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Prevalence of obesity among urban and rural dwellers in Nigeria

Abstract

Introduction: There is a global rise in the prevalence of obesity in both developed and developing countries reaching epidemic levels.

Objective: This study aims at determining the prevalence of obesity among urban and rural dwellers in Nigeria.

Methods: The study was a cross sectional study, 400 subjects were selected (198 males and 202 females) through a systematic random sampling procedure. A pre tested semi structured questionnaire was administered to obtain socio-demographic characteristics, lifestyle behaviors, and anthropometric indices. Anthropometric data were measured by standard methods. The body mass index (BMI), waist circumference, waist hip ratio and total body fat percentage were determined. Descriptive statistics, $\chi 2$ and correlation were performed on the data at 5% level of significance.

Results: The mean BMI was 24.2±4.43. The prevalence of obesity in the urban and rural areas were 16.5% and 4.0% respectively ($p<0.05$). The prevalence of obesity was lower among participants who were active than those who lived a sedentary lifestyle (6.0% vs14.4%; $p< 0.05$). Those who consumed alcohol had higher BMI than those who do not consume alcohol (12.0 vs 9.9; $p<0.05$). About 32.3% men from urban vs. 10.2% from rural had waist circumferences ≥94cm ($p<0.05$). Similar trends were also observed among the women. There was also a strong correlation between the BMI, WC and WHR in both the male and female participants.

Conclusion: Obesity is significantly ($P<0.05$) prevalent in the urban area than in rural area.

Keywords: waist circumference, dietary pattern, sedentary lifestyle

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Abbreviations: WHO, world health organization; BMI, body mass index; WHR, waist hip ratio

Introduction

Obesity and overweight constitute a major public health problem and their prevalence is increasing at an alarming rate worldwide.[1] Obesity is a major risk factor for the development of certain chronic diseases and has been related to some hormone-dependent cancers.[2,3] Many environmental factors such as lifestyle and poor diet,[4] age, socio-economic factors[5] and a lack of physical activity play an important role in the onset of obesity.[6] Overweight refers to an excess body weight compared to set standards. The excess weight may come from muscles (lean body mass), bone, fat (adipose tissues), sometime tumors and/or body water. Obesity specially refers to having an abnormally high proportion of total body fat.[7] Obesity and overweight according to World Health Organization (WHO) standards are present when the Body Mass Index (BMI) values are more than 30 and 25, respectively. Due to the shift in dietary consumption and increase sedentary lifestyle, there has been an increase in the prevalence of obesity and overweight in Nigeria. This study therefore, assessed the prevalence of obesity among rural and urban dwellers in south-west Nigerian using Ado-Ekiti as a case study.

Materials and methods

The study was descriptive cross sectional in design. The study was carried out in an urban and rural location of Ado-Ekiti among the adult aged 18years and above. Sampling procedures were as follows: sample size was calculated on the basis of 50% risk factor prevalence, 5% precision, 95% CI. Sample size was estimated at 384 and rounded to 400 persons to compensate for missing questionnaire. Odo-Ado and Adebayo area of Ado-Ekiti Nigeria were purposively chosen as the respective rural and urban locations based on their peculiar characteristics. Houses in the two locations were assigned numbers and systematic random sampling procedure was used to select the households that participated in the study. Exclusion criteria included individuals unable to provide the requested information or written consent to participate in the study.

Survey procedure

The interviewers were first trained prior to the commencement of the survey in order to standardize the data collected and the anthropometric measurements. The data were collected in the participants' respective houses during a personal interview.

Data collection

The sampling instruments included a semi-structured questionnaire which was validated and pre-tested in another setting that was not selected for the main study. These people were within the age group qualified for the study. The questionnaire was designed to elicit information on demographic and socio-economic status (age, sex, ethnic group, religion, etc.) (Monthly allowance, highest education, occupation etc) and lifestyle practices

Variables studied

The following measurements were performed: body weight, height, BMI (kg/m2). Body weight was measured using bathroom scales, with the person wearing light clothes and no shoes. Body weight was expressed in Kilograms. The bathroom scales were calibrated before and during the study. The reading was taken to the nearest 0.1kg. Height was measured using a height gauge with the subject standing barefoot. Size was expressed in centimeters. BMI, corresponding to the person's weight divided by the square of the person's height (kg/m^2), was used to define underweight (BMI <18.5kg/m^2), normal weight (BMI ≥18.5 and<25.0kg/m^2), overweight (BMI ≥25.0 and <30.0kg/m^2) and obesity (BMI≥30.0kg/m^2) according to WHO recommendations.

