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Burden of Abdominal Obesity and Related Risk factors in a Nigerian Rural Community

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Abstract
Background: *Abdominal obesity is a health challenge affecting adult individuals in many African countries. Some studies on abdominal obesity and associated risk factors done in Nigeria were urban dominated and those involving rural areas were mostly conducted in the South West and South East regions of Nigeria. We assessed the prevalence and identified related risk factors for abdominal obesity in a rural community in Nigeria.*
Materials and Methods: *Homesteads were randomly selected and all consenting adults (≥ 18 years of age) were recruited for this cross-sectional study (134 individuals: 48 men, 86 women). Sociodemographic data and anthropometric measurements (weight, height and abdominal circumference) were obtained. Abdominal obesity was based on waist circumference ≥94cm for men and ≥80cm for women.*
Results: *Abdominal obesity prevalence in this community was 54%. Results from one village (Ogboli: 68%) and ethnic group (Ibo: 60%) were significantly higher than in others in the same variable category. Multivariate logistic regression analysis suggested age, gender and marital status as strongest risk factors for abdominal obesity.*
Conclusion: *There is a need for regular health screening and weight reduction measures to reduce the risk of obesity and its comorbidities in this community.*
Key Word: *Abdominal obesity; waist circumference; Body mass index (BMI); Hypertension, Morbidity*

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I. Introduction

Obesity is a public health burden affecting a high percentage of adult individuals and is an important risk factor for the development of hypertension, diabetes and cardiovascular diseases. [1-5] Increase in the burden of obesity has been noted in both developed and developing countries. The global prevalence of central obesity according to age, sex, race, place of residence and geographical region was 41.5% with the highest prevalence found in Southern and Central America especially among adults and female subjects.[6] Similarly, based on the OECD analysis of health survey data, the prevalence of obesity in United States in 2015 was 32.4% among adult men and 38.2% among adult women.[7] In 2013, 2 billion individuals worldwide were overweight or obese, and 62% of the world's obese population resided in developing countries.[8] In the same year, the prevalence of obesity among various categories of adult Nigerians ranged from 8.1% to 22.2%.[8] A particular concern is abdominal obesity, with most developing countries apparently seeing an increase in prevalence of this condition, especially among adults in rural communities.

In Nigeria, studies have shown prevalence of obesity in general by regions as follows: Abuja (64%), Abia (12.3%), Ekiti (4%), Bayelsa (13.6%), Enugu (21.2%), Ile-Ife (29.1%) and Oghara (10.9%).[9-15] These studies also reported sociodemographic, socioeconomic, lifestyle, dietary and psychosocial factors as the most strongly related risk factors associated with obesity.[8, 10, 14,15] Thus, health and economic challenges caused by obesity affect adults in rural communities even though they may not share the high-risk lifestyles that are predominant among elite urban dwellers in Nigeria.

Gradual improvement in the quality of life is nonetheless leading to increased longevity, and with broad demographic shifts giving rise to an aging population, there is a heightened necessity for proactive management of chronic and life-restricting diseases. Prominent among such diseases is hypertension – rightly termed "a silent killer" – for which obesity is an important risk factor. Rising prevalence of obesity in developing countries is leading in turn to rapid increase in hypertension, morbidity and mortality, especially in rural settings.[16] In Nigeria, depending on target population, type of measurement, and cut-off value used for defining hypertension, studies show prevalence of hypertension in rural settings ranging from 13.5% to 46.4%, compared with 8.1% to 42.0% in urban settings.[16-17] In three rural communities in Ife North Local Government Area, Osun State, South West Nigeria, the prevalence of hypertension was 26.4%, indicating a rising trend.[18]

In Abia State, hypertension was high in both rural and urban settings.[19] In a rural community in the Niger Delta region of Nigeria, prevalence of hypertension was 20.2%.[20] In rural communities in Benin, Southern Nigeria, prevalence of hypertension was 37.6%.[21] Immediately prompting the present study was a reported 44% prevalence of hypertension in a rural community in Delta State, Nigeria, with BMI category (obese) being statistically significant in the bivariate and multivariate adjusted logistic regression.[16] The studies listed above also reported obesity as one of the most strongly related risk factors associated with hypertension.[16,18-20] Studies have also shown that the increasing burden of obesity is related to psychosocial, dietary and lifestyle factors.[6,8,10,11,15,22-25]

However, most of the studies on obesity and associated risk factors in Nigeria have had an urban focus, and those involving rural areas were mostly conducted in the South West and South East regions of Nigeria. No studies we are aware of have assessed burden specifically of abdominal obesity and its related risk factors in South-South Nigeria (Delta State).

