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Screening for Obesity during the World Health Day in Ogboloma, a Small Rural Settlement in the Niger Delta Region of Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author OGE designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author DO helped in the literature search and managed the analyses of the study. Both authors took part in the actual screening of participants during the study. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine the prevalence and correlates of generalized and central obesity in a small rural Ijaw community in the Niger Delta region of Nigeria. This is essential in the primary prevention of diseases associated with obesity.
Study Design: Place and Duration of Study: The study was cross-sectional in design. Participants were recruited through a consecutive sampling of all eligible participants who presented for a screening exercise during the world health day in April 2012. The study site was Ogboloma, a small rural population in Bayelsa State, Nigeria.
Methodology: Socio-demographic data, clinical history, anthropometry and blood pressures were taken. Confidentiality was maintained. Data were stored and analyzed using SPSS version 20.0.
Results: Generalized obesity was found in 12.2% of participants while 23.7% were overweight. A total of 47(35.9%) individuals either had generalized obesity or were overweight. Central obesity was more prevalent among females across the three different criteria. Waist hip ratio identified more

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participants as obese (69.5%) compared with waist circumference (51.1%) and waist height ratio (57.3). The predictors of generalized obesity were age and education while central obesity was predicted mainly by gender.

Conclusion: The prevalence of obesity in this rural community was high and compares with recent trends. There is a need for regular screening of communities for obesity so that affected individuals can be managed properly to minimize the risk of attendant complications.

Keywords: Bayelsa state; central obesity; generalized obesity; ogboloma; world health day.

1. INTRODUCTION

More than half a billion adults were reported to be obese in 2008 and this has been projected to exceed two billion by 2030 [1]. Recent global figures from the World Health Organization (WHO) indicate that obesity is not just a problem of the developed countries but is also on the increase in the developing world, with over a hundred and fifteen million people suffering from obesity-related problems [2]. The reported prevalence of overweight and obesity amongst urban dwellers in Africa is 35% and it is estimated that by 2025, 75% of the obese people worldwide will reside in the developing world [3]. Since infectious diseases have continued to play a significant role in morbidity and mortality, these low-income countries are now confronted with a double burden where both communicable and chronic non-communicable diseases co-exist [4].

Nigeria, the most populous country in Africa is not left out of this raging obesity epidemic. Data from the WHO Global InfoBase show that the prevalence of overweight and obesity together increased by 23% in men and 18% in women while the prevalence of obesity alone increased by 47% in men and 39% in women between 2002 and 2010 in Nigeria [5].

The observed rise in prevalence of obesity has important health implications. Obesity is strongly associated with impaired glucose tolerance and diabetes, hypertension and heart disease.[6] Other complications include dyslipidaemia, cerebrovascular disease, pulmonary and gastrointestinal diseases, renal disease, reproductive and psychosocial issues.[6] However, till lately, this scourge seems to have been more obvious in urban communities compared with rural ones [7]. Although there have been some reports on obesity across Nigeria, most have come from urban communities. This is probably because obesity was viewed as a disease of affluence associated with individuals in the higher socio-economic group living in urban communities. Times are however changing, the pre-existing gap is becoming narrowed and the traditional rural communities are gradually becoming 'urbanized' [8]. Rural dwellers are beginning to adopt western lifestyles. These may have an important impact on the epidemiology of obesity and related conditions.

The study aimed at determining the prevalence of obesity and associated factors in a rural ijaw community. Although a few prevalence reports exist among the ijaw population in this setting, most of them were not detailed to include the various aspects of central obesity.

2. MATERIALS AND METHODS

This study was done as part of activities to commemorate the World Health Day on April 7, 2012. The World Health Day is usually commemorated once a year globally and provides an opportunity to sensitize the general population on health-related issues. The participants included farmers, traders, drivers, artisans, civil servants, and the unemployed as well as the retired in Ogboloma. Ogboloma is a small rural setting in Bayelsa State, Niger Delta area of Nigeria with a total population of about 4000. The community was chosen for convenience due to proximity to the researchers' institution. Prior sensitization visits were made to the community and the respondents were asked to converge in the community town hall on a certain day where the screening exercise was to take place. Adults who were more than 18 years old were included in the study. Exclusion criteria included pregnancy, presence of oedema, inability to stand or walk, and history suggestive of secondary hypertension or diabetes. Each participant was assessed using an interviewer-administered structured questionnaire containing information such as age, gender, highest level of education attained, history of alcohol and tobacco consumption as well as a personal history of hypertension.