Non-Stretch flexible tapes were used for measuring the waist circumference. The waist circumference was taken when the subject stood with the feet about 25-30cm apart. The measurement was taken with the tape placed midway between the upper hip bone and the uppermost border of the right iliac crest and reading taken when the tape was snug but does not compress the skin and underlying soft tissues. The circumference was measured to the nearest 0.1cm at the end of normal expiration. The hip circumference was measured when the subject was standing erect with arms at the sides and feet together the researcher sat at the side of the subject so that the level of maximum extension of the buttocks was seen. The tape was placed around the buttocks in a horizontal plane. The tape was snug around the skin but does not compress the soft tissues. The measurement was recorded to the nearest 0.1cm with the subject wearing light dressing around hip.

Statistical analysis

Summary statistics were used to describe the study population. Results were reported as percentage and mean and standard deviation. The association between demographic and socio-economic status with BMI was researched through Chi square test. Waist hip ratio (WHR) was calculated and compared for safe levels and at risk of disease using the standards based on NIH/WHO guideline and Gallagher. The waist circumference for men and women was compared with the increased relative risk standard defined as "increased risk": men ≥ 94cm and women ≥80cm, "substantially increased risk" for men is ≥102cm and for women ≥88cm All statistical analyses were performed using the Statistical Package for Social Sciences statistical software package version 17.0 (SPSS Inc., Chicago, IL, USA)

Results

The socio demographic characteristics of respondents are presented in Table 1, a total of 400 respondents participated in the study. Two hundred participants were recruited from each of rural and urban locations. 84% of the participants were from the Yoruba ethnic group, 13.8 % Igbo, 1.25% Hausa and the remaining 1% were from others ethnic group. Most had tertiary education 283 70.8% and were mostly Christians 81.3%. The relationship between the body mass index, gender and socio demographic status were presented in Table 2. The overall prevalence of obesity was significantly higher in urban (16.5%) area than in rural area 4.0% ($P<0.05$). The prevalence was higher in women than in men 15.9 v 4.0% ($p<0.05$). The prevalence of obesity increases with age in women, age group 53 and above had the highest percentage of obesity (50%), but in men the highest prevalence was observed between the ages of 34 and 42 (12.5%). The prevalence of overweight (not including obesity) increases with age in men with the highest age group 53 and above having the largest percentage (83.3%) and until the age of 52years in women (45.8%). Women with the highest education level were more obese (6.8%), the same trend was observed in men (16.7%). Considering occupation and sex, civil servants were more obese that those with other occupations (8.2% in men and 20% in women) a positive relationship was found between the prevalence of obesity and total family income in both genders; as income of the family increased, the prevalence of obesity increased. Considering marital status, married men were prone to obesity than single and divorced or widower. However, both married and widowed women were at higher risk of being obese.

