

Adolescent obesity: An emerging public health crisis in an urban city in South-South Nigeria

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Abstract

In Nigeria, a prevalence of obesity of 4.2% has been reported among adolescents in a study in South-West Nigeria. Studies on the prevalence of obesity among adolescents have yielded different prevalence rates in different parts of the country. The present study was planned to determine the prevalence of obesity amongst apparently healthy adolescents aged 10-18 years in secondary schools in Uyo, as well as determine associated predisposing factors to obesity. This was a cross sectional school-based study of 1,701 adolescents selected by multi-stage sampling technique, carried out between December 2016 to February 2018. It involved measurement of weight, height and waist circumference of the study subjects, as well as administration of pretested questionnaires. Body Mass Index (BMI), Waist Circumference (WC) percentile and waist to height ratio of the subjects were determined. Data was

analysed using SPSS version 20. Prevalence of obesity was determined and Chi Square was used to determine the relationship between qualitative variables. General obesity was defined as a BMI $\geq 95^{\text{th}}$ percentile, while central obesity was defined as WtHR ≥ 0.5 or waist circumference $\geq 90^{\text{th}}$ percentile for age and sex. Prevalence of general obesity was 5.6% while the prevalence of central obesity was 11.2% using WC percentile and 9% using WtHR. This study also revealed higher prevalence of obesity in females, adolescents from monogamous homes, as well as those whose parents are from the upper socio-class. It is recommended that routine measurement of the indices of adiposity and public health enlightenment measures aimed at reducing the burden of obesity amongst adolescents in Uyo be encouraged by public health authorities. The physicians should be encouraged to measure the indices of adiposity during consultations.

Introduction

Obesity is an emerging and important paediatric public health problem associated with risks of complications in childhood and increased morbidity and mortality throughout adult life.¹ In children, Obesity is defined as a Body Mass Index (BMI) $\geq 95^{\text{th}}$ percentile for age and sex, or a waist circumference $\geq 90^{\text{th}}$ percentile for age/sex.¹ It can also be defined as a waist to height ratio greater than 0.5.¹ The main burden of obesity as a public health concern is the increased morbidity from ischaemic heart disease, heart attack and stroke in adult life.² These morbidities if not treated can lead to death. The pre-diabetes rate in overweight adolescents is 2.6 times higher than that of normal weight adolescents.³ Overweight and obese children also have increased risks of asthma, obstructive sleep apnea, musculoskeletal, emotional, behavioral and orthopedic problems.⁴⁻⁷

Childhood obesity can be caused by a range of factors which may be genetic or environmental.⁸ The obesogenicity of an environment is thus the sum of all the factors inherent within it that predispose to obesity.⁹ These factors include lack of exclusive breastfeeding, sedentary behavior, consumption of high calorific food, increased maternal pregravid weight, amongst others.¹⁰⁻¹³

There is a growing global obesity epidemic with wide variations in secular trends amongst various countries.¹⁴ In the United States of America, prevalence of 20.5% was reported amongst adolescents¹⁵ while in a developing country like Ghana, prevalence of 0.8% has been reported in Kumasi region.¹⁶ In Nigeria, the national prevalence of obesity is unknown.¹⁷ However, a study done in South-Western Nigeria revealed a prevalence of 4.2% amongst adolescents.¹⁸

This study therefore is a prevalence study that addresses the burden of obesity (both general and central) amongst adolescents in a city in South-South Nigeria. It also identifies some factors peculiar to adolescent obesity in this region.

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Ethics approval and consent to participate: The Ethics Committee of University of Uyo Teaching Hospital approved this study (UUTH/AD/S/96/VOL XIV/565). The study is conformed with the Helsinki Declaration of 1964, as revised in 2013, concerning human and animal rights. All patients participating in this study signed a written informed consent form for participating in this study.

Informed consent: Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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Materials and Methods

This study was conducted amongst adolescents attending public and private schools in Uyo, Akwa Ibom State between December 2016 and February 2018. Uyo is the capital of Akwa Ibom State and has an estimated population of 847,500 a total area of 362km².¹⁹ The people are predominantly civil servants, farmers, traders and artisans.²⁰ The study was conducted amongst adolescents between 10-18years old. Sample size was determined using the Fisher's formula, with a population prevalence (from a previous study) of 4.2%, and a degree of precision of 1%.^{18,21,22}

Thus, the total sample size was 1701.

Ethical approval was obtained from the university of Uyo Teaching Hospital. Approval was obtained from the State Ministry of Education and permission obtained from the school principals. Written informed consent was obtained from the parents and assent from the student.