Weight was measured in kilograms to the nearest 0.5 kg using a bathroom scale. Each

subject was weighed wearing light clothing without shoes or stockings. The height of the subjects was measured using a stadiometer with the participant standing erect without shoes and with his head placed in such a way that the external auditory meatus and the angle of the eye were on a horizontal line. The height was measured in metres to the nearest 0.1 cm. Body mass index (BMI) was calculated as the weight (kg) / (height [m])^2 and recorded in kg/m.^{2} Generalized obesity was defined as BMI $\geq$ 30kg/m^2.

A measuring tape was used to measure the waist and hip circumference. The smallest circumference between the xiphisternum and the umbilicus on expiration was taken as the waist circumference (WC) while the hip circumference (HC) was taken at the point of maximum posterior protuberance of the buttocks with the participant standing upright and both feet together. Both measurements were taken to the nearest 0.1 cm. Central obesity was defined using 3 criteria: Waist circumference (WC), waist hip ratio (WHR) and waist height ratio (WHtR). For males, WC >94cm was considered abnormal while for females, values >80cm was abnormal while lesser values were considered normal. WHR was calculated by dividing the WC by the HC. WHR of >0.9 and >0.8 was considered' abnormal' for males and females respectively. WHtR was calculated by dividing the WC by the height of the participant. A WHtR of >0.5 was considered as abnormal while lesser values were normal.

Blood pressure (BP) was measured by an Accoson mercury sphygmomanometer. Participants must have avoided alcohol, cigarette smoking and coffee before the measurement. They sat on a chair with their feet flat on the floor and arm resting on a table such that the arm cuff was at their heart level. The cuff was securely applied to the upper arm of the participants using the fastener strip. BP was taken from the left arm after at least 10 min of rest using appropriate cuff size. The mean of two readings taken at least 2 min apart was determined. Subjects having a systolic BP (SBP) 140 mmHg and above, or a diastolic BP (DBP) 90mmHg and above or who had a normal blood pressure but were being treated for hypertension were categorized as hypertensives [9].

Random blood glucose was also determined for each participant using an Accucheck glucometer. Hyperglycaemia was defined as any value $\geq$ 7.8 mmol/l.

2.1 Ethical Approval

Ethical approval was obtained from the Ethics and Research Committee of the Niger Delta University Teaching Hospital, Okolobiri, Bayelsa State. Permission of the paramount traditional leader was sought before proceeding with the study. Informed consent was also obtained from the participants.

2.2 Data Analysis

All data analyses were conducted with SPSS. Descriptive statistics such as means and standard deviation were computed for continuous variables and proportions and percentages for categorical variables. Pearson's chi-square ($\chi 2$) test was used to find the association between categorical variables. Student's t-test was used to compare continuous variables.

Binary logistic regression was used to examine the associations between potential correlates (age, gender, education, smoking status, alcohol, hypertension and hyperglycemia with generalized and central obesity). Odds Ratio and 95 % confidence intervals were presented in the logistic regression models. Level of significance was set at $P < .05$.

3. RESULTS AND DISCUSSION

3.1 Characteristics of the Participants

The mean age of participants was 48.4$\pm$14.8 yrs with no statistical difference between males and females. There was no significant difference in the mean ages of female participants (49.0$\pm$15.3 yrs) compared with male participants (47.6$\pm$14.1 Yrs).

There was no statistically significant difference in the mean values of the obesity-related parameters between male and female participants. However, the mean diastolic blood pressure was higher among the males (Table 1).

3.2 Prevalence of Obesity

Generalized obesity was found in 12.2% of participants while 23.7% were overweight. A total of 47(35.9%) individuals either had generalized obesity or were overweight. Only 3(6.1%) males met the criteria for generalized obesity, all of which were in the mild category. Among females,

Table 1. Characteristics of the study participants

Characteristic	All	Males	Females	*P*
Age(yrs)	48.4±14.8	47.6±14.1	49.0±15.3	.596
BMI(kg/m^2)	24.4±4.6	24.5±3.6	24.3±5.5	.796
WC(cm)	85.3±13.6	84.9±13.4	85.5±13.7	.824
HC(cm)	93.9±13.0	92.6 ±9.6	94.7±13.2	.376
WHR	0.91±0.08	0.92±0.11	0.90±0.05	.257
WHtR	0.53±0.09	0.50±0.08	0.55±0.09	.257
SBP(mmHg)	138.1±22.5	140.7±24.8	136.5±21.0	.314
DBP(mmHg)	87.3±12.8	90.5±14.6	85.4±11.2	.038*
RBS(mmol/l)	6.6±3.1	6.6±2.6	6.6±3.3	.999

BMI = body mass index,WC = waist circumference, HC= hip circumference, WHR = waist to n hip ratio, WHtR = waist to height ratio
**statistically significant*
Test statistics: Students t-test

the prevalence of mild, moderate and morbid obesity among females were 8.5%, 6.1% and 1.2%. Even though generalized obesity was more prevalent among females, the difference was not statistically significant (*P*=0.264).