The relationship between the body mass index (BMI), gender and lifestyles of the respondents is shown in Table 3. The prevalence of obesity was lower among subjects who were active compare to the sedentary (6.0% v 14.4%; p< 0.05) Similar trend was observed separately in men and women. Those who consumed alcohol had higher percentage of obesity compare to non-alcohol consumers (12.0 v 9.9; p<0.05). There was no significant relationship (p>0.05) between smokers, non smokers and the body mass index both in males and females. There was a significant relationship between the breakfast habits and body mass index. Those who had regular breakfast recorded highest prevalence of obesity (10.8%) and 42 (12.5%). The relationship between the men's place of residence and their waist circumference is shown in Figure 1. Participants from urban area have higher waist circumference than those from rural area. 9.8% men from the urban area have a higher risk of developing non communicable diseases such type 2 diabetes and cardiovascular diseases compared to 6.9% from rural area. 2.5% men in the urban area have abdominal obesity compared to 3.95% in the rural area. Similarly, the relationship between the place of residence and the waist circumference among the women is shown in Figure 2. Women from rural area have more risk of developing non communicable diseases compared to those in the urban area, but there were more women with abdominal obesity in Urban than in rural area ($P<0.05$).
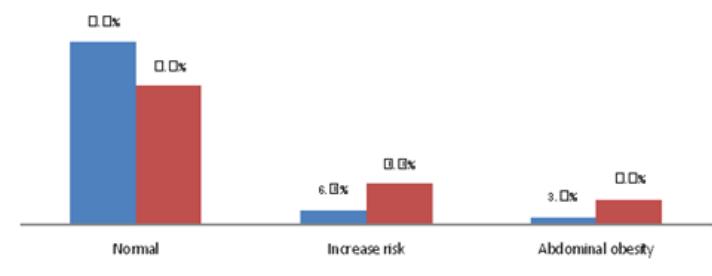

Figure 1 Waist circumference for the rural and urban men *P*=0.001.

Classification of waist circumference (WC) values for men.

Normal (<90), Increase risk (>94cm), Abdominal obesity (>102cm).
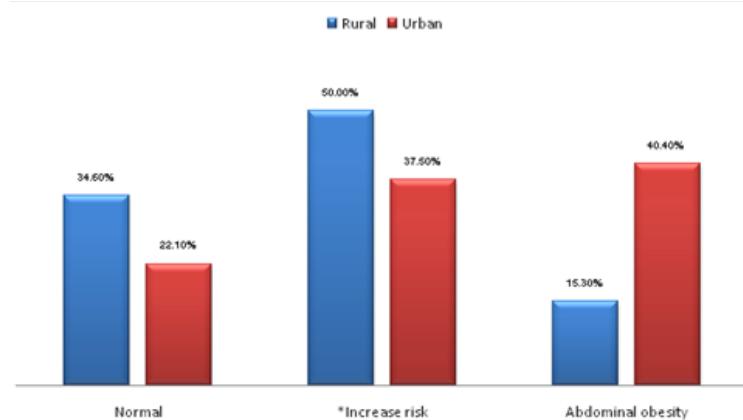
Figure 2 Waist circumference for the rural and urban women *P*<0.05.

Classification of waist circumference (WC) values for females.

Normal WC (<80cm), Increase risk WC (>80cm), abdominal obesity; (>88cm).

Table 1 Socio demographic characteristics of the study participants

	All		Male		Female	
	N	**%**	**N**	**%**	**N**	**%**
Age Group						
18-25	112	28	57	28.8	55	27.2
26-33	139	34.8	68	34.3	71	35.1
34-42	94	23.5	48	24.2	46	22.8
43-52	43	10.8	19	9.6	24	11.9
>52	12	2.9	6	3	6	3
Religion						
Islam	67	16.8	43	21.7	24	11.9
Christianity	325	81.3	152	76.8	173	85.6
Others	8	2	3	1.5	5	2.5
Ethnicity						
Yoruba	336	84	162	81.8	174	86.1
Igbo	55	13.8	30	15.2	25	12.4
Hausa	5	1.25	3	1.5	2	1
Others	4	1	3	1.5	1	5

Table continued...

	All		Male		Female	
	N	**%**	**N**	**%**	**N**	**%**
Occupation						
Civil Servant	109	27.3	49	27.7	58	29.7
Farmer	11	2.8	7	3.5	4	2
Trading	156	39	55	23.8	91	45
Artisen	29	7.3	28	14.1	1	5
Student	95	23	49	24.7	46	22.8
Marital Status						
Single	165	41.3	96	48.5	69	34.2
Married	226	56.5	98	49.5	128	63.4
Widower	4	1	1	0.5	3	1.5
Divorced	5	1.3	3	1.5	2	1
Educational Status						
No Formal	5	1.3	2	1	3	1.5
Primary	24	6.0	16	8.1	8	4.0
Secondary	88	22.0	47	23.7	41	20.3
Tertiary	283	70.8	133	67.2	150	74.3
Monthly income						
< 10 000	52	13	27	13.6	25	12.4
10 000-20000	70	17.5	38	19.2	32	15.8
21000-30000	74	18.5	33	16.7	41	20.3
31000-40000	98	24.5	47	23.7	51	25.2
>400000	106	26.5	57	26.8	40	26.2
Place of Residence						
Rural Area	200	50	102	51.5	98	48.5
Urban Area	200	50	96	48.5	104	51.5

