Anthropometric Status and Food Consumption Pattern of Undergraduates in Oduduwa University, Ipetumodu, Osun State

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Abstract

Background

Anthropometric measurements are a series of quantitative measurements of the muscle, bone, and adipose tissues used to assess an individual's body composition. The core elements of anthropometry are height, weight, body circumference (waist, hip, and head), and skin fold thickness. The body mass index (BMI) as a simple nutritional assessment tool is widely used to classify underweight, overweight and obesity. There is dearth of information on anthropometric status and food consumption pattern of undergraduates of Oduduwa University, hence the aim of the cross-sectional study was to determine the anthropometric status and food consumption pattern of undergraduates at Oduduwa University, Impetuous, Nigeria.

Two hundred and seventy undergraduates were selected using multistage sampling technique, a semi-structured interviewer administered questionnaire was used for data collection, of the 270 questionnaires distributed, 264 questionnaires were retrieved. A 40-item food frequency questionnaire was used to assess respondents' food consumption patterns. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 23. Statistical significance was set at $p < 0.05$.

Majority (62.5%) of the respondents were between the ages of 18 – 25 years, 57.6% were females while 42.4% were males. Larger percentage (81.4%) of the respondents were of normal BMI (76.3% female and 88.3% within the normal BMI range), 5.6% were overweight (5.3% female and 6.3% male) while 5.3% were obese (6.5% female and 3.6% male), 11.1% of the respondents (female) had high waist to hip ratio and 9.8% of the respondents (male) had high waist to hip ratio which depicts central obesity. 50.4% of respondents had good food consumption pattern, while 49.6% had poor food consumption pattern. A significant association was found between BMI and Food consumption pattern of respondents [X= 3.183; p-value< .011]. Undergraduates should limit the intake of processed food (snacks), soft drink and increase the intake of fruit and vegetable for improved anthropometric status.

Methodology

Study Design: A cross-sectional study design was adopted.

Study location: The study was carried out at Oduduwa University. Oduduwa is a private University established in 2009, it is located in Ipetumodu, Ile Ife, Osun State, Nigeria, and occupies about 100 hectares. Oduduwa University offers both undergraduate and postgraduate courses and programs leading to officially recognized higher education degrees in several areas of study.

Target Population: The targeted population for the study included male and female undergraduates of Oduduwa
University, Ipetumodu, Nigeria.

1. Introduction

Anthropometric measurements are a series of quantitative measurements of the muscle, bone, and adipose tissues used to assess an individual's body composition. The core elements of anthropometry are height, weight, body circumference (waist, hip, and head), and skinfold thickness. The body mass index (BMI) as a simple nutritional assessment tool is widely used to classify underweight, overweight and obesity. Still, it does not differentiate between adiposity and muscularity, leading to underestimating or overestimating obesity in specific individuals.
The waist-to-hip ratio is considered a better measure of obesity-associated health risks. These measurements are essential because they represent diagnostic criteria for obesity. which significantly increases the risk for non-communicable disease conditions such as cardiovascular disease, hypertension, diabetes mellitus, and many more [3].

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m2). The World Health Organization (WHO) recommends BMI as the most useful population level measure of overweight and obesity, because is used as the same for both sexes and in all ages of adults (WHO, 2012). Another indicator is the waist circumference or abdominal adiposity, which is associated with excess abdominal fat and total body fat. Abdominal adiposity is defined as a waist circumference of ≥ 102 cm for men and ≥ 88 cm for women. The risk of cardiovascular disease (CVD) and non-insulin dependent diabetes is high in men and women with abdominal adiposity [13].

A dietary pattern is a quantity, variety, or combination of different foods and beverages present in an individual's diet and the frequency with which they are regularly consumed. Dietary patterns (DP) are the general profile of food and nutrient consumption characterized by the usual eating habits [7]. A typical example of a dietary pattern is the Mediterranean diet which includes high consumption of fruits, vegetables, bread, and other cereals, beans, nuts, and seeds. Other dietary patterns include a plant-based diet that comprises high intakes of vegetables, tubers, and fruits, with no animal products (meats, fish, eggs, dairy, and poultry) or processed foods. Healthful dietary patterns include high consumption of fruits, vegetables, nuts and legumes, low-fat dairy products, and whole grains with limited intakes of processed meats.

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According to World Health Organization, in 2016 more than 1.9 billion adults aged 18 years and
older were overweight, having a body mass index between the range of 25 to 29. Over 650 million adults were obese, 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight. Overall, about 13% of the world's adult population were obese in 2016, and the prevalence of obesity almost tripled between the years 1975 and 2016 [12].