Central obesity was more prevalent among females across the three different criteria (p<0.001, 0.002 and 0.003 for WC, WHR and WHtR ratio respectively). WHR identified more participants as obese (69.5%) compared with WC (51.1%) and WHtR (57.3%). Generally, central obesity was more prevalent among women across the three different criteria (Table 2).

3.3 Predictors of Obesity

Education was found to have a positive association with generalized obesity. Compared with those with at most a primary level of education, individuals with at least a secondary level of education had 16 fold risk of developing generalized obesity (p=0.003; 2.601 – 107.898). However, there was no association between education and indices of central obesity (Table 3).

Female participants had 19x risk of having abnormal waist circumference compared with their male counterparts (*P* <0.001, CI= 5.029-69.533). Similarly, odds for abnormal WHR and WHtR were 8x more in females (*P* <0.001, CI = 2.436 – 24.294) and (*P* = 0.001, CI =2.412 – 23.510 respectively). Education was found to have a positive association with generalized obesity. Compared with those with at most a primary level of education, individuals with at least a secondary level of education had 16 fold risk of developing generalized obesity

Table 2. Prevalence of obesity among the participants using various criteria

Characteristic	ALL (n=131, n (%)	Males [n=49, n (%)]	Female [n= 82, n(%)]	*P*
BMI(kg/m^2)				
<18.5	7(5.3)	2(4.1)	5(6.1)	
18.5-24.9	77(58.8)	28(57.1)	49(59.8)	
25.0-29.9	31(23.7)	16(32.7)	15(18.3)	
30.0-34.9	10(7.6)	3(6.1)	7(8.5)	.247
35.0-39.9	5(3.8)	0(0.0)	5(6.1)	
>40.0	1(0.8)	0(0.0)	1(1.2)	
WC				
Males > 94 cm Females>80 cm	67(51.1%)	10(20.4)	57(69.5%)	<.001
WHR				
Males>0.9 Females> 0.8	91(69.5%)	26(53.1)	65(79.3)	.002*
WHtR				
>0.5	75(57.3)	20(40.8)	55(67.1)	.003*

*BMI: Body mass index; WC: waist circumference; WHtR:waist-to-height ratio; WHR: waist-to-hip ratio, *statistically significant; Test statistics: chi-square*

Table 3. Multivariate analyses of risk factors for generalized obesity

Factor	Categories of variable	*P*	OR	CI
Generalized obesity				
Age	<40 (Ref)	.674	1.420	0.276 – 7.295
Gender	Male (Ref)	.004*	24.346	2.742 – 216.184
Education	None(Ref)	.003*	16.753	2.601 – 107.898
Smoking	None(Ref)	.137	4.171	0.636 – 27.336
Alcohol	None(Ref)	.848	0.876	0.226 – 3.392
Elevated BP	No(Ref)	.381	0.537	0.134 – 2.159
Hyperglycaemia	No(Ref)	.215	2.848	0.544 – 14.906

BP = blood pressure, Ref= reference
**statistically significant*

Table 4. Multivariate analyses of risk factors for waist circumference

Factor	Categories of variable	*P*	OR	CI
WC				
Age	<45 (Ref)	0.498	0.711	0.266 – 1.904
Gender	Male (Ref)	<0.001*	19.03	5.029- 69.533
Education	None(Ref)	0.692	0.806	0.277 – 2.344
Smoking	None(Ref)	0.238	0.439	0.112 – 1.723
Alcohol	None(Ref)	0.384 0.327	0.668	0.269 – 1.656
Elevated BP	No(Ref)		1.586	0.631 – 3.988
Hyperglycaemia	No(Ref)	0.170	0.345	0.075 – 1.579

*BP = blood pressure, WC = waist circumference, OR = odds ratio, CI= confidence interval, *statistically significant*

(*P*=0.003; 2.601 – 107.898). However, there was no association between education and indices of central obesity (Table 4).

Compared with those who were below 45 yrs, participants above 45 yrs old had about 5 times increased odd for the development of abnormal waist hip ratio(*P*=0.03, CI = 1.698 – 14.445) (Table 5).

In addition to the effect of gender on WHtR, participants with hypertension had three times likelihood of having abnormal WHtR, compared with those with normotension. There was however no association between hypertension and the other indices of obesity.

There was also no association between hyperglycemia, alcohol or smoking and the indices of obesity (*P* >0.05) (Table 6).

4. DISCUSSION

The prevalence of obesity (12.2% for generalized obesity and 23.7% for overweight) found in this study is comparable to reports of between 10.1and 14.8% in some rural communities in South. Eastern Nigeria [10,11] and south western Nigeria[12]. Emmanuel et al found a comparable value of 13.58% in Idema, another rural community in Bayelsa State [13]. Similarly, rates of overweight reported in those studies did not differ much from our findings in this study.