A total of 12 schools (6 public and 6 privates) were selected for the study.

Weight of the participants was measured to the nearest 0.10kg.

6 AA battery powered digital scale (Seca® 877 class III) was used to measure the weight.²³ Height was measured to the nearest 0.10cm using a portable collapsible stadiometer (Seca® Leicester portable height measure). Measurements were taken at the Frankfurt plane to avoid parallax error.²³ Waist circumference was measured to the nearest 0.10cm using a flexible non elastic tape (Seca ® 201). The tape was placed parallel to the floor, midway between the last palpable rib and the top of the iliac crest. Each student was also made to fill a pre-texted questionnaire. The socio-economic class of each participant was determined using the Oyedeji's classification. BMI was calculated using the formula $BMI = \text{Weight(kg)}/\text{Height}^2(\text{m}^2)$

Waist to Height ratio (WHtR) was calculated using the formula $\text{Waist Circumference (cm)} \div \text{Height (cm)}$. Corresponding percentiles for BMI and waist circumference were obtained from the respective percentile charts (CDC/WHO respectively).

All Data obtained were arranged into tables and analyzed using the statistical package for the Social Sciences (SPSS) Version 20.

The prevalence of Obesity was determined as $BMI \geq 95^{\text{TH}}$ percentile (general obesity)²⁴ or $WHtR \geq 0.5/WC^{25}$ percentile $\geq 90^{\text{th}}$ percentile²⁶ for central adiposity. Statistical significance was set at p values < 0.05 at 95% confidence interval.

Table 1, Figures 1 and 2 show the sociodemographic characteristics of the participants.

A total of 1701 children were studied. Majority of the participants were less than 14 years old (580 or 34.1%). The least number of participants were between 16-18 years of age (544 or 32%).

The male to female ratio of the participants was 1:1.4. The highest numbers of participants in the study were Ibibios (1,385 or 81.4%). Hausas had the least number of participants (10 or 0.6%). Most of the participants were Christians (99.5%) while just a few were Muslims (0.5%).

Table 1. Demographic characteristics of participants.

	N
Age group	
10 -<14 years	580
14-<16 years	577
16-18 years	544
Sex	
Male	720
Female	981
Religion	
Christianity	1692
Islam	9
Others	0
Nature of Family	
Monogamous	1457
Polygamous	244
Family setting	
Married	1450
Divorced	90
Single	51
Widowed	110
Total	1701(100)

Table 3. Socio-demographic status in relation to the prevalence of obesity among adolescents using BMI percentile.

	Obese N (%)	Non-Obese N (%)	Total N (%)	p
Age group				
10-<14years	35 (6)	545 (94)	580 (34.1)	0.7
14-<16 years	34 (5.9)	543 (94.1)	577 (33.9)	
16-18 years	27 (5)	517 (95)	544 (32)	
Sex				
Male	19 (2.6)	701 (97.4)	720 (42.3)	0.001*
Female	77 (7.8)	904 (92.2)	981 (57.7)	
SEC				
Upper class	71 (7.1)	925 (92.9)	996 (58.6)	0.002*
Middle class	11 (2.4)	441 (97.6)	452 (26.6)	
Lower class	14 (5.5)	239 (94.5)	253 (14.9)	
Nature of Family				
Monogamous	89 (6.1)	1368 (93.9)	1457 (85.7)	0.04*
Polygamous	7 (2.9)	237 (97.1)	244 (14.3)	
Family setting				
Married	80 (5.5)	1370 (94.5)	1450 (85.2)	0.35
Divorced	7 (7.8)	83 (92.2)	90 (5.3)	
Single	5 (9.8)	46 (90.2)	51 (3.0)	
Widowed	4 (3.6)	106 (96.4)	110 (6.5)	
Total	-	-	1701 (100)	

Majority of the participants were in Social Class 2 (516 or 30.3%); while Social Class 5 had the least number of participants (37 or 2.2%). Most of the participants (1,457 or 85.7%) were from monogamous homes. Adolescents whose parents were still married had the largest number of participants (1,457 or 85.7%), while those from single parents had the least number of participants (51 or 3%).

Table 2 shows the prevalence of obesity using the three parameters selected.

The prevalence of general obesity was 5.6% while that of central obesity was 11.2% using WC percentile and 9% using WHtR.

