve as a basis for initiating nutrition and health education programs that can foster healthy lifestyles and behavior change among undergraduates. Hence, this study assessed the dietary pattern and prevalence of overweight and obesity among undergraduates of the Federal University of Agriculture, Abeokuta.

MATERIAL AND METHODS

Study Design
The study was cross-sectional and descriptive in design.

Study Area and Location
The study was conducted at the Federal University of Agriculture, Abeokuta located along Alabata road in Odeda Local Government Area of Ogun State (Latitude 7° 30'N and Longitude 3° 54'E), South Western region of Nigeria.

Study Population
The participants were 300 full-time undergraduate students of the Federal University of Agriculture, Abeokuta.

Sample Size
The sample size was determined using Fisher's formula and the result was approximated to 300 respondents to cater for attrition and possible dropout.

Inclusion Criteria
Conditions for inclusion of respondents into the study included;
·All respondents must be full-time undergraduate students of the Federal University of Agriculture, Abeokuta (FUNAAB).
· All respondents willing to participate in the study.
· All respondents who are apparently healthy and in stable condition at the time of data collection.

Sampling Procedure/Technique
Multi-stage sampling approach was used to select 300 respondents (undergraduate students) at the university.

First stage: The researcher grouped the 10 colleges in the university with respect to similarities in programs. Five groups resulted as follows.
1. College of Physical Science and College of Engineering
2. College of Food Science and Human Ecology and College of Biological Sciences.
3. College of Plant Science, College of Veterinary Medicine, and College of Animal and Livestock Production.
4. College of Environmental Management and College of Agricultural Management and Rural Development.
5. College of Management Science.

Second stage: A simple random sampling technique was used to select 1 college each from the 5 groups selected in the first stage. The selected colleges were:
1. College of Physical Science (COLPHYS)
2. College of Food Science and Human Ecology (COLFHEC)
3. College of Animal and Livestock Production (COLANIM)
4. College of Agricultural Management and Rural Development. (COLAMRUD)
5. College of Management Science (COLMAS)

Third stage: A proportionate sampling technique was used to pick the number of respondents from each college with respect to each college's population. A total of 300 respondents were achieved from the five colleges.
The university student database was used as the sampling frame, sought from the University Information and Communication Technology Department (ICTREC) through the Head of Department, Nutrition and Dietetics Department. Approval was also sought from the Head of Department, Nutrition and Dietetics Department on data collection. Data were collected for four Thursdays starting June 27th, 2021 to July 18th, 2021.
Research Instrument: The study data were drawn from primary sources using a self-administered

structured questionnaire divided into six sections and anthropometry tools.

Section A: Socio-economic and Socio-demographic Characteristics of Respondents.

Demographic data consisted of questions on personal details such as age, gender, ethnic group, etc. The socioeconomic data included parent occupation, estimated income, and income-generating activities.

Section B: Physical Activity Level.

The questionnaire was adapted from the World Health Organization's "Global Physical Activity Questionnaire" GPAQ [10]. It contains questions related to physical activity at work, travels, and during leisure/recreational activities

Section C: Dietary Intake

The 24-hour dietary recall questionnaire contained questions on what the respondents ate for the past 24 hours before the day of data collection as used by [11]. Respondents were probed for in-between meals, food, and drinks intake quantities were estimated using household utensils and food models. The average weight was estimated to the nearest gram. Energy, Carbohydrate, Protein, and Fat intake of the respondents were analyzed using Nutri-Survey for Windows and percentage adequacy was calculated relative to the RDA. [12].

Section D: Dietary Pattern

A validated Food Frequency Questionnaire was administered to the respondent, containing lists of foods and the frequency of the respondent's consumption of such foods. Respondents were guided on how to fill it and it was completed by them [13].