Table 5. Multivariate analyses of risk factors for waist hip ratio

Factor	Categories of variable	*P*	OR	CI
Age	<45 (Ref)	0.03*	4.95	1.698 – 14.445
Gender	Male (Ref)	0.001*	7.69	2.436 – 24.294
Education	None(Ref)	0.264	1.86	0.626 – 5.542
Smoking	None(Ref)	0.240	2.27	0.578 – 8.882
Alcohol	None(Ref)	0.704	0.83	0.314 – 2.186
Hypertension	No	0.136	0.47	0.176 – 1.267

*OR = odds ratio, CI = confidence interval, *statistically significant*

Table 6. Multivariate analyses of risk factors for waist height ratio

Factor	Categories of variable	*P*	OR	CI
Age	<45 (Ref)	0.364	1.549	0.602 -3.988
Gender	Male (Ref)	0.001*	7.531	2.412–23.510
Education	None(Ref)	0.390	1.571	0.561 – 4.403
Smoking	None(Ref)	0.138	2.542	0.740 – 8.734
Alcohol	None(Ref)	0.619	0.522	0.522- 2.978
Hypertension	No	0.021*	2.823	0.147 – 0.855
Hyperglycaemia	No	0.096	4.047	0.780–20.993

*OR- odds ratio, CI = confidence interval, *statistically significant*

The rate of obesity in this study was much higher than previously reported in a rural community in Niger Delta region of Nigeria [14]. The prevalence of generalized obesity in that study was only 3.4% in that population. This may partly be due to the fact that since the participants were virtually all farmers, they must have been engaged in some form of physical activity in the process which may have reduced their tendency to be obese. Our rate is however less than that reported in urban communities among civil servant [15] and hospital employees in the same state [16]. The figure is also less than the 52.0% for the women versus 28.0% for the men reported in Uyo, another urban community in the Niger Delta [17]. The reason ascribed to the high prevalence was rapid urbanization of the town following its emergence as a state capital as well as change in dietary habits. It is therefore possible that despite the fact that obesity is becoming more prevalent in rural communities, there may still be a disparity in prevalence rates between rural and urban communities.

Central obesity was more prevalent than generalized obesity in this study. This appears to be the observed trend in most reports of obesity. Waist hip ratio identified more cases of central obesity, followed by waist height ratio.

The prevalence of central obesity was higher in women than men, a finding that is generally consistent with other studies in Nigeria and other parts of Africa [18-21] Studies in African populations have documented positive association of a large body size with good nutrition, healthy life, affluence, beauty, fertility, and absence of HIV/AIDS [22-25]. This may partly explain why the obesity epidemic has continued to thrive among women and also has important implication in attempts to curtail it.

WHR was positively correlated with age though there was no association between age and other indices of obesity such as BMI, WC, or WHtR. Several studies have similarly shown that obesity increases with age [12,26,27].

The presence of hypertension was associated with an abnormal waist/height ratio. This finding is in agreement with those of previous studies, which suggested a superiority of the WHtR over BMI in their association with hypertension [28,29]. The WHtR has recently been considered a better screening tool than WC and BMI for adult cardiometabolic risk factors [30] This implies that obesity screening should not be limited to BMI but should more elaborately include indices of central obesity such as WC, WHR and WHtR. This is important in order not to exclude categories of individuals with central obesity who may not have generalized obesity and vice-versa.

5. CONCLUSION

This study has shown a high prevalence of generalized and central obesity especially among women in a rural ijaw community. There is a need for regular screening of communities for obesity so that affected individuals can be promptly managed to minimize risk of attendant complications. Individuals found to be obese could be screened for other associated medical conditions such as hypertension and hyperglycaemia. However, this study has certain limitations. The cross-sectional design of this study makes it difficult to establish causal relationship between obesity and its predictors. Some aspects of the history relied on self-report such as previous history of hypertension, tobacco and alcohol use. This may be subject to recall bias. Dietary habits and physical activities were not assessed. The amount of alcohol consumed by participants was not quantitified. Results could have been different for heavy and light drinkers. There could also have been some distinction between heavy tobacco smokers, light smokers, current smokers and quitters. However, these limitations do not invalidate the

findings of the study. There is a need for more studies to be carried out, including prospective studies to directly assess causal relationships between obesity and some of these predictors.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

Ethical approval was granted by the ethical and research committee of the Niger Delta University Teaching Hospital, Okolobiri, Bayelsa State, Nigeria. This study is not against any public interest and the release of information is allowed by legislation. This work has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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