According to the World Health Organization Fact Sheet, overweight and obesity are linked to more deaths worldwide than underweight. More people are obese than underweight; this occurs in every region except parts of sub-Saharan Africa and Asia (World Health Organization, 2020).
Obesity has been shown to be a predisposing factor in the rising prevalence of morbidity and mortality associated with non – communicable diseases like type-2 diabetes mellitus, hypertension, cancer, stroke among adults [4]. The aim of the study was to determine the anthropometric status and food consumption pattern of undergraduates at Oduduwa University, Impetuous, Nigeria. The implementation of the study's findings will assist in improving the students' dietary lifestyle and promote good health.

2. Inclusion and Exclusion criteria

2.1. Inclusion criteria

The inclusion criteria were full-time undergraduate students of Oduduwa University who were
available when carrying out this study and gave consent. Also, the study included only those who
were healthy, had not been diagnosed with any disease.

2.2. Exclusion criteria

The exclusion criteria were full-time undergraduate who are pregnant, staff, or on any form of medication. Also, undergraduates who were unwilling to participate in the study were excluded.

2.3. Sample size determination

The sample size was calculated using the Leslie Kish formula cross-sectional sample size
determination model for a single proportion as follows:
$n = Z^2 p(1-p)/d^2$ where:
n= Minimum desired sample size
Z= the standard normal deviate usually set at 1.96, which corresponds to a 5% significance level.
P = prevalence of outcome of interest,
D = degree of accuracy desired (precision), usually set at 5% (0.05)Using P= 19.9% as the prevalence [10] a total number of 270 was derived for the study.

2.4. Sampling technique

Multistage sampling technique was used.

2.4.1. Stage one: Selection of Faculties

Three faculties were selected using a simple random sampling method (ballot method) from the six faculties in the university. The selected faculties selected were Faculty of Management and
Social Sciences, Faculty of Natural and Applied Sciences and Faculty of Environmental Design and Management.

2.4.2. Stage two: Selection of Departments

Two departments were selected from each of the three faculties using simple random sampling.

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The departments selected included Mass Communication and Accounting from Management andSocial Sciences, Computer Science and Industrial Sciences from Natural and Applied Sciences and Architecture and Estate Management from Environmental Design and Management.

2.4.3. Stage three: Selection of Respondents

Respondents were selected from each of the selected departments using proportionate sampling.

3. Method of data collection

A semi-structured interviewer-administered questionnaire was used in collecting data. Anthropometric measurements taken were height, weight, waist circumference and hip circumference. Weight was taken using a calibrated weighing scale, height was taken using a stadiometer while waist and hip circumference were taken using a tape rule. Body Mass Index (BMI) was calculated using weight in kilograms divided by the square of the height in meters square [7]. BMI was classified according to the cut-off point established by the World Health Organization. Food consumption pattern was determined using a 40-item semi quantitative food frequency questionnaire.

4. Data Analysis

Data was analyzed using Statistical Package for services solution (SPSS) version 21. Data were analyzed using frequency distribution (frequency table, Mean, Median, Mode, and percentages). Chi square was used to examine relationship between variable of interest. All P values of less than 0.05 was considered as statistically significant.

5. Operational Definitions

Food Consumption Pattern was either classified as good or poor. Good (Those who often take Fruits, cereals, beverages, fish, Milk and its products) and Poor. (Those who often take snacks, meat and poultry, soft drinks and processed foods but rarely take fruits and vegetables).

Nourished: Those whose BMI falls within the normal range ($18.5- 24.9kg/m^2$)

Malnourished: Those whose BMI are below or above the normal range.

Gynoid Obesity: Those whose waist to hip ratio are within the normal cutoff point.

Android Obesity: Those whose waist to hip ratio are above the cutoff point.

6. Ethical Considerations

A written approval letter was obtained from the school authority and the students. Respondents had the right to withdraw from the study at any time if they so desire without any penalty. All COVID-19 precautionary protocols were ensured at all times during the collection of data. Confidentiality of the respondents was maintained by ensuring that participants' personal information was not linked to the questionnaires nor disclosed.

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7. Results

S/N	Items	Option	Frequency	Percentage
		Below 18 years	67	25.4
		18-25 years	165	62.5
		26-30 years	32	12.4
1	Age	Above 30	0	0
2	Sex	Male	112	42.4
		Female	152	57.6
3	Marital Status	Single	258	97.7
		Married	6	2.3
4	Religion	Christianity	141	53.4
		Islam	123	46.6
		Yoruba	155	58.7
		Igbo	34	12.9
		Hausa	7	2.6
5	Ethnicity	Others	68	25.8
		Management and Social Science	67	25.4
		Natural and Applied Science	118	44.7
6	Faculty	Environmental design and management	79	29.9

Table 1: Sociodemographic Characteristics of Respondents.