Table 2 BMI distribution by gender and socio demographic characteristics

BMI	All				Male				Female			
	n	<25	25-29	>30	n	<25	25-29	>30	n	<25	25-29	>30
Age group												
18- 25	112	91.1	6.3	2.7	57	96.5	35.1	0	55	89.1	9.1	5.5
26- 33	139	64.7	24.5	10.8	68	75	20.6	4.4	71	56.3	28.2	15.3
34-42	94	42.6	42.6	14.9	48	60.9	27.1	12.5	46	26.1	56.7	12.2
43-52	43	34.9	46.5	18.6	19	52.6	47.4	0	24	20.8	45.8	33.3
53 P<	12	25	50 0.05	25	6	16.7	83.3 0.05	0	5	33.3	16.7 0.05	50
Religion												
Islam	67	68.7	19.4	11.9	43	77.4	23.3	2.3	24	62.5	12.5	25
Christianity	325	61.2	28.3	10.5	52	73.7	15.1	5.3	173	50.3	34.7	15
Others P	8	62.5	25 NS	12.5	3	66.7	53.1 NS	0	5	80	20 NS	0
Ethnicity												
Yoruba	336	64.5	26.8	10.7	162	73.5	23.3	4.9	174	52.3	31.6	16.1
Igbo	55	60	27.3	12.7	30	76.7	15.1	3.3	25	48	36	16
Hausa	5	100	0	0	3	100	0	0	2	100	0	0
Others P<	4	50	50 NS	0	3	33.3	66.7 NS	0	1	100	0 NS	0
Occupation												
Civil Servant	109	41.3	44.3	14.7	49	46.9	44.9	8.2	60	36.7	43.3	20
Farming	11	72.7	27.3	0	7	85.7	14.3	0	4	50	50	0
Trading	156	60.9	26.3	12.8	65	72.3	21.5	6.2	91	52.7	29.7	17.6

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Table continued...

	All				**Male**				**Female**			
BMI	**n**	**<25**	**25-29**	**>30**	**n**	**<25**	**25-29**	**>30**	**n**	**<25**	**25-29**	**>30**
Artisan	29	79.3	17.2	3.4	28	82.1	14.3	3.6	1	0	100	0
Student P<	95	85.3	10.5 0.05	4.2	29	95.9	4.1 0.05	0	46	39.5	17.4 0.05	8.7
Marital Status												
Single	165	86.1	9.7	3	96	91.7	7.3	1	69	72.3	15.9	5.8
Married	226	46.5	38.1	15.5	99	56.1	35.7	8.2	128	39.1	39.8	21.1
Widower	4	25	50	25	1	0	100	0	3	33.3	33.3	33.3
Divorced P<	5	80	20 0.05	0	3	0	100 0.05	0	2	50	50 0.05	0
Educational Status												
Non Formal	5	60	40	0	2	0	100	0	3	33.3	66.7	0
Primary	24	83.3	12.5	4.2	16	87.5	12.5	0	8	75	12.5	12.5
Secondary	88	78.4	14.8	6.8	47	85.1	17.5	0	41	65.9	14.6	14
Tertiary P	283	56.3	6.3 NS	12	132	67.7	25.6 NS	6.8	150	46.7	36.7 NS	16.7
Monthly Income												
< 10 000	52	88.5	9.6	1.9	27	88.9	11.1	0	25	88	8	4
10 000-20 000	70	84.5	11.4	4.3	38	86.8	10.5	2.6	32	81.3	12.5	6.3
21 000- 30 000	74	67.6	21.6	10.8	33	87.9	9.1	3	41	51.2	31.7	17.1
31 000- 40 000	99	55.1	31.6	13.3	47	70.2	25.5	4.3	51	41.2	37.3	21.6
>40 000 P<	106	40.6	44.3 0.05	15.9	55	50.9	39.6 0.05	9.4	53	30.2	39 0.05	20.7
Place of Residence												
Rural Area	200	78.5	17.5	4	102	85.3	13.7	1	98	70.1	22.4	7.1
Urban Area P<	200	47.5	36 0.05	16.5	96	61.3	21.7 0.05	9.4	104	37.5	36.5 0.05	26.4