Table 3 shows the relationship between the sociodemographic characteristics of the participants and their BMI percentile. Adolescents between 10 to <14years had the highest prevalence of general obesity (6%) compared to the other age groups. Females had the highest prevalence of general obesity compared to males (7.8% cf 2.6%). This was statistically significant (p=0.001). Adolescents whose parents were from the upper social class had the highest prevalence of general obesity (7.1%). This was statistically significant (p=0.002). In addition, general adiposity was more prevalent amongst adolescents from monogamous homes (6.1%). This was statistically significant (p=0.04).

Tables 4 and 5 show the relationship between sociodemographic factors and the measures of central adiposity. The prevalence of central obesity was highest in adolescents between 16-18years (14.3% and 11.2% respectively). The prevalence of obesity was higher in females compared to males (13.6% cf 7.9%; 12.6% cf 4% for WC percentile and WHtR respectively). This was statistically significant (p=0.001). Adolescents from the upper social class had the highest prevalence of central obesity (13.6% and 10.1% for WC percentile and WHtR respectively). Why this was significant for WC percentile (p=0.001), it was not significant for WHtR (p=0.14). The prevalence of central obesity was higher among adolescents from monogamous homes (14.4% and 9.5% respectively). This was not statistically significant (p=0.55 and 0.07 respectively).

Discussion

The overall prevalence of general obesity in this study was 5.6% while the prevalence of Central Obesity was 11.2% using WC percentile and 9% using WHtR. The Prevalence of central obesity was higher than the prevalence of general obesity. This is an agreement with a study which showed that WC measurement alone or in combination with height is a more sensitive measure for identifying obesity compared to BMI.²⁷ The 5.6% obtained as the prevalence of general obesity in this study is much lower than the 20.5% reported by Ogden *et al.* amongst American adolescents.¹⁵

The lower prevalence of general obesity in this study may be due to difference in genetic make-up between both population and partly due to the fact that adolescents in our setting are exposed to less calorigenic diets compared to those in the USA.

The prevalence of Obesity using BMI is very similar to the 5.7% reported by Rohilla *et al.* amongst adolescents in India.²⁸ Similarities in the age group of adolescents studied may explain this despite differences in the study environment.

The prevalence of general obesity obtained in this study is much higher than that reported in some studies in Ota and Ile-Ife, South-West Nigeria (3.4% and 4.2%),^{18,29} as well as Benue, North-Central Nigeria (1.8%).³⁰ This difference may be due to the fact that Uyo is a more Urban setting compared to these cities; and has more eateries which have contributed to the increased obesity

of Uyo compared to these areas. The prevalence of Central obesity obtained from this study is high, and higher than the 10.6% and 8.4% reported by Castro *et al* and Park *et al*, in Brazilian and Korean adolescents respectively.^{31,32} The difference in prevalence may be due to the sample size used in this study compared to these other two mentioned. However, the prevalence of central obesity is much lower than the 24.5% reported by Senbanjo and Oshikoya amongst adolescents in Abeokuta.³³ This is because Senbanjo and Oshikoya used the 75th percentile cut-off (which included adolescents between the 75th and 90th percentile).

The prevalence of central obesity using WHtR is very similar to the 9.1% reported by Kromeyer-Hauschild *et al.* amongst German adolescents.³⁴ Similarity in the age group of respondents could explain this.

Table 2. Prevalence of obesity in adolescents using body mass index, waist to height ratio, and waist circumference percentile.

	Obese N (%)	Non-Obese N (%)
BMI Percentile	96 (5.6)	1605 (94.4)
Waist to Height Ratio	153 (9)	1548 (91)
Waist Circumference	190 (11.2)	1511 (88.8)

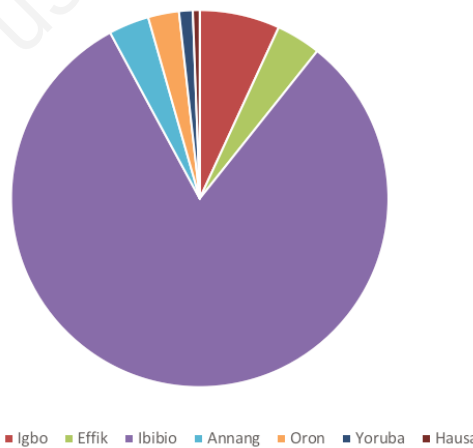


Figure 1. Ethnic groups of participants.

