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Prevalence Of Obesity And Awareness Of Diabetes Mellitus And Its Relationship With Obesity Among Undergraduate Students Of A Private University In Southern Nigeria

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Abstract:

Introduction: *Overweight, or obesity, is characterized by an abnormal or excessive buildup of fat and is a key risk factor for the majority of Non-Communicable Diseases (NCDs). Overweight and obesity is prevalent among undergraduate students mainly due to unhealthy dietary practices. In addition, knowledge of obesity and its contribution to the onset of most NCDs is pertinent for design and implementation of health promotion and education programmes. This study examined the prevalence of obesity and awareness of diabetes mellitus and its relationship with obesity among undergraduate students in Novena University Ogume, Delta State Nigeria. Methodology: A cross-sectional study design was used in the research. A random sample of 282 undergraduate students was used in the study, which was conducted in 2019 at Novena University. The instruments for data collection were a semi-structured questionnaire, stadiometers, weighing scale, and measuring tape. The Statistical Package for Social Sciences, version 23.0, was used to analyze the data that had been gathered. To look for relationships between the relevant variables at the P<0.05 level of significance, descriptive and inferential statistics were used.*

Results: *The mean age of the respondents was 26.91±6.57 years and the majority (77.7%) was females. More females were overweight (28.3%) and obese (9.9%) and had waist-hip ratio (32.8%) higher than males. The respondents demonstrated good knowledge of the relationship between obesity and diabetes (50.5%). Predictors of knowledge on the relationship between obesity and diabetes were female sex (P=0.01, OR=2.829, 95% CI=1.543-5.185) and family history of obesity (P=0.006, OR=2.450, 95% CI=1.299-4.622) and diabetes (P=0.000, OR=6.839, 95% CI=8.782-12.713).*

Conclusion: *Findings of the study confirmed the prevalence of overweight and obesity among the study population. Therefore, implementation of weight reduction programmes is essential.*

Key words: ***body mass index, lifestyle, obesity, overweight, prevalence, risk factors***

1. INTRODUCTION

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.[1] Body Mass Index (BMI), which is calculated by dividing a person's weight in kilograms by their height in meters squared, is a standard method used to determine the prevalence of overweight and obesity.[1] Another method is the waist-hip ratio which is calculated by dividing the value of the waist with that of the hip to generate the waist-hip ratio.[1] Overweight is defined as BMI greater than or equal to 25kg/m^2, while obesity is defined as BMI greater than or equal to 30kg/m^2.[1] Perhaps the most common

type of malnutrition, obesity affects children, adolescents, adults, in both developed and developing nations. The World Health Organization (WHO) estimates that in 2020, approximately 39 million children under the age of five were overweight or obese, compared to over 340 million adolescents aged five to 19 and over 1.9 billion adults aged eighteen and above who were overweight in 2016.[1] Obesity and overweight are becoming a bigger issue in Africa, and the patterns are becoming worse. As shown by the WHO's projection and analysis by December 2023, it is anticipated that one in five people and one in ten children and adolescents in ten high-burden African nations will be obese. The estimate indicates that in those ten high-burden African nations, the prevalence of obesity in children and adolescents will range from 5% to 16.5%, while in adults it would range from 13.6% to 31%.[2]

Previous research conducted in Nigeria has demonstrated the prevalence of overweight and obesity across a range of population strata, including adults,[3-8] adolescents [9,10] and children.[11,12]

A collection of disorders that impact how the body uses blood sugar are together referred to as diabetes mellitus (DM).[13] Insulin production or usage problems lead to type 2 diabetes. [13] This hormone is responsible for enabling blood glucose to enter cells, giving them the energy they need to function. Research has consistently shown that obesity increases the risk of type 2 diabetes and prediabetes.[14-16] According to some research, those who are obese have a roughly ten-fold higher risk of developing type 2 diabetes than people who are moderately overweight.[14] According to the National Diabetes Statistics Report, 45.8% of adult diabetics in the United States were obese in 2013–2016, and 15.5% were extremely obese. The research also states that 89% of adult Americans with diabetes were obese or overweight.[17] Although, the actual complete mechanism of the link between obesity and DM is not fully understood, some experts have attempted to explain the pathophysiological mechanism by postulating that non esterified fatty acids (NEFAs), glycerol, hormones, cytokines, pro-inflammatory markers, and other substances implicated in the development of insulin resistance are found in higher concentrations in obese persons.[18,19] NEFA release in particular, which is linked to insulin resistance in both type 2 diabetes and obesity and is found to be elevated in these circumstances.[20]

Moreover, because obesity is becoming more common in developing nations like Nigeria, which has been linked to the advent of type-2 diabetes and is deemed a health calamity,[21] it is therefore pertinent to evaluate the awareness and knowledge on the relationship between obesity and type-2 diabetes among young adults who may not have been diagnosed of type-2 diabetes, but may be at risk of diabetes in the future due to overweight and obesity. This is also important because previous studies in Nigeria have reported the prevalence of obesity among adolescents and young adults [9,22,23] and suboptimal knowledge of DM among adolescents and young adults including undergraduate students.[24-28] Hence, this study was designed with the aim of assessing the prevalence of obesity and awareness of the relationship between obesity and onset of diabetes mellitus among undergraduate students of Novena University Ogume Delta State, Nigeria.