8. BMI Distribution of Respondents

		Female		Male	
Variable	**Options**	**Freq.**	**Percentage**	**Freq.**	**Percentage**
	Below 18.5 kg/m2	18	11.8	2	1.8
	18.5 – 24.9 kg/m2	116	76.3	99	88.3
BMI	25.0-29.9 kg/m2	8	5.3	7	6.3
	30.0 and above	10	6.5	4	3.6
	Total	152	100	112	100

Table 2: BMI Distribution of Respondents

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8.1. Waist to hip ratio for female

		Female	
		Freq.	**%**
Waist to hip ratio	Low (0.80 or lower)	13	8.6
	Moderate (0.81-0.85)	122	80.3
	High (0.86 or higher)	17	11.1
	Total	152	100

Table 3: Waist to hip ratio for female.

The below majority (80.3%) of the respondents (female) had a waist to rip ratio within the normal range 0.81- 0.85, 11.1% had a high waist to hip ratio.

8.2. Waist to hip ration ratio for Male

		F	**%**
Waist to hip ratio	Low (0.95 0r lower)	2	1.8
	Moderate (0.96-1.00)	99	88.4
	High (1.0 or higher)	11	9.8
	Total	112	100

Table 4: Waist to hip ration ratio for Male

The below majority (88.4%) of the respondents (male) had a waist to rip ratio within the normal range 0.96- 1.00 while 9.8% had a high waist to hip ratio.

8.3. Summary of Waist to Hip Ratio of Respondents

Categories	**Frequency**	**Percentage**
Gynoid	221	83.7
Android	43	16.3
Total	264	100

Table 5: Summary of Waist to Hip Ratio of Respondents.

Gynoid Obesity: Those whose waist to hip ratio are within the normal cutoff point.

Android Obesity: Those whose waist to hip ratio are below or above the cutoff point

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S/N	On average, how many time(s) do you eat the following in a day	Option	Frequency	Percent
1.	Snacks in-between meals	Ones	44	16.7
		Twice	144	54.5
		Three times	44	16.7
		Never	32	12.1
		Total	**264**	**100.0**
2	Swallow	Ones	118	44.7
		Twice	32	12.1
		Three times	26	9.9
		Never	88	33.3
		Total	**264**	**100.0**
3	Cereals	Ones	94	35.6
		Twice	104	39.4
		Three times	36	13.6
		Never	30	11.4
		Total	**264**	**100.0**
4	Root and Tubers	Ones	132	50.0
		Twice	60	22.7
		Three times	46	17.4
		Never	26	9.9
		Total	264	100.0
5.	Fruits	Once	38	14.4
		Twice	70	7.6
		Three times	136	51.4
		Never	20	7.6
		Total	**264**	**100.0**
6	Vegetables	Once	138	52.2
		Twice	92	34.8
		Three times	22	8.3
		Never	12	4.5
		Total	**264**	**100.0**
7	Meat And Poultry/ Fish and Sea Foods	Once	66	25.0
		Twice	64	24.2
		Three times	134	50.8
		Never	0	0.0
		Total	**264**	**100.0**
8	Milk And Its Product	Once	142	53.8
		Twice	50	18.9
		Three times	40	15.1
		Never	32	12.1
		Total	**264**	**100.0**
9	Beverages	Once	22	8.3
		Twice	62	23.5
		Three times	174	65.9
		Never	6	2.3
		Total	**264**	**100.0**

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10	Soft Drinks	Once	54	21.2
		Twice	62	23.5
		Three times	118	44.7
		Never	28	10.6
		Total	**264**	**100.0**
11	Processed Harvested Food	Once	102	38.6
		Twice	86	28.8
		Three times	70	26.5
		Never	16	6.1
		Total	**264**	**100.0**
12	Processed Cooked Food	Once	46	17.5
		Twice	64	24.2
		Three times	122	46.2
		Never	32	12.1
		Total	**264**	**100.0**

Table 6: Food Consumption Pattern of Respondents.

8.4. Summary of Food Consumption Pattern of Respondents

Categories	Frequency	Percentage
Good	133	50.4
Poor	131	49.6
Total	264	100.0

Table 7: Summary of Food Consumption Pattern of Respondents.

The above table presents the summary of food consumption pattern of respondents, slightly above half (50.4%) had good pattern, while almost half (49.6%) had poor pattern. Those who has good food consumption pattern often take Fruits, cereals, beverages, fish, Milk, and its products while those who had a poor food pattern often take snacks, meat and poultry, soft drinks and processed foods but rarely take fruits and vegetables.