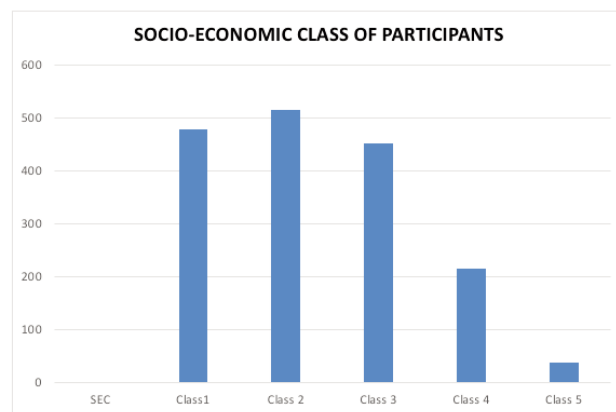


Figure 2. Socio-economic class of participants.

This study shows that all forms of obesity have higher prevalence amongst adolescents in the upper socio-economic class. Alkali *et al.* reported comparable findings amongst adolescent in Gombe.³⁵ However, this is contrast to what is obtainable in developed nations like the US where obesity is commoner amongst the low socio-economic class.³⁶ The reason for this may be because adolescents in our environment from high socio-economic class are more likely to consume junk food and engage in less degree of physical activities as a manifestation of affluence thus increasing the risk of developing obesity.

The result of this study also shows that all forms of obesity are commoner in females, and there is a significant association between gender and obesity. Similar findings have been reported in

other studies in Nigeria and some parts of the world.³⁷⁻⁴⁰ This may be explained by the fact that there is a sex specific gene (Lysophospholipase-like-1 gene) which is expressed solely in females and is known to cause increased distribution in females.⁴¹

A significant association was found between obesity and family setting with general obesity being commoner amongst adolescents from monogamous homes. The reason for this may be due to the fact that monogamous setting may have fewer children struggling for food, thus making food more readily available.⁴²

The pattern of general and central adiposity differs in adolescents with central obesity being commoner amongst the adolescents studied.

Table 4. Social status in relation to the prevalence of obesity among adolescents using waist circumference percentile.

Age group	Obese N (%)	Non-Obese N (%)	Total N (%)	p
Age group				
10-<14 years	55 (9.5)	525 (90.5)	580 (34.1)	0.02*
14-<16 years	57 (9.9)	520 (90.1)	577 (33.9)	
16-18 years	78 (14.3)	466 (85.7)	544 (32.0)	
Sex				
Male	57 (7.9)	663 (92.1)	720 (42.3)	0.001*
Female	133 (13.6)	848 (86.4)	981 (57.1)	
SEC				
Upper class	135 (13.6)	861 (86.4)	996 (58.6)	0.001*
Middle class	33 (7.3)	419 (92.7)	452 (26.6)	
Lower class	22 (8.7)	231 (91.3)	253 (14.9)	
Nature of Family				
Monogamous	166 (11.4)	1291 (88.6)	1457 (85.7)	0.55
Polygamous	24 (9.8)	220 (90.2)	244 (14.3)	
Family setting				
Married	158 (10.9)	1292 (89.1)	1450 (85.2)	0.29
Divorced	13 (14.4)	77 (85.6)	90 (5.3)	
Single	9 (17.6)	42 (82.4)	51 (3.0)	
Widowed	10 (9.1)	100 (90.9)	110 (6.5)	

Table 5. Social status in relation to the prevalence of obesity among adolescents using waist to height ratio.

Obese	Non-Obese N (%)	Total N (%)	p N (%)	
Age group				
10-<14 years	42 (7.7)	502 (92.3)	544 (32.0)	0.07
14-<16 years	46 (8)	531 (92)	577 (33.9)	
16-18 years	65 (11.2)	515 (88.8)	580 (34.1)	
Sex				
Male	29 (4)	691 (96)	720 (4.3)	0.001*
Female	124 (12.6)	857 (87.4)	981 (57.7)	
SEC				
Upper class	101 (10.1)	895 (89.9)	996 (58.6)	0.14
Middle class	32 (7.1)	420 (92.9)	452 (26.6)	
Lower class	20 (7.9)	233 (92.1)	253 (14.9)	
Nature of Family				
Monogamous	139 (9.5)	1318 (90.5)	1457 (85.7)	0.07
Polygamous	14 (5.7)	230 (94.4)	244 (14.3)	
Family setting				
Married	126 (8.7)	1324 (91.3)	1450 (85.2)	0.19
Divorced	8 (8.9)	82 (91.1)	90 (5.3)	
Single	9 (17.6)	42 (82.4)	51 (3.0)	
Widowed	10 (9.1)	100 (90.9)	110 (6.5)	

Conclusions

This study has shown that obesity is becoming a public health challenge in our environment. Regular measurement of the indices of adiposity is necessary to stem this tide. Given the significant relationship between diseases, the importance of this cannot be over-emphasized.

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