2. Materials and Methods

2.1 Study Design and Setting

The study utilized a cross sectional study design that assessed the prevalence of obesity and awareness of the relationship between obesity and onset of diabetes mellitus among undergraduate students at Novena University, Ogume Delta State Nigeria.

The first private university in Delta State, Novena University, Ogume, was the site of the study. The University manages a network of campuses. Its take-off location is at Amai, while its main campus is located in Ogume. Academic activities were conducted in three colleges in 2019—the Natural and Applied Sciences, Management and Social Sciences, and Health Sciences—at the time of the study. Roughly 3000 students from 12 departments attended the university in total.[30]

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2.2 Study Population

The study population was made up of both male and female undergraduate.

Sample size determination:
The sample size for single proportion was used for the study.[31]

$$n = \frac{Z^2 Pq}{d^2}$$

Where

n = minimum sample size
Z = 1.96% (at 95% confidence interval)
P = 75.90% or 0.759 i.e previous studies (awareness of Diabetes amongst Undergraduates in a Nigerian University, South west Nigeria.[27]

q = (1-p)
d = degree of accuracy desire at 5% or 0.05

To compute the N (Minimum sample size)

$$N = \frac{1.96^2 \times 0.759 \times (1 - 0.759)}{0.05^2}$$

$$N = \frac{3.8416 \times 0.759 \times 0.241}{0.0025}$$

$$N = \frac{0.7027016}{0.0025}$$

N = 281.08 (minimum sample size of 282 approximate was used for the study)

2.3 Sampling Procedure

The number of students to be chosen from each of the twelve departments in the university was determined using a proportionate sampling technique. Thereafter, the students from each department were chosen using a simple random sampling method.

Table 1: List and Distribution of the Study Sample Size on the Twelve Departments in Novena University in 2019

S/N	Department/ Programme	Population of the students	Proportionate allocation	Approximate sample size collected from each department
1.	Public and Community Health	500	500/3000*282	47
2.	Microbiology	150	150/3000*282	14
3.	Chemical Science	150	150/3000*282	14
4.	Computer Science	150	150/3000*282	14
5.	Energy and Petroleum Studies	350	350/3000*282	33
6.	Accounting	150	150/3000*282	14
7.	Mass Communication	400	400/3000*282	38
8.	Economics	200	200/3000*282	19
9.	Business Administration	150	150/3000*282	14
10.	Political Science	250	250/3000*282	24
11.	Intelligence and Security Studies	400	400/3000*282	38
12.	Sociology	150	150/3000*282	14
TOTAL		**3000**		**283**

2.3.1 Instrument for data collection

The instrument used for the study was a questionnaire comprising five sections. Section A contains the demographic characteristics of the respondents; section B contains questions on the awareness and knowledge on the relationship between Obesity and Diabetes, section C assessed the dietary lifestyle of the respondents, section D appraised the knowledge of the respondents on risk factors and health implications of obesity and section E assessed the body mass index of the respondents. In addition, height, measuring tape and weighing scale were used to collect anthropometric parameters.

2.3.2 Method of data collection

The questionnaire was self-administered to the respondents in the classrooms. Data were collected from May to June 2019. The researcher, with the help of two research assistants administered the questionnaires to the respondents and the filled questionnaires were retrieved from the respondents immediately after filling. The filling out of each questionnaire took approximately 15-20 minutes. After filling out the questionnaire, the anthropometric measurements for each student were taken and recorded. Their heights were taken using a standard stadiometer and a portable calibrated weighing scale to the nearest 0.1kg was used to measure the weight of the respondents. The measuring tape was used to measure the waist and hip to determine the waste-hip ratio. This was carried out by measuring the waist and the hip with measuring tape. Thereafter, the waist value was divided by the value of the hip to generate the waist-hip ratio. Both measurements were taken using standard procedures, as described by the World Health Organisation (WHO).[32]

3. Data Analysis

Data were first sorted, manually coded, then imported into a computer, where they were then examined using the Statistical Package for Social Sciences version 23.0 (IBM SPSS Chicago, Illinois, United States of America). Frequency distribution, cross tabulations, and Chi-square test were performed to test for associations between the variables of interest and logistic regression on selected variables as predictors of knowledge of the relationship between obesity and diabetes at $P<0.05$ level of significance.

3.1 Ethical Considerations

As at the time the study was conducted, Novena University did not have a formal ethics review committee, the principles outlined in the declaration of Helsinki [29] in research involving human subject were followed. In addition, verbal informed consent was obtained from each study participant before data were collected.

