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Health Assessment of the Ikwerres and Okrikas Ethnic Group of Rivers State, Nigeria: Using Body Mass Index and Waist-to-Hip Ratio

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Authors' contributions

This work was carried out in collaboration among all authors. Authors NA and OMA conceptualized the manuscript. Authors OMA and LIW collected the data and analyzed the study. Authors NA and FCI wrote the manuscript. Authors OMA and NA reviewed and edited the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Body mass index (BMI), and waist-to-hip ratio (WHR), are acceptable indicators in accessing health status that are used to assess cardiometabolic disorders and to predict future health risks. The aim of the study assesses the health status of Ikwerres and Okrikas ethnic groups using BMI and WHR.

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Methods: The study adopted a descriptive cross-sectional study design where it comprises of 300 respondents (139 females and 161 males) between the age of 18-37 years were randomly selected. BMI was deduced from the division of body weight by the square root of standing height and WHR by direct division of waist circumference and hip circumference.
Results: A study of 300 subjects from Ikwerre and Okrika ethnic groups in Rivers State found that 11.8% were underweight, 76.4% normal weight, 7.5% overweight, and 4.3% obese in males. The association of BMI was significant with gender differences, and the waist-to-hip ratio showed that 69.6% of males were within the normal range. BMI and waist-to-hip ratio are significant.
Conclusion: BMI shows gender differences and the association between BMI and WHR is significant.

Keywords: Body mass index; waist-to-hip ratio; health status; Ikwerre acceptable indicator and Okrika.

1. INTRODUCTION

Health status assessment is defined in relation to blood pressure, body mass index (BMI), waist-to-hip ratio (WHR), and random Blood Sugar (RBS) [1]. Health status parameters are used in assessing cardiometabolic disorder and are most often times used to determine future health risks [2]. The Ikwerre and Okrika ethnic groups are indigenous to Rivers State, Nigeria. To understand the health status and risks of these communities, it was important to conduct a health assessment using reliable indicators. Two commonly used measures are Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR) [3].

Body Mass Index (BMI) is a widely accepted indicator for assessing body weight and categorizing individuals into underweight, normal weight, overweight, or obese [4]. It is calculated by dividing a person's weight in kilograms by the square of their height in meters [5]. BMI provides a general overview of an individual's weight status and can be used to identify potential health risks associated with being underweight, overweight or obese. Though Obesity is a long-term (chronic) health condition that progresses over time. It is morphologically defined by presence of excess bodily fats within the adipose tissues that may impair health [6]. Body fat itself is not a disease, of course, but when there is excess fat, it alters normal body functions by increasing the risk for cardiovascular disease (mainly heart disease and stroke), type 2 diabetes, musculoskeletal disorders like osteoarthritis, and some cancers (endometrial, breast and colon) [7]. BMI helps to assess the body fat of an individual as WHR helps in assessing abdominal fat.

Waist-to-Hip Ratio (WHR) is another useful tool in assessing the distribution of body fat. It is calculated by dividing the waist circumference by the hip circumference [8]. WHR helps determine the risk of developing certain health conditions, such as cardiovascular diseases [9]. Higher WHR values indicate an excess of abdominal fat, which is associated with increased health risks. Several studies had correlated the significance of WHR, as an indicator or measure of health, fertility, and the risk of developing serious health conditions [10]. The WHO states that abdominal obesity is defined as a waist–hip ratio above 0.90 for males and above 0.85 for females, or a body mass index (BMI) above 30.0 [11]. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) states that "total cholesterol levels are usually higher in persons with predominant abdominal obesity, defined as a waist-to-hip circumference ratio of ≥ 0.8 for women and ≥ 1.0 for men [12].

By conducting health assessments using BMI and WHR, healthcare providers and researchers can gain valuable insights into the health status and potential risks within the Ikwerre and Okrika ethnic groups. These assessments can help identify patterns related to weight and body fat distribution, which can inform prevention and intervention strategies for addressing obesity-related health issues within these communities. Understanding the health status of diverse ethnic groups is essential for promoting overall well-being and developing targeted healthcare interventions [13]. BMI and WHR assessments provide valuable information that can contribute to improving health outcomes and reducing health disparities among the Ikwerre and Okrika ethnic groups in Rivers State, Nigeria.