II. Material And Methods

This epidemiological survey conducted was carried out in three villages (Idinisagba, Umuodafe and Ogboli). A total of 134 adult subjects (both male and female) aged 20-80 years were used for this study.

Study design: Epidemiological survey study

Study Location: This study is a community-based work done in Ibusa, Delta State, Nigeria.

Sample Size: 134 patients

Study Duration: March 2017- April 2018

Sample size calculation: Simple random sampling was used to select eight homesteads in Idinisagba, ten in Umuodafe and six in Ogboli. With total population of 210, a final sample of 134 were eligible for inclusion and willing to participate. Of the total sample, 45 participants were from Idinisagba, 67 from Umuodafe and 22 from Ogboli.

Subjects and selection method: The study population was drawn from subjects meeting the inclusion criteria for abdominal obesity residing in Idinisagba, Umuodafe and Ogboli respectively between March 2017 and April 2018.

Inclusion criteria:

1. Subjects with abdominal obesity
2. Either sex
3. Subjects aged 18 and above
4. Subjects with waist circumference of ≥94cm for men and ≥80cm for women

Exclusion criteria:

1. Subjects aged <18 years
2. Subjects with waist circumference of <94cm for men and<80cm for women

Procedure methodology

The questionnaire used in the survey collected various sociodemographic data on the respondents' general health care practices and their lifestyle behaviours. It also contained questions about the risk factors associated with abdominal obesity. Anthropometric measurements (weight, height and abdominal circumference) were also obtained. A portable electronic scale (Hana, Omron Health Care) was used to measure body weight and a tape measure (Sandex Powerlock-P5NE) for height and abdominal circumference measurement. The electronic scale was reset to zero after individual measurements. Body weight was recorded to the nearest 0.1 kg (after removal of foot wears, heavier clothing and pocket contents). Height (without foot wears and head scarf) and abdominal circumference were recorded to the nearest 0.5 cm. Abdominal circumference was measured midway between the last rib and the iliac crest and measurements ≥94 cm and ≥ 80 cm were regarded as indicative of abdominal obesity in male and female participants, respectively. In our study, we used the new International Diabetes Federation (IDF) definition of central (abdominal) obesity for Sub-Saharan Africans, defined as waist circumference ≥ 94cm for men and ≥ 80cm for women with raised blood pressure or treatment of previously diagnosed hypertension.[26] The BMI categories used in this study were based on the WHO classification.[33-35]

Ethical Approval

Ethical approval for this study was granted by the Humanities and Social Sciences Research Ethics Committee of the University of KwaZulu-Natal, Durban (protocol reference number: HSS/0525/013D). Gatekeeper's permission was also obtained from the ruler of the community.

Data analysis

Data were processed and analysed using Stata 13.0 (StataCorp, 2013). Significant association between various explanatory variables and abdominal obesity were assessed using the standard Pearson's chi-square ($\chi 2$) test. If an expected cell count in the cross tabulation had less than five observations (sparse numbers) then exact methods (viz., Fisher's exact test) were used instead. Bivariate logistic regression and multivariable adjusted stepwise logistic regression were also used to assess the influence of various explanatory variables on abdominal obesity status. Factors associated with abdominal obesity with a p-value cut-off <0.2 based on the bivariate associations were selected for entry into the adjusted multivariable logistic model. An explanatory variable with an adjusted p-value of <0.05 was deemed statistically significant.