3.2 Anthropometric Measurements

The height and weight obtained were used to calculate the Body Mass Index (BMI) of respondents using the formula BMI = Weight (kg)/Height (m2). Body-mass index categories were defined using the WHO cut-off points in units of kg/m2, normal weight =18.5 kg/m2 - < 25 kg/m2, overweight = 25 kg/m2 - < 30 kg/m2 and obese >30 kg/m2.

The waist-hip ratio is defined as abdominal obesity in men as a waist-to-hip ratio of 0.90 or more, while for women, it is a ratio of 0.85 or more.[33]

3.3 Scales of Measurement

3.3.1 Knowledge scale

A dichotomous knowledge scale was developed by the authors and used to quantify the level of knowledge on the relationship between Obesity and Diabetes mellitus. The sum of quantity of test items in the knowledge section of the questionnaire was six items. The right answer was scored as 1 while the wrong answer was scored as 0. Therefore, every study participant's knowledge score was categorized between 0-3 as Code 1 and >4 as Code 2. Respondents that scored between 0-3=Code 1 were adjudged to have exhibited poor knowledge on the relationship between obesity and diabetes mellitus and >4=Code 2 as having good knowledge on the relationship between obesity and diabetes mellitus.

Furthermore, a dichotomous knowledge scale was developed and used to quantify the level of knowledge on the knowledge on the risk

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factors and health implications of obesity. The sum of quantity of test items in the knowledge section of the questionnaire was four items. The right answer was scored as 1 while the wrong answer was scored as 0. Therefore, every study participant's knowledge score was categorized between 0-2 as Code 1 and >2 as Code 2. Respondents that score between 0-2=Code 1 were adjudged to have exhibited poor knowledge of the risk factors and health implications of Obesity and >4=Code 2 as having good knowledge of the risk factors and health implications of Obesity.

4. Results

Of the 283 copies of the questionnaire administered, only 273 were retrieved, which represents 96.5% response rate. This was considered a good number to make conclusion on data collected for the study.

In Table 2, the majority of the students sampled were females 212(77.7%), while more 99(26.3%) were between ages of 23-37 years and 50(18.3%) were selected from Public and Community Health Department. Furthermore, about 121(44.3%) were from 300 levels of study.

Table 2: Socio-demographic Characteristics of the Respondents

Variable	Frequency (N=273)	Percentage
Gender		
Male	61	22.3
Female	212	77.7
Age (Years)		
18-22	77	28.2
23-27	99	36.3
28-32	47	17.2
33-40	30	11.0
41-47	20	7.3
Marital Status		
Single	241	88.3
Married	32	11.7
Department		
Intelligence & Security	30	10.9
Studies	30	10.9
Mass Comm	50	18.3
Public & Community Health	15	5.5
Business Admin.	35	12.8
Energy & Petroleum Studies	18	6.6
Microbiology	20	7.4
Political Science	15	5.5
Accounting	15	5.5
Computer Science	15	5.5
Chemical Science	20	7.4
Economics	10	3.7
Sociology		
Level of study		
100	23	8.4
200	72	26.4
300	121	44.3
400	57	20.9

Mean age: 26.91±6.57

Table 3 shows the mean weight, height, BMI and waist-hip ratio of the respondents.

Table 3: Mean Anthropometric Variables

VARIABLE	MEAN	S.D	MINIMUM	MAXIMUM
Weight	65.44	±8.18	45.00	90.00
Height	1.6412	±0.06797	1.50	1.87
BMI	24.397	±3.52	16.14	36.89
Waist-Hip ratio	0.8048	±0.09451	0.51	0.99

In Figure 1, underweight was found in 8.2% of males and 1.9% of females. Also, overweight and obesity were prevalent in 26.2% males and 28.3% females, 4.9% males and 9.9% females, respectively.

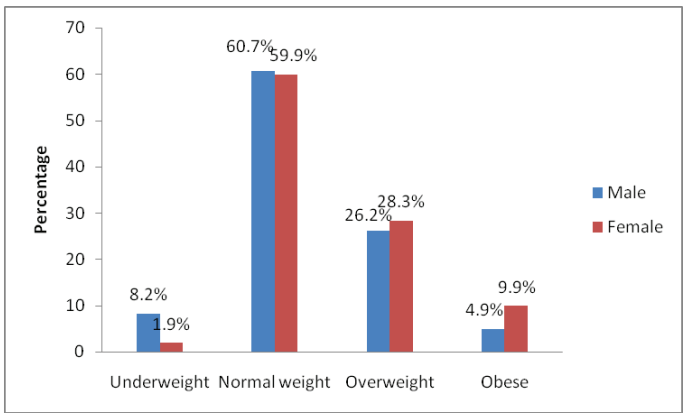


Fig. 1. Distribution of the students according to the BMI cut-off point

Figure 2 shows that 32.8% of the females were obese, while 21.7% of the males were obese .