Assessment of Nutritional Status of Respondent Using Anthropometry

The Anthropometric measurements were taken using standard procedures [14]. Respondent's height and weight were measured using well calibrated height meter and bathroom weighing scale respectively. The respondents were asked to stand erect, and barefooted, and height was recorded to the nearest 0.5cm. The weighing scale was placed on an even surface, well-calibrated, and zeroed, and respondents were asked to remove their footwear and other heavy wear before standing on it. Readings were taken to the nearest 0.1kg and parallax error was avoided.

Waist and hip circumference were taken using constant tension tape. Waist circumference was measured twice while standing erect, midway between the lower hip and iliac crest, arms at the side, and feet together, at the end of normal expiration to the nearest 0.5cm. Hip circumference was measured twice at the point of greatest circumference around the hip and buttocks recorded to the nearest 0.5cm. Research assistants were trained in the use of the data instruments. Untallied figures of both waist and hip circumference were confirmed with a third measurement, average was used for data analysis.

Data Analysis

Data generated from questionnaires were coded and analyzed using SPSS V20.0 for Windows. Frequency distribution, mean and percentages were computed, cross cross-tabulation was used to compare two variables. Data from 24-hour dietary recall was analyzed using the Nutri-Survey for Windows. Body mass index was calculated using the formula weight/(height)2. Chi-square (2) was used to test for statistical significance between variables and $P<0.05$ was considered significant. The result was presented using tables, text, and charts.

Informed Consent

Before the study, permission to embark on the study was obtained from the Department of Nutrition and Dietetics, Federal University of Agriculture, Abeokuta. Consent was sought from respondents by asking them to append signatures on questionnaires before filling after the research objective was explained to them. Undergraduates who did not give consent were excluded.

RESULT

Socio-demographic and Socio-economic Characteristics of the Respondents

The results in Table 1 show 52% of the respondents were male. 67% were between 20 to 23 years old, 75.7% were Yoruba, 69.7% were Christians, and 89.3% were single. Of the respondents' major source of income, 52.7% depend on both their father and mother. 40.3% have their father's occupation as civil servants. The respondent's mother's occupation amounted to 54.7% as a businesswomen. 27.7% have estimated monthly income above N15,000. 61.3% have no other income-generating activities.

Table1: Socio-demographic and Socio-economic Characteristics of the Respondents(N = 300)

Background Information	Variable	Frequency (F)	Percentage (%)	Mean ± S.D
Age	16-19	6	2.0	21.46 ± 2.30
	20-25	201	67.0	
	24-27	91	30.3	
	28-31	2	0.7	
Gender	Male	156	52.0	
	Female	144	48.0	
Ethnic group	Hausa	23	7.7	
	Igbo	39	13.0	
	Yoruba	227	75.7	
	Others	11	3.7	
Religion	Christianity	209	69.7	
	Islam	89	29.7	
	Others	11	3.7	
Marital Status	Single	268	89.3	
	Married	18	6.0	
	Divorced	6	2.0	
	Others (i.e. engaged)	8	2.7	
Major Source of Income	Self	40	13.3	
	Father	59	19.7	
	Mother	30	10.0	
	Both	158	52.7	
	Others	13	4.3	
Father's Occupation	Civil Servant	121	40.3	
	Business Man	115	38.3	
	Artisan	24	8.0	
	Unemployed	14	4.7	
	Others	26	8.7	
Mother's Occupation	Civil Servant	90	30.0	
	Business Man	164	54.7	
	Artisan	26	8.7	
	Unemployed	12	2.7	
Estimated monthly Income	<2000	19	6.3	
	2001-5000	44	14.7	
	5001-10000	82	27.3	
	10001-15000	72	24.0	
	>15000	83	27.7	
Other income activities	Have other income Activities	116	38.7	
	No other income activities	184	61.3	

Physical Activity Level of Respondents

Table 2 shows that 60.7% of the respondents (182 respondents) engage in high physical activities, 27.0% (81 respondents) engage in moderate physical activities and 12.3% (37 respondents) engage in low physical activities.

Nutrient intake and Nutrient Adequacy Ratio of the Respondents.