III. Results

Table 1 presents a summary of the characteristics of the study participants (n = 134). Half the sample (67 participants) were from Umuodafe village. The age range of respondents was between 20 and 80 years, with a mean age and standard deviation of 52.6 ± 20.6 years. The median age was 54.5 years (interquartile range: 31–72 years). More women participated in the study (86/134; 64%). The mean BMI of the sample was 25.3 kg/m2 ± 5.9 kg/m2 and median BMI was 24.7 kg/m2 (interquartile range: 21.3 kg/ms2 – 27.9 kg/m2). The majority of the participants (101/134; 75.4%) were married and all but one was Christian. Of the sample, 116 participants (87%) were from the Ibo ethnic group. More than half of the participants (78/134; 58.2%) reported secondary school or higher as their highest educational level. The overall prevalence of abdominal obesity in the community was 54%, (Table 2) as determined according to the measurements during the survey.

Table 3 shows the prevalence of abdominal obesity organised according to demographic variables. A significantly higher prevalence was seen amongst female participants than amongst male participants (75.6% vs. 14.6%; P < 0.001). Prevalence of abdominal obesity increased significantly with age (P < 0.001), and was significantly higher in the Ogboli village (68.2%; P = 0.021) than in Idinisagba (64.4%) or Ogboli (41.8%). Prevalence of abdominal obesity was significantly higher amongst married individuals than amongst single participants (65.4% vs. 18.2%; P < 0.001).

In Table 4, bivariate and multivariable logistic regression analyses were used to identify risk factors associated with abdominal obesity after adjustment for potential confounding from other variables. After multivariable adjustment, age, gender and marital status remained significantly associated with abdominal obesity (P < 0.001). No significant difference in risk existed when comparing Umuodafe to Idinisagba as the reference village. However, Ogboli showed increased odds (risk) of abdominal obesity compared to Idinisagba after multivariable adjustment (P = 0.040). Cigarette smoking showed marginally significant higher risk of abdominal obesity after multivariable adjustment (p = 0.076)

Table 1 - Characteristics of the study participants (n=134)

Variable	Frequency (%)
Age group	
20-30	33 (24.6)
31-40	10 (7.5)
41-50	16 (11.9)
51-60	23 (17.2)
61-70	16 (11.9)
71-80	36 (26.9)
Marital Status	
Single	33 (24.6)
Married	101 (75.4)
Gender	
Male	48 (35.8)
Female	86 (64.2)
Ethnicity	
Ibo	116 (86.6)
Hausa	3 (2.2)
Other †	15 (11.2)
Religion	
Christianity	133 (99.2)

Islam	1 (0.8)
Educational level	
No basic education	24 (17.9)
Primary school	32 (23.9)
Secondary school	44 (32.8)
Tertiary education	34 (25.4)
Village	
Idinisagba	45 (33.6)
Umuodafe	67 (50.0)
Ogboli	22 (16.4)

†, Other ethnic groupings include Urhobo, Isoko, Ozoro, Tiv, Efik and Ibibio.

Table 2 - Overall prevalence of abdominal obesity in the study sample (n=134).

Classification	Prevalence: n (%)
International Diabetes Federation definition of central (abdominal) obesity (Defined as waist circumference ≥ 94cm for men and ≥ 80cm for women)	72 (53.73)

Table 3 – Results of Pearson's chi-square ($\chi 2$) analysis of prevalence of abdominal obesity organized according to demographic variables

Variable	Number of abdominal obese participants (prevalence %)	p-value †
Age group		
20-30	5 (15.2)	< 0.001
31-40	6 (60.0)	
41-50	10 (62.5)	
51-60	16 (69.6)	
61-70	10 (62.5)	
71-80	25 (69.4)	
Marital Status		
Single	6 (18.2)	< 0.001
Married	66 (65.4)	
Gender		
Male	7 (14.6)	< 0.001
Female	65 (75.6)	
Ethnicity		
Ibo	70 (60.3)	< 0.001
Hausa	0 (0.0)	
Other	2 (13.3)	
Educational level		
No basic education	18 (75.0)	0.002
Primary education	23 (71.9)	
Secondary education	18 (40.9)	
Tertiary education	13 (38.2)	
Village		
Idinisagba	29 (64.4)	0.021
Umuodafe	28 (41.8)	
Ogboli	15 (68.2)	

†, Fisher's exact test.

TABLE 4: Bivariate and multivariate logistic regression analyses of factors associated with abdominal obesity.