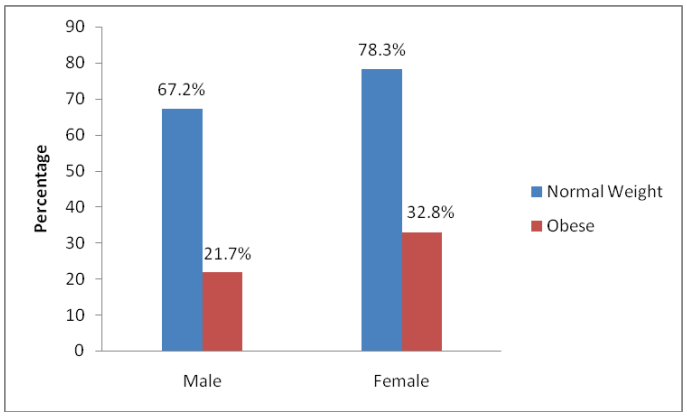


Fig. 2. Waist-hip ratio of males and females

In Table 4, about half of the respondents 91(50.3%) affirmed to frequently go longer than five hours almost every day without eating anything and the majority 121(66.9%) affirmed that they do eat at fast food restaurants almost every day. Furthermore, foods high in fat that the respondents affirmed to eat frequently were fried foods 142(78.5%) and butter 89(49.2%).

Table 4: Dietary Lifestyle of Respondents

Variables	Frequency	Percentage
Diet and Nutrition lifestyle: How often do you go longer than five hours without eating anything?		
Frequently (almost every day)	91	50.3
Sometimes (every few days)	88	48.6
Rarely (once in a year)	2	1.1
How often do you eat at fast food restaurants?		
Frequently (almost every day)	121	66.9
Sometimes (every few days)	51	28.2
Rarely (once in a year)	9	5.0
How often do you eat food that are usually highly rich in fat?		
Cheese		
Frequently (almost every day)	20	11.0
Sometimes (every few days)	39	21.5
Rarely (once in a year)	122	67.4
Chips		
Frequently (almost every day)	56	30.9
Sometimes (every few days)	124	68.5
Rarely (once in a year)	1	0.6
Maize		
Frequently (almost every day)	48	26.5
Sometimes (every few days)	128	70.7
Rarely (once in a year)	5	2.8
Fried foods		
Frequently (almost every day)	142	78.5
Sometimes (every few days)	38	21.0
Rarely (once in a year)	1	0.6
Butter		
Frequently (almost every day)	89	49.2
Sometimes (every few days)	83	45.9
Rarely (once in a year)	9	5.0
Nuts		
Frequently (almost every day)	28	15.5
Sometimes (every few days)	152	84.0
Rarely (once in a year)	1	0.6

In Table 5, foods high in simple sugar that the respondents affirmed to eat frequently were cakes and biscuits 138(76.2%), drinks 160(88.4%) and tea with sugar 106(58.6%).

Table 5: Consumption of Diet High in Sugar among Respondents

Variables	Frequency	Percentage
How often do the respondents consume food that are usually higher in simple sugar?		
Candy		
Frequently (almost every day)	48	26.5
Sometimes (every few days)	96	53.0
Rarely (once in a year)	37	20.4
Cakes and Biscuits		
Frequently (almost every day)	138	76.2
Sometimes (every few days)	35	19.3
Rarely (once in a year)	8	4.4
Ice-cream		
Frequently (almost every day)	30	16.6
Sometimes (every few days)	140	77.3
Rarely (once in a year)	11	6.1
Drinks		
Frequently (almost every day)	160	88.4
Sometimes (every few days)	21	11.6
Tea with sugar		
Frequently (almost every day)	106	58.6
Sometimes (every few days)	70	38.7
Rarely (once in a year)	5	2.8

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In Table 6, diets affirmed by the respondents to be consuming frequently that include at least two servings were vegetables 91(50.3%), bread or grains 129(71.3%) and meat/chickens/beefs 121(66.9%).

Table 6: Frequency of Consumption of Constituents of Balanced Diet among Respondents

Variables	Frequency	Percentage
Responses of the respondents on how often they eat well balance diet that includes at least two serving of:		
Milk or dairy products		
Frequently (almost every day)	43	23.8
Sometimes (every few days)	132	72.9
Rarely (once in a year)	6	3.3
Fruits		
Frequently (almost every day)	84	46.4
Sometimes (every few days)	97	53.6
Vegetables		
Frequently (almost every day)	91	50.3
Sometimes (every few days)	90	49.7
Bread or grains		
Frequently (almost every day)	129	71.3
Sometimes (every few days)	52	28.7
Meat/chickens/beef		
Frequently (almost every day)	121	66.9
Sometimes (every few days)	53	29.3
Rarely (once in a year)	7	3.9

In Table 7, the majority of the respondents 230(84.2%) affirmed to measure their weight while about 200(73.3%) affirmed to have heard about obesity with more than half 104(58.0%) defining it as overweight and few 53(19.4%) affirmed to have family history of obesity.