Table 3 shows the nutrient intake and nutrient adequacy ratio of respondents. 63.7% of the respondents had excess energy intake, 2216 median, and a high nutrient adequacy ratio of

Table 2: Physical Activity Level of the Respondents. (N=300)

Activity Level of Respondents	Frequency (F)	Percentage (%)
High Activity Level	182	60.7
Moderate Activity Level	81	27.0
Low Activity Level	37	12.3

Table 3: Nutrient Intake and Nutrient Adequacy Ratio of the Respondents(N=300)

Nutrient	Median	RDA	NAR	Inadequate N(<60% of RDA)	Adequate N(60-80% of RDA)	Excess N(>80% of RDA)
Energy (kcal)	2216	2500	88.6	77(25.6)	32(10.7)	191(63.7)
Carbohydrate (g)	329.6	344	95.8	1(0.3)	20(6.7)	279(93.0)
Protein (g)	109	156	69.9	137(45.6)	115(38.3)	48(16.0)
Fat (g)	42.6	56	76.1	101(33.7)	72(24.0)	127(42.3)

Table 4: Body Mass Index of the respondent(N=300)

Categories	Frequency (F)	Percentage (%)
BMI (kg/m^2)		
Underweight	29	9.7
Normal weight	207	69.0
Overweight	55	18.3
Obese I	7	2.3
Obese II	1	0.3
Obese III	1	0.3
Waist-to-Hip Ratio		
No abdominal obesity	222	74.0
Abdominal obesity	78	26.0

88.6%. 93% consumed excess carbohydrates, 45.6% consumed inadequate protein, and 42.3% consumed excess fat.

Anthropometric Indices of the Respondent

Table 4 shows that 9.7% of the respondents were underweight, 69.0% were normal weight, 18.3% were overweight, 2.3% were obese grade I, 0.3% were obese grade II, and another 0.3% were obese grade III. 74% have no abdominal obesity while 26% have abdominal obesity.

Table 5: Frequency of food consumption in each food group by respondents

The table shows the frequency at which respondents consume foods in different food groups. Biscuit was consumed by 53 respondents daily, 97 respondents once a week, 41 respondents 2 to 3 times weekly, 52 respondents 3 to 4 times weekly, 8 respondents monthly, and 20 respondents rarely. 90.3% of the respondents consumed biscuits in total. The pasta was consumed by 23 respondents daily, 83 respondents once a week, 111 respondents 2 to 3

times weekly, 42 respondents 3 to 4 times weekly, 14 respondents monthly, and 24 respondents rarely. 99% of the respondents consumed pasta in total. All respondents consumed bread, jollof rice, breakfast cereals, and golden morn. Cassava flakes, eba, amala, plantain, and yam were consumed daily by 40, 22, 25, 9, and 11 respondents respectively. Legumes like beans, groundnuts, and moimoi were consumed by 19, 19, and 15 respondents daily. Dairies like boiled eggs, milk, chicken, and fried eggs were consumed daily by 40, 37, 17, and 11 respondents respectively. 62, 99, 9,6, and 65 respondents rarely consume watermelon, apple, pineapple, and orange respectively. 35, 100, 99, and 94 respondents also rarely consume onion, cucumber, okra, and spinach respectively.