Factor	Bivariate		Multivariate	
	OR (95% CI)	*P -value*	OR (95% CI)	*P-value*
Demographic factors				
Age	1.04(1.02,1.06)	< 0.001	-	-
Female gender	18.12(7.07,46.43)	< 0.001	84.81(13.97,514.80)	< 0.001
Ethnicity (Ibo vs Hausa/other)	0.10(0.02,0.46)	0.003	-	-
Educational status				
Primary education	0.85(0.25,2.83)	0.794		
Secondary education	0.23(0.76,0.69)	0.009	8.50(1.54,46.93)	0.014
Tertiary education	0.20(0.06,0.65)	0.007		
Marital status				
Married vs single	8.48(3.20,22.49)	0.001	27.28(4.53,164.17)	< 0.001
Lifestyle risk factors				
High alcohol intake	1.55(0.77,3.10)	0.212	0.28(0.06,1.27)	0.100
Diet high in cholesterol or fat	0.70(0.34,1.43)	0.337	-	-
Little physical activity	1.00(0.48,2.09)	0.991	2.86(0.62,13.01)	0.174
Smoking	1.54(0.77,3.10)	0.218	0.10(0.01,1.26)	0.076
Village				
Idinisagba	-	-		
Umuodafe	1.18(0.39,3.49)	0.762		
Ogboli	0.39(0.18,0.86)	0.020	0.28(0.08,0.94)	0.040

IV. Discussion

The overall prevalence of abdominal obesity found in this study (viz., 54%) is comparable with studies in most rural communities in the neighbouring West African countries.[8] However, it appears to be higher than the 13.6%,[12] 42.4%, 21.2%,[10,13] and 29.1%[14] prevalence reported in rural communities respectively, in the Niger Delta Region, in South Eastern Nigeria (Abia and Enugu), and in South Western Nigeria (Ile-Ife, Osun State). These variations could be attributed to the differing target populations used in the respective studies, especially in terms of age. The ≤90 years upper age limit age used in this study, compared to the ≤70 years upper age limit used in the South Eastern and South Western Nigeria studies, may explain the higher prevalence of abdominal obesity in this study, as it has been shown that abdominal obesity increases with age, irrespective of gender.[9,15] There was also notably increased likelihood (risk) of abdominal obesity in Ogboli village compared to other villages. Cultural behaviours, including traditional food and diet such as palm kernel soup (a high-cholesterol diet) may be an attributable factor to the increased risk in Ogboli as well as the overall high prevalence of 54%.

Besides culture-attributable factors, other factors such as gender, age and some lifestyle factors are well-known risk factors for the development of abdominal obesity. In this study, the prevalence of abdominal obesity was found to be higher in females than in males (females 75.6%; males 14.6%), which corresponds with findings in other studies, globally and within Nigeria.[8,9,10,13-15] In line with previous research,[9] our study also revealed that abdominal obesity prevalence was significantly higher in married individuals. Family issues and problems play a role in the development of hypertension (of which obesity is an important risk factor). This may be attributed to the heavy responsibilities and increased social stress faced by this group of people.[8,9] In this study population, only five of the younger participants (< 30 years of age) were obese. This target group being in their prime age are mostly engaged in physical and recreational activities. There was a significant association between abdominal obesity and both gender and marital status as indicated in the Multivariable logistic regression. In this study, the sociodemographic factors (age, gender and marital status) were the strongest risk factors for abdominal obesity. This is consistent with findings from previous studies.[8,15,30] Increasing age and BMI status (overweight or obese) are well-known risk factors for development of abdominal obesity.[8,9,10,13-15,22-25]

V. Conclusion

The prevalence of abdominal obesity (54%) is high in this rural community with the overall prevalence ranging from 8.1% to 22.2% in rural settings in the country of study. There was also notably increased likelihood (risk) of abdominal obesity in Ogboli village compared to other villages. The study findings indicate that abdominal obesity is an important health issue even in the rural communities. Due to the scarcity of resources and facilities seen in most developing countries, the management of abdominal obesity, especially in rural communities, may have to face some challenges. It is therefore pertinent that measures be taken to reduce the risk factors for abdominal obesity in order to maintain optimum health in the rural settings. This could be achieved by adopting some simple measures such as body weight control and promotion of physical and recreational activities through sensitizations in schools, churches and community organizations.

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