Table 7: Knowledge on the Relationship between Obesity and Diabetes

Variables	Frequency N=273	Percentage
Proportion of respondents that measure their weight		
Yes	230	84.2
No	43	15.8
How often the respondents do measure their weight		
Weekly	9	3.9
Monthly	81	35.2
twice in a year	48	20.9
once in a year	3	1.3
Occasionally	89	38.7
Proportion of respondents that have heard about obesity before		
Yes	200	73.3
No	73	26.7
Knowledge of respondents on obesity	**N=200**	
Overweight	104	58.0
Excessive fatness	76	42.0
Don't Know	20	10.0
Proportion of respondents with family history of obesity		
Yes	53	19.4
No	220	80.6
Proportion of respondents that have heard about diabetes mellitus		
Yes	137	50.2
No	136	49.8
Knowledge of respondents about what diabetes mellitus is	**N=137**	
High sugar level in the body	96	70.1
Don't Know	41	29.9
Proportion of respondents with family history of diabetes		
Yes	46	16.8
No	227	83.2
Responses of respondents as to whether there is a relationship between obesity and diabetes		
Yes	111	40.7
No	155	56.8
Don't Know	7	2.6

In Table 8, the majority of the respondents 211(77.3%) affirmed that excessive consumption of fatty acids led to obesity, while 204(74.7%) affirmed that indiscriminate consumption of alcohol lead to obesity and its health complications such as diabetes mellitus and 204(74.7%) affirmed that overweight with reduced physical activity led to obesity and its health complications such as diabetes mellitus.

Table 8: Knowledge on the Risk Factors and Health Implications of Obesity

Variables	Frequency	Percentage
Can excessive consumption of fatty foods lead to obesity?		
Yes	211	77.3
No	62	22.7
Can indiscriminate consumption of alcohol lead to obesity and its health complications such as diabetes mellitus?		74.7
Yes	204	25.3
No	69	
Can overweight with reduced physical activity lead to obesity and its health complications such as diabetes mellitus?		
Yes	204	74.7
No	69	25.3
Can obesity lead to diabetes since they have a relationship?		
Yes	204	74.7
No	69	25.3

In Figure 3, about 50.5% of the respondents demonstrated good knowledge of the relationship between obesity and diabetes, while 74.4% demonstrated good knowledge of the risk factors and health implications of obesity.

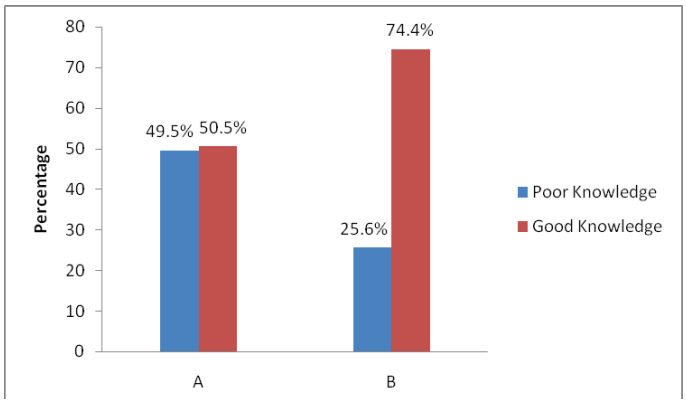


Fig. 3. A-Knowledge on the relationship between obesity and diabetes

B-Knowledge on the risk factors and health implications of obesity

In Table 9, the predictors of knowledge on the relationship between obesity and diabetes were female sex (P=0.01, OR=2.829, 95% CI=1.543-5.185), 400 level of study (P=0.018, OR=3.370, 95% CI=1.232-9.222), family history of obesity (P=0.006, OR=2.450, 95% CI=1.299-4.622), and family history of DM (P=0.000, OR=6.839, 95% CI=8.782-12.713). Similarly, the predictors of knowledge of the risks factors and health implications of obesity was family history of DM (P=0.000, OR=3.204, 95% CI=0.297-1.154).

Table 9: Logistic Regression on Selected Variables as Predictors of Knowledge of the Relationship between Obesity and Diabetes

Variables	knowledge on the relationship between obesity and diabetes				Knowledge of the risk factors and health implications of obesity			
	P-Value	OR	95% CI		P-Value	OR	95% CI	
			Lower	Upper			Lower	Upper
Sex								
Male (r)								
Female	0.01	2.829	1.543	5.185	0.585	0.830	0.424	1.622
Age								
18-22 (r)								
23-27	0.863	0.917	0.314	2.467	0..321	0.699	0.345	1.417
28-32	0.540	1.352	0.515	3.550	0.081	2.820	0.881	9.022
33-40	0.540	1.389	0.486	3.972	0.000	3.812	0.029	0.219
41-47	0.204	2.111	0.667	6.682	0.998	4.237	0.011	1.289