Table 5: Frequency of food consumption in each food group by respondents

N=300	Daily	Once a week	2 – 3 times weekly	4 – 5 times weekly	Monthly	Rarely	Total Percent respondent that consumed	%
Cereals								
Biscuit	53	97	41	52	8	20	271	90.3
Pastas	23	83	111	42	14	24	297	99.0
Bread	20	59	130	51	10	30	300	100
Jollof rice	30	91	117	31	22	9	300	100
Breakfast Cereals	47	55	64	36	19	79	300	100
Golden Morn	47	25	69	35	10	114	300	100
Root and Tubers								
Cassava Flakes	40	41	84	55	27	47	294	98.0
Eba	22	62	62	49	21	38	254	84.6
Amala	25	57	76	20	35	70	283	94.3
Plantain	9	48	54	41	38	91	281	93.6
Yam	11	77	45	23	47	88	291	97.0
Legumes and pulses								
Beans	19	76	54	60	13	31	253	84.3
Groundnut	19	35	114	19	24	82	293	97.6
Moi-moi	15	52	49	36	46	77	275	91.6
Dairy Product								
Boiled egg	40	52	82	36	27	26	263	87.6
Milk	37	82	80	36	2	15	252	84.0
Chicken	17	77	64	28	59	47	292	97.3
Fried egg	11	86	61	29	20	84	291	97.0
Fruits								
Watermelon	21	75	72	33	19	62	282	94.0
Apple	23	72	27	42	21	99	284	94.6
Pineapple	25	78	20	36	29	96	284	94.6
Orange	11	74	39	26	33	65	248	82.6

Table 5: Most Frequently consumed Foods in each Food group (Continued).

Food group	No of respondents that consumed food per frequency							
N=300	Daily	Once a week	2 – 3 times weekly	4 – 5 times weekly	Monthly	Rarely	Total respondent that consumed	Percent
Vegetables								
Onions	135	18	47	50	4	35	289	96.3
Cucumber	20	51	50	30	48	100	299	99.6
Okro	27	38	46	24	45	99	279	93.0
Spinach	25	53	66	12	39	94	289	96.3
Beverages								
Sweetened tea	18	59	36	14	16	152	295	98.3
Soda	9	72	25	9	13	153	281	93.6
Coffee	1	17	13	23	62	176	292	97.3
Sweets								
Sugar	91	57	92	39	3	12	294	98.0
Cakes	9	45	59	59	61	56	289	96.3
Chocolate	10	69	89	34	7	49	258	86.0
Cookies	21	47	75	23	33	94	293	97.6
Fats								
Butter	36	68	66	29	17	67	283	94.3
Margerine	18	33	52	38	25	108	274	91.3
Meat								
Red meat	53	65	78	41	18	29	284	94.6
Turkey	29	69	71	22	57	31	279	93.0
Crayfish	57	57	57	36	28	50	285	95.0
Titus	41	48	75	22	49	56	291	97.0
Mackerel	44	39	38	11	36	104	272	90.6