2. MATERIALS AND METHODS

The study adopted a cross-sectional descriptive study design to generate a value for values for waist to hip ratio (WHR), and body mass index of

the adult population of Ikwerre and Okrika ethnic group of Rivers State, Nigeria within the designated age interval of 18-37years. University of Port Harcourt, Port Harcourt, Nigeria was used as the study area and the study elapse from February to May, 2023. The study population comprised of three hundred respondents (150 males and 150 females). A multi-stage random sampling techniques was used to evaluate the outcome of the respondents. The sample size of the respondents was obtained using the sample size formula

$$\text{Sample size} = \frac{Z_{1-\alpha/2^2}\, p(1-p)}{d^2}$$

Where $Z_{1-\alpha/2}$ = Standard normal variate (at 5% type 1 error) = 1.96

p = expected proportion of respondents (130%)

d = absolute error = 0.05

$$\text{Sample Size} = \frac{1.96^2 \times 1.3(1-0.85)}{0.05^2} = 299.64$$

2.1 Data Collection

A descriptive questionnaire was issued to gather the respondent's socio-demographic data and using a non-stretchable measuring tape, the waist circumference (WC) was measured adopting the following anatomical landmark; from the umbilicus to just above the iliac crest, measurement around the largest part of your hips; the widest part of your buttocks marks the hip circumference (HPC). The standing height and weight were measured using a stadiometer and a digital weight balance. The waist to hip ratio (WHR), was obtained from direct division of the waist circumference and the hip circumference. Body mass index was obtained from the division of weight by height in meters square (kg/m^2).

2.2 Statistical Analysis

The obtained data was subject to statistical analysis using statistical package for social science (SPSS version 25) data was presented mean±standard deviation. Inferential statistics used was independent t-test, to compare mean among gender. Pearson correlation, to determine the association between BMI and WHR Probability value less than 0.05 was considered statistically significant (P<0.05).

3. RESULTS

The study comprised three hundred subjects (139 females and 161 males) with an age interval of 18-37 years from the Ikwerre and Okrika ethnic groups of Rivers State (Figs. 1, 2, 3). The study showed that the average mean value of the body weight, standing height, body mass index, waist circumference, hip circumference, and waist-to-hip ratio was 66.33±10.96, 171.07±9.58, 22.82±4.38, 76.94±8.68, 91.95±9.64 and 0.84±0.12 respectively.

Table 2, explore that 11.8% were observed to be underweight, 76.4% normal weight, 7.5% were overweight and only 4.3% were obese in the male population. In the female population, 4.3% were underweight, and 67.6% were normal weight. Overweight was observed at 12.9% and 15.1% were observed to be obese. The association of BMI was considered significant with gender differences (P<0.05). The waist-to-hip ratio showed that in males, 69.6% was observed to be within the normal range (< 0.9) and only 30.4% of the total male population was above the obese (accumulation of abdominal fat) while in the female population, 77.7% were within the normal range (<0.85), only 21.6% shows the accumulation of abdominal fat. It was not significantly different with gender.

Table 1. Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
body weight (kg)	300	48.50	111.00	66.3270	10.96689
standing height (cm)	300	149.00	193.00	171.0753	9.58606
body mass index (kg/m^2)	300	16.34	39.11	22.8272	4.38760
waist circumference (cm)	300	60.50	122.00	76.9467	8.68221
hip circumference (cm)	300	67.00	124.00	91.9523	9.64881
waist to hip ratio	300	.57	1.89	.8484	.12654