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Level 100 (r) 200 300 400	 0.740 0.398 0.018	 1.176 1.480 3.370	 0.451 0.596 1.232	 3.067 3.678 9.222	 0.023 0.407 0.001	 0.091 0.413 0.033	 0.012 0.051 0.004	 0.715 3.341 0.262
Family History of Obesity Yes No (r)	 0.006	 2.450	 1.299	 4.622	 0.366	 1.399	 0.676	 2.897
Family History of DM Yes No (r)	 0.000	 6.839	 8.782	 12.713	 0.000	 3.204	 0.297	 1.154

5. Discussion

The findings of the study show more females were overweight and obese than males using the BMI classification and waist-hip ratio anthropometric measurements. The dietary lifestyle of the respondents shows that they consume diets that are highly rich in fat and high in simple sugar. Most of the respondents displayed knowledge of the relationship between obesity and diabetes and knowledge of the risk factors and health implications of obesity.

The distribution of the respondents according to the BMI classification and waist-hip ratio shows that more of the females were overweight and obese than males. Several studies have postulated that sex differences in obesity is driven by biological differences in body composition between sexes which emerges during the fetal- and post-natal periods [34] and following birth females generally have greater fat mass and less fat free mass, which is in turn associated with less energy intake and lower calories needs for females than males. [35,36] The current findings could be attributed to these highlighted influences and the fact that female respondents were more in the study than males. This is because females generally are more in the population than males in the institution where the study was carried out. In addition, the findings were similar to that of other studies in Nigeria.[37-39] However, it must be stressed that the aforementioned other studies only used the BMI for their classification of nutritional status unlike the current study that added the waist-hip ratio. The findings were also similar to the findings among Serbian students in Northern Kosovo which utilized both the BMI and waist-hip ratio to determine nutritional status.[40] Another factor which could be posited as contributing to the overweight and obesity of the respondents is their dietary pattern as some affirmed is consuming chips, maize, butter, nuts and fried foods, which are rich in fat. This finding is similar to that of a previous study in Nigeria where the respondents affirmed to consume food products containing fats and oils.[39] The implication of the finding is that the likelihood of more of the respondents becoming overweight and obese is high, which may predispose them to contracting cardiovascular and other non-communicable diseases. Similarly, most of the respondents affirmed to either consume frequently or sometimes food that is high in simple sugar. This could also predispose them to sugar related diseases such as DM in the future. However, one must note that most undergraduate students in Nigeria do consume a lot of high sugar containing drinks because they skip meals, and they find it difficult to eat during school hours.

About half of the respondents demonstrated good knowledge of the relationship between obesity and DM. The majority affirmed to have heard of obesity while only about half affirmed to have heard of DM. This shows the lack of DM awareness among the respondents, however, previous studies reported higher DM awareness among students.[24,26,27] Besides, some of the respondents affirmed to have family history of both obesity and DM. This could put them at risk of DM in the future because family history has been shown to be a risk factor for onset of DM.[41-43] In addition, the majority of the respondents displayed good knowledge of the risk factors such as consumption of fatty foods, alcohol, overweight, and reduced physical activity and health implications of obesity. This could be attributed to the high awareness of obesity among the respondents. The finding is in consonance with a previous study which examines knowledge of the health consequences of obesity among overweight/obese black and Hispanic adults. [44] The observed knowledge could act as both enabling and reinforcing factors in the implementation of DM prevention programmes among the study participants. This finding should be encouraged and sustained by relevant stakeholders both in the Ministries of Education and Health.

Furthermore, predictors of knowledge on the relationship between obesity and DM were female sex, older age, higher class level and family history of obesity and DM. On the other hand. predictors of knowledge of the risk factors and health implications of obesity were older age and family history of obesity and DM. Family history and age remains a key predictor of knowledge of DM which could be taken into consideration in the implementation of public health intervention programmes among the general population [41-43] and students.[45,46]

6. Study Strengths and Limitations

A major strength of the study is the focus on the population who might be at risk of contracting DM in the future and therefore could benefit from targeted interventions.[45]

A limitation of the study was the cross-sectional design of the study which means that it did not establish a cause-and-effect relationship. In addition, the study was conducted in a single institution, so the generalization of the finding should be done with caution. A larger multi-institution study is recommended.

7. Conclusion

The findings of the study confirmed the prevalence of overweight and obesity among the study population according to the BMI and waist-hip ratio classification. Dietary lifestyle reveals that the respondents consume diets that are high in fats and sugar. Besides, the respondents demonstrated good knowledge of the relationship between obesity and DM and knowledge of the risk factors and health implications of obesity. Therefore, there is need for the implementation of health promotion and educational programmes among undergraduate students in the study area taking in account the nutritional status, dietary lifestyle and awareness and knowledge of the relationship between obesity and diabetes by the ministries of education, health and the management of various tertiary institutions in Nigeria. In addition, a policy brief on healthy dietary lifestyle could be developed by institutions and institutionalized to prevent non-communicable diseases among youths in the future.