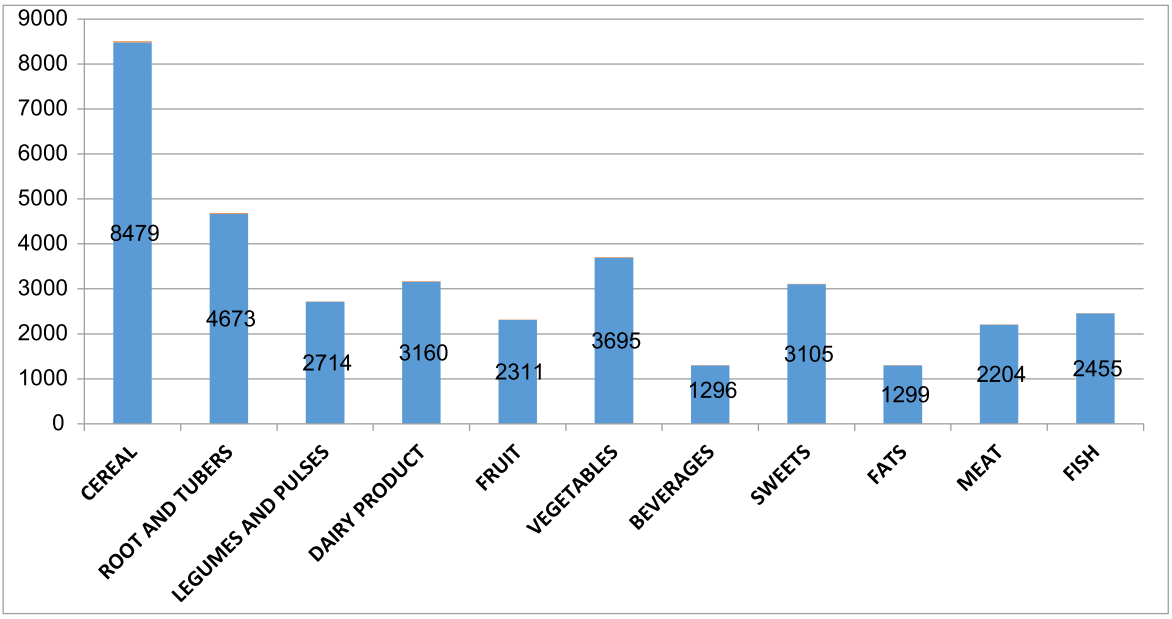

Figure 1: **Cumulative weekly food group consumption**

Most Frequently Consumed Food Groups among the Respondents.

Figure 1 shows the cumulative number of times each food group was consumed in a week by all respondents. Cereal was mostly consumed 8479 times. Roots and tubers 4673 times in a week. Vegetables, Dairy Products, and Sweets were consumed 3695, 3160, and 3105 times respectively. Legumes and Pulses, Fish, Fruit, and Meat were consumed 2714, 2455, 2311, and 2204 times in a week respectively. Fats and Beverages were consumed 1299 and 1296 times respectively.

DISCUSSION

Socio-economic and demographic Characteristics

In this study, the majority of respondents fell between the ages of 20-23. More of the respondents were males, similar to the results of [15]. This could be attributed to the study location being a University of Agriculture. Most respondents were Yorubas' and Christians were thrice as many as Muslims; which may be attributed to the Institution's location in the southwest of Nigeria similar to the study [16]. Just a few of the respondents were married which is expected by society due to the majority's age range. More than half of respondents had their major income from both themselves and their parents; which could be attributed to the country's reality as most undergraduates are preparing for life after school. Most respondents earn above N10,000 monthly, this is an indication that respondents could afford a decent meal.

Anthropometric Characteristics

This study revealed that about two-thirds of the respondents had normal weight according to BMI classification similar to the findings of [17] and [18]. Overweight and obesity account for about one-quarter of the respondent's population, which is in agreement with a study done by [9] among undergraduates in South Eastern States of Nigeria whereas the study is not in accordance with that done in the University of Nsukka Nigeria among undergraduates where the prevalence of overweight and obesity were 25.6% and 10.1% respectively [19]. Over two-thirds of the respondents had no risk of abdominal obesity, similar to the study of [20].

Dietary intake and pattern

The study found an energy intake median close to 2500kcal, similar to the findings of [21] among university girls in Abia. However, the study is in contrast to the study on food intake and meal patterns of adolescents in Ila-Orogun where the daily energy intake was higher than that recommended by most respondents [22]. The result also showed that about half the respondents had inadequate protein intake, also contrast to the study by [23] in his studies which may be attributed to the fact that the study is from different parts of the world where the former is a developing country and the latter is a developed country.

The findings of this study also showed that almost all the respondents had an excess intake of carbohydrates, similar to the result of [24], the reason may be linked to carbohydrates being the cheapest and most readily available foods. More than one-third of the respondents were found to have an excess intake of fat, a similar finding was reported by [25].

Physical Activity Level

The findings of this study revealed that most of the respondents engage in high physical activity levels, which is similar to the findings of [26] but in contrast with the study of [27] maybe because of a difference in location as the study was conducted in a different continent.

CONCLUSION

The findings of this research work revealed a high prevalence of overweight and obesity among undergraduates of the age range 16 to 29 years old. Despite moderate to intense physical activity levels, this result can be attributed to dietary intake and pattern especially high consumption of energy-dense meals.

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Conflict of Interest

We confirm that this manuscript is an original work of the authors and has not been submitted for publication elsewhere. Therefore, there is no conflict of interest.

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