8.5. Association between BMI and Food Consumption Pattern of the Respondents

Categories	Nourished	Malnourished	X	P-value
Good	99	34	3.183	.011
Poor	116	15		

Table 8: Association between BMI and Food Consumption Pattern of the Respondents.

The above shows there is a significant association between BMI and Food consumption pattern of respondents [X= 3.183; p-value< .011].

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8.6. Association between Food Consumption Pattern and Waist to Hip Ratio of Respondents

Categories	Android	Gynoid	X	P-value
Good	105	28	3.015	0.029
Poor	116	15		

Table 9: Association between Food Consumption Pattern and Waist to Hip Ratio of Respondents.

The above shows there is a significant association Food consumption pattern and waist to hip ratio of respondents [X= 3.015; p-value< .029].

9. Discussion

Majority (81.4%) of the respondents were of normal BMI using WHO classification of BMI with 76.3% female and 88.3% within the normal BMI range. 5.6% were overweight (5.3% female and 6.3% male) while 5.3% were obese (6.5% female and 3.6% male). The overweight student for male (6.3%) student is higher compared to female student (5.3%) while the obese student for female (6.5%) is higher than male (3.6%). The result concurs with a study [1] which reported that more female (8.2%) undergraduates were obese compared to males (6.7%). Gender of student was statistically significantly associated with BMI with more females than males being obese. Using BMI as a measurement of nutritional status, 18.5% of the respondents were malnourished while 81.4% were of good nutritional status.

For waist to hip ratio, majority of the respondents had a moderate waist to hip ratio (80.3% for female and 88.4% for male). However, 11.1% of the respondents (female) had high waist to hip ratio and 9.8% of the respondents (male) had high waist to hip ratio. High waist-hip ratio depicts central obesity, the implication is that more females deviated from the standard compared to males. This implies that these students may be at high risk of developing chronic diseases such as type 2 diabetes and cardiovascular diseases [9]. To avoid future infertility and risk of developing non-communicable those with high waist to hip ratio were advised to increase the consumption of fruit and vegetable and limit the intake of processed food.

Food consumption pattern of the respondents revealed that 188 (71.2%) of the respondents consumed snacks more than once in a day possibly to enable them cope with the energy needs of the body as they go about their normal academic activities. The pattern also shows a high intake of snacks among them, just as observed among the university students in the South-Eastern states of Nigeria [2], These habits may lead to overweight and obesity which has been identified as a major contributing factor to incidence of chronic diseases later in life [5].

The consumption of soft drink was high among the respondents with 180 (68.2%) taking soft drink more than once in a day, this implies that consumption of refine carbohydrate is high and may be a predisposing factor for the development of type 2 diabetes later in life.

Larger percentage (78%) of the respondents consumed fruit more than once in a day while 43% consume vegetable more than once in a day. This may be attributed to the sweet taste of some fruits and dislike for some vegetables due to their taste. A study among university students in Douala, Cameroon showed that university students ate very little fruits and vegetables (Sop

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et al., 2010). Contrary to African medical school students, 83.5% of Asian (Chinese) college students consumed fruits and vegetables daily [8].

A significant association was found between BMI and Food consumption pattern of respondents [X= 3.183; p-value< .011]. In a study carried out among undergraduates in Nigeria observed a significant relationship between vegetable consumption and Body Mass Index (X2 = 16.031, p-value = 0.001) [6]. Many dietary recommendations emphasize increasing consumption of plant-based foods, such as fruits, vegetables, and whole grains to control excess weight gain and mitigate the health risk associated with excess weight gain.

There exist a significant association between food consumption pattern and waist to hip ratio of respondents [X= 3.015; p-value< .029]. Higher fruit and dairy products consumption was associated with a lower gain in waist circumference whereas consumption of soft drinks was positively associated with waist circumference. A dietary pattern that is high in fruit and vegetable and low in soft drinks may help to prevent abdominal fat accumulation.

10. Conclusion

Food Consumption Pattern of half (49.6%) of the respondents was poor 81.4% of the respondents were of good nutritional status while 18.5% were malnourished. Anthropometric status was significantly associated with food consumption pattern, Individuals should limit the intake of processed food (snacks), soft drink and increase the intake of fruit and vegetable for improved anthropometric status. The limitation of the study included the possibilities of bias in self-reporting of food consumption pattern, there is need for a larger study among different universities (Private and Public) to gather adequate information on the anthropometric status and food consumption pattern of university students.

11. Conflict of Interest

The author declares no conflict of interest.

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