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Conflicts of interest

The authors declare no potential competing interests.

References

1. WHO. Health. 2021. Obesity and Overweight factsheet from the WHO.
2. World Health Organisation Africa. Obesity rising in Africa, WHO analysis finds. WHO Africa. 2022;
3. Agofure O. Prevalence of obesity among adults in Issele-Uku, Delta State Nigeria. Alexandria Journal of Medicine. 2018 Dec 1;54(4):463–8.
4. Wahab KW, Sani MU, Yusuf BO, Gbadamosi M, Gbadamosi A, Yandutse MI. Prevalence and determinants of obesity - a cross-sectional study of an adult Northern Nigerian population. Int Arch Med. 2011;4(1):10.
5. Oyeyemi AL, Adegoke BO, Oyeyemi AY, Deforche B, Bourdeaudhuij I, Sallis JF. Environmental factors associated with overweight among adults in Nigeria. International Journal of Behavioral Nutrition and Physical Activity. 2012;9(1):32.
6. Etukumana E, Puepet F, Obadofin M. Prevalence of Overweight and Obesity among Rural Adults in North Central Nigeria. Nigerian Journal of Family Practice. 2015;3(2).
7. Chinedu SN, Ogunlana OO, Azuh DE, Iweala EEJ, Afolabi IS, Uhuegbu CC, et al. Correlation between Body Mass Index and Waist Circumference in Nigerian Adults: Implication as Indicators of Health Status. J Public Health Res. 2013 Jul 27;2(2):jphr.2013.e16.
8. Ijoma UN, Chime P, Onyekonwu C, Ezeala-Adikaibe BA, Orjioke C, Anyim OB, et al. Factors Associated with Overweight and Obesity in an Urban Area of South East Nigeria. Food Nutr Sci. 2019;10(07):735–49.
9. NV A, TO U, KN O, JC E, ST E, CA N, et al. Prevalence of Overweight and Obesity among Secondary Schools Adolescents in Onitsha, Anambra State Nigeria. Int J Med Sci Clin Invent. 2022 Jan 6;9(01):5891–9.
10. Sabageh A, Ojofeitimi E. Prevalence of obesity among adolescents in Ile-Ife, Osun state, Nigeria using body mass index and waist hip ratio: A comparative study. Nigerian Medical Journal. 2013;54(3):153.
11. Adebimpe WO. Prevalence and knowledge of risk factors of childhood obesity among school-going children in Osogbo, south-western Nigeria. Malawi Medical Journal. 2019 Mar 31;31(1):19.
12. Adeniyi OF, Fagbenro GT, Olatona FA. Overweight and Obesity Among School-aged Children and Maternal Preventive Practices against Childhood Obesity in Select Local Government Areas of Lagos, Southwest, Nigeria. International Journal of Maternal and Child Health and AIDS (IJMA). 2019 Jun 30;8(1):70–9.
13. IDF. International Diabetes Atlas 10th Edition. Vol. 10th editi, Diabetes Research and Clinical Practice. 2021.
14. Algoblan A, Alalfi M, Khan M. Mechanism linking diabetes mellitus and obesity. Diabetes Metab Syndr Obes. 2014 Dec;587.
15. Kahn SE, Hull RL, Utzschneider KM. Mechanisms linking obesity to insulin resistance and type 2 diabetes. Nature. 2006 Dec 13;444(7121):840–6.
16. Røder ME, Porte D, Schwartz RS, Kahn SE. Disproportionately Elevated Proinsulin Levels Reflect the Degree of Impaired B Cell Secretory Capacity in Patients with Noninsulin-Dependent Diabetes Mellitus [1]. J Clin Endocrinol Metab. 1998 Feb;83(2):604–8.
17. DHHS. National Diabetes Statistics Report, 2020. National Diabetes Statistics Report. 2020;

18. Kasuga M. Insulin resistance and pancreatic cell failure. Journal of Clinical Investigation. 2006 Jul 3;116(7):1756–60.

19. Karpe F, Dickmann JR, Frayn KN. Fatty Acids, Obesity, and Insulin Resistance: Time for a Reevaluation. Diabetes. 2011 Oct 1;60(10):2441–9.

20. Jelic K LSDGCJMOD. American Diabetes Association. 2007. A cross-sectional analysis of NEFA levels following standard mixed meal in a population of persons with newly diagnosed type 2 diabetes mellitus across a spectrum of glycemic control .

21. Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr. 2000 Sep;72(3):694–701.

22. Okagua J, Alex-Hart BA, Jaja TP. Overweight and obesity status of school adolescents in Portharcourt, southern Nigeria. Niger J Med. 2016;25(1).