Table 3 BMI distribution by lifestyle and gender. ns means not significant at 5% level

BMI	All				Female				Male			
	n	<25	25-29	≥30	n	<25	25-29	≥30	N	<25	25-29	≥30
Physical Activity												
Active	199	72.4	21.6	6.0	70	50	33.7	12.9	129	84.5	13.2	2.3
Sedentary P<	201	53.7	31.8 0.05	14.4	132	53.8	28.9 ns	17.4	69	53.6	37.7 0.05	8.7
Alcohol Intake												
Yes	133	51.9	36.1	12.0	42	33.3	40.5	26.2	91	60.4	34.1	5.5
No P<	267	68.5	22.1 0.05	9.9	160	57.5	29.4 0.05	13.1	107	85.0	11.2 0.05	3.7
Smoking Habit												
Yes	14	78.6	14.3	7.1	1	0	100	0	13	84.6	7.7	7.7
No P	386	62.4	27.0 ns	10.4	201	52.7	31.3 ns	15.9	185	73.0	22.7 ns	4.3
Breakfast Consumption												
Daily	269	60.6	28.6	10.8	140	47.1	35.7	17.1	129	75.2	20.9	3.9
Occasionally	119	65.5	24.4	10.1	60	63.3	23.3	13.3	59	67.8	25.4	6.8
Rarely P<	12	91.7	8.3 0.05	0	2	100	0 0.05	0	10	90 ns	10	0
Snacking Habit												
Daily	36	75	13.9	11.1	13	61.5	15.4	23.0	23	82.6	13.0	4.3
Occasionally	178	62.4	27.0	10.7	98	54.1	31.6	14.3	80	72.5	21.3	6.3
Rarely P	186	61.3	29.0 ns	9.7	91	49.5	34.1 ns	16.5	95	72.6	33.7 ns	3.2

Table 4 The inter correlation of the age groups, body mass index(BMI), waist circumference(WC) and waist hip ratio(WHR) in Men

	1	2	3	4
1. BMI	1	0.58**	0.44**	0.82**
2. WHR	0.58**	1	0.49**	0.79**
3 AGE	0.44**	0.49**	1	0.49**
4 WC	0.22**	0.79**	0.49**	1

**=*p*<0.05 BMI, body mass index; WHR, waist hip ratio; WC, waist circumference

Table 5 The inter correlation of the age groups, body mass index (BMI), waist circumference(WC) and waist hip ratio(WHR) in women

	1	2	3	4
1. BMI	1	0.50**	0.50**	0.86**
2. WHR	0.55**	1	0.44**	0.70**
3 AGE	0.50**	0.44**	1	0.55**
4 WC	0.86**	0.70**	0.54**	1