23. Ene-Obong H, Ibeanu V, Onuoha N, Ejekwu A. Prevalence of overweight, obesity, and thinness among urban school-aged children and adolescents in southern Nigeria. Food Nutr Bull. 2012;33(4).

24. Ubangha L, Odugbemi T, Abiola A. Diabetes mellitus: Identifying the knowledge gaps and risk factors among adolescents attending a public school in Lagos State. Journal of Clinical Sciences. 2016;13(4):193.

25. Agofure O OBROUAAOHDA. Knowledge of diabetes mellitus: An aggregate qualitative study of students, teachers, market women, religious organization and community youths. Ibom Med . 2021;14(2):161–9.

26. Agofure O OH. Knowledge of Diabetes Mellitus among Students of a Public Secondary School in Southern Nigeria: A Cross-Sectional Study. sjhr; 2022.

27. Omobuwa O, Alebiosu O. Awareness of diabetes amongst undergraduates in a Nigerian University, South West Nigeria. Sahel Medical Journal. 2014;17(1):29.

28. A. A. M. KNOWLEDGE ATTITUDE AND PERCEPTION OF DIABETES MELLITUS AMONG STUDENTS OF UNIVERSITY OF PORT HARCOURT, RIVERS STATE, SOUTH–SOUTH ZONE NIGERIA. World J Pharm Res. 2017 Oct 1;92–107.

29. World Medical Association Declaration of Helsinki. World Medical Association declaration of Helsinki: Ethical principles for medical research involving human subjects. Vol. 310, JAMA. 2013.

30. Novena University Records Department. 2019.

31. Lachenbruch PA, Lwanga SK, Lemeshow S. Sample Size Determination in Health Studies: A Practical Manual. J Am Stat Assoc. 1991;86(416).

32. Jelliffe DB. The assessment of the nutritional status of the community. WHO Monograph Series . 1966;(53).

33. WHO Expert Consultation. Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation, Geneva, 8-11 December 2008. World Health Organization . 2011;(December).

34. Broere-Brown ZA, Baan E, Schalekamp-Timmermans S, Verburg BO, Jaddoe VWV, Steegers EAP. Sex-specific differences in fetal and infant growth patterns: A prospective population-based cohort study. Biol Sex Differ. 2016;7(1).

35. Wisniewski AB, Chernausek SD. Gender in childhood obesity: Family environment, hormones, and genes. Gend Med. 2009;6(SUPPL. 1).

36. Campbell MK. Biological, environmental, and social influences on childhood obesity. Vol. 79, Pediatric Research. 2016.

37. Onyechi U, Okolo A. Prevalence of obesity among undergraduate students, living in halls of residence, University of Nigeria, Nsukka campus, Enugu state. Animal Research International. 2009 Dec 8;5(3).

Advances in Medical, Pharmaceutical and Dental Research Journal (AMPDR)- ISSN 2812-4898
http://dx.doi.org/10.21622/AMPDR.2024.04.1.776

38. Emmanuel A OEGSGJDGLDN. Prevalence of Overweight and Obesity among Undergraduate Nursing Students in Nigeria. International Journal of Nursing and Health Science. 2015;2(5):56–9.

39. Omage K, Omuemu VO. Assessment of dietary pattern and nutritional status of undergraduate students in a private university in southern Nigeria. Food Sci Nutr. 2018 Oct 22;6(7):1890–7.

40. Mitic N, Popovic L, Milic M, Radic I, Popovic B. Prevalence of Overweight and Obesity among Students of Uni-versity in Pristina/ Kosovska Mitrovica, According to Different Anthropometric Indices. Iran J Public Health. 2021 Sep 6;

41. Uloko AE, Musa BM, Ramalan MA, Gezawa ID, Puepet FH, Uloko AT, et al. Prevalence and Risk Factors for Diabetes Mellitus in Nigeria: A Systematic Review and Meta-Analysis. Diabetes Therapy. 2018 Jun 14;9(3):1307–16.

42. Asiimwe D, Mauti GO, Kiconco R. Prevalence and Risk Factors Associated with Type 2 Diabetes in Elderly Patients Aged 45-80 Years at Kanungu District. J Diabetes Res. 2020 Jan 30;2020:1–5.

43. Amarasinghe S, Balakumar S, Arasaratnam V. Prevalence and risk factors of diabetes mellitus among adults in Jaffna District. Ceylon Medical Journal. 2015 Sep 27;60(3):107.

44. Winston GJ, Caesar-Phillips E, Peterson JC, Wells MT, Martinez J, Chen X, et al. Knowledge of the health consequences of obesity among overweight/obese Black and Hispanic adults. Patient Educ Couns. 2014 Jan;94(1):123–7.

45. Otovwe A. Demographic Determinants of Knowledge, Perception, and Attitude towards Diabetes Mellitus among Public In-School Adolescents in Southern Nigeria. School Health. 2023;10(4):2–10.

46. Khan RK MRSBSWS. Predictors of diabetes risk perception among college students. 2022;1809–1809.