**=*p*<0.05 BMI, body mass index; WHR, waist hip ratio; WC, waist circumference

Discussion

In the present study, obesity was significantly more prevalent in the urban area than rural area with prevalence of 16.5% versus 4.0% respectively (*p*<0.05). The higher prevalence of obesity in the urban area compared to rural area is attributable to rapid and unplanned urbanization in developing countries, change from local dietary pattern to western style diet which is driven by the proliferation of fast food outlets in major cities in developing nations. Exposure to and consumption of high fat and refined food high in calorie and a reduced energy expenditure in form of physical inactivity have been implicated.[8] The women were more obese than men with prevalence rates of 15.9% versus 4.0% (*p*<0.05). Similar finding was noted by on obesity and overweight profile in the Niger delta region where women had significantly higher prevalence rates of obesity than men.[9] The Age was strongly associated with obesity in women; prevalence of obesity in women peaked at 53 and above as previously reported by Shimokata H et al.,[10] This association between obesity and age in women can be explained, in part, by parity and post menopausal status.[11] The reduced risk of obesity in younger women may reflect a possible shift in the burden of obesity in women, from the positive association observed in most studies from sub-Saharan Africa[12,13] to the inverse association reported from developed countries. Therefore, younger women, who are more likely to be educated, adopt lifestyles that are less prone to obesity in response to their exposure to the cultures of more developed countries.[14]

Findings from this research showed that individual income was strongly and positively associated with obesity, especially in men as presented in Table 1, men with the highest monthly income were more obese (9.4%) compared to other income group, this contradicts the studies conducted by Parkes KR.[15] Participants with tertiary education had the highest prevalence of obesity compared with those with no form of formal education (12.0% versus 16.9%) This finding contradicts the study done by Muhammad A et al.,[16] who found that respondents with no schooling and no formal education had significantly higher BMI than those with formal education. In these study civil servants had the highest percentage of obese individuals compared to other occupations type. This study agreed with who

reported that men in government and private services were more likely than manual workers to be overweight/obese suggesting that subjects with lower job status had lower risk of overweight/obesity. This is due to the fact that these low status jobs are more physically demanding and involve heavy manual exertions, such occupation thus could decrease risk for overweight and obesity. Physical activity was also found to be an important predictor of overweight/obesity in this study as presented in Table 3, those who lived a sedentary lifestyle had the highest prevalence of obesity (14.4%) compared with active lifestyles (6.0%), this result is similar to the findings of.[17] This study also showed that most of the respondents from the urban area were aware on the risks associated with being obese or overweight, method of prevention and causes of obesity, this result is similar to that conducted by Iloh G et al.,[18] on 9,296 Nigerians adult which showed that 14.8% were aware of their obese condition; out of these, 46.5% had knowledge of lifestyle modification. However, majority (72.3%) of those who had knowledge of lifestyle modification demonstrated low knowledge level of lifestyle modification.

The result of this study shows a positive relationship between the waist circumferences and the participants' place of residence. The urban dwellers have greater abdominal fat than their counterparts from rural area. An excess of abdominal fat has been associated with a range of metabolic abnormalities and diseases.[19] Individuals with this characteristic are at the highest risk for developing type 2 diabetes, metabolic syndrome, and subsequent cardiovascular complications, including retinopathy, nephropathy, neuropathy, macular degeneration, and cardiovascular disease. The result shows that waist-hip-ratio increases with increase in age in both sexes. Age-related differences in waist–hip ratio in both men and women were also reported by Shimokata H et al.[20] From Tables 4 & 5 positive correlations was observed between body mass index, waist circumference and waist-hip ratio in men and women[21] reported in his study that only in male were waist-hip ratio and body mass index significantly correlated. So, relationship between other parameters such as; BMI vs. WHR and WHR vs. WC were not statistically correlated. In men there was no correlation with WC or WHR. The study showed that socio demographic factor such as age, educational level, marital status and monthly income were strongly associated with body mass index.

There was also a significant relationship between physical activity and obesity; participants who do not engage in regular physical activity had higher risk of being obese. Increased body mass index is also associated with increased, waist circumference, waist hip ratio and total body fat percentage.

Conclusion

Urban residents are more informed on being overweight and obese, although the knowledge did not reflect on their body mass index, as more participants from urban area were either overweight or obese. Public awareness should be created in both the urban and rural areas on the causes and consequences of being overweight or obese. Excessive alcohol consumption should be discouraged among the rural and urban dwellers. An enabling environment that promote physical activities such as recreational centers and side walk paths should be created by national government and private institution to prevent a sedentary lifestyle. Therefore, findings of this study can serve as baseline data for monitoring the effectiveness of national programs for the prevention and control of obesity.

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Conflict of interest

Author declares that there is no conflict of interest.

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