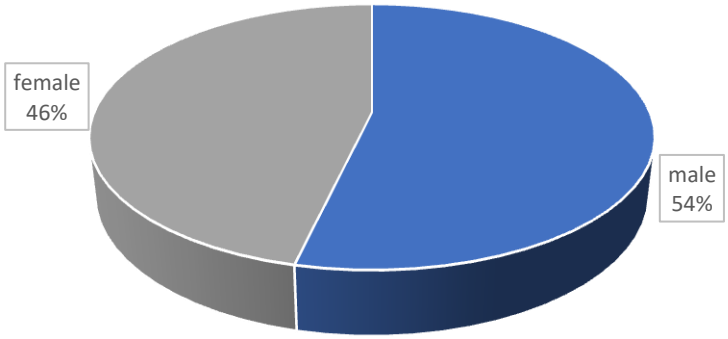

Fig. 1. The gender

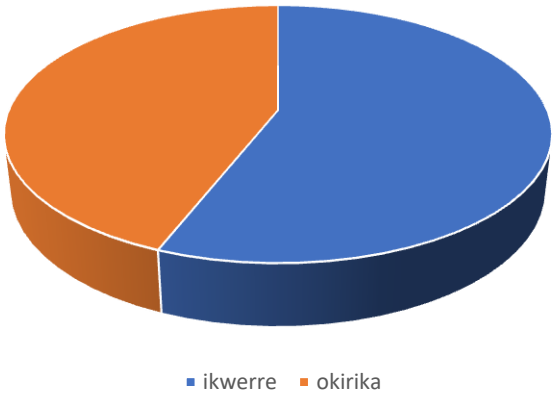

Fig. 2. Ethnicity

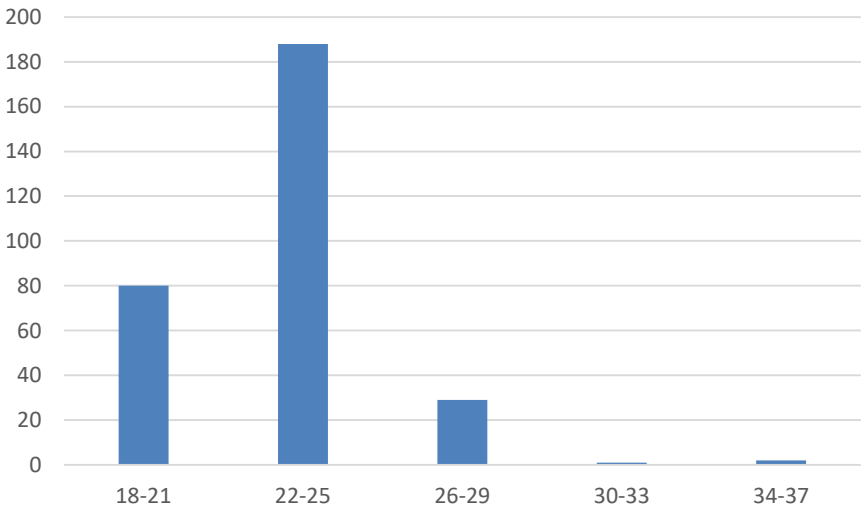

Fig. 3. Age range

Table 2. Association of BMI, WHR with gender

Body mass index					
			X^2	**P-Value**	**Inference**
Male	Underweight	19(11.8%)			
	Normal	123(76.4%)			
	Overweight	12(7.5%)			
	Obese	7(4.3%)	17.315	0.001	S
Female	Underweight	6(4.3%)			
	Normal	94(67.6%)			
	Overweight	18(12.9%)			
	Obese	21(15.1%)			
Waist-to-hip ratio					
Male	Normal	112(69.6%)			
	Obese	49(30.4%)	4.051	0.132	NS
Female	Normal	108(77.7%)			
	obese	30(21.6%)			

Significant (S), non-significant (NS)

Table 3. Association of BMI, WHR with age

Body mass index								
		Underweight	**Normal weight**	**Overweight**	**Obese**	**X^2**	**p-value**	**Inference**
age	18-21	9(11.3%)	53(66.6%)	10(12.5%)	8(10.0%)			
	22-25	15(8%)	142(75.5%)	16(8.5%)	15(8.0%)	21.345	0.046	S
	26-29	0(0%)	21(72.4%)	4(13.8%)	4(13.8%)			
	30-33	1(100.0%)	0(0%)	0(0%)	0(0%)			
	34-37	0(0%)	1(50.0%)	0(0%)	1(50%)			
Waist-to-hip ratio								
	Age	**Normal**	**Obese**					
	18-21	60(75%)	20(25%)					
	22-25	142(75.5%)	46(24.5%)					
	26-29	16(55.2%)	13(44.8%)			9.361	0.313	NS
	30-33	1(100%)	0(0%)					
	34-37	1(50%)	1(50%)					

Significant (S), non-significant (NS)

Table 4. Association of BMI, WHR with ethnicity

Ethnicity	**Variable**		**X^2**	**P-value**	**Inference**
Ikwerre	Underweight	14(8.3%)			
	Normal weight	118(70.2%)			
	Overweight	18(10.7%)			
	Obese	18(10.7%)			
Okrika	Underweight	11(8.3%)	1.207	0.75	NS
	Normal weight	99(75%)			
	Overweight	12(9.1%)			
	Obese	10(7.6%)			
Waist-to-hip ratio					
Ikwerre	Normal weight	125(74.4%)			
	Obese	43(25.6%)			
Okrika	Normal weight	95(72%)	1.103	0.576	NS
	Obese	37(28%)			

Non-significant (NS)

Table 5. Correlation of BMI and WHR

	Mean±STD	p-value	Inference
body mass index	22.82±4.38	0.024	S
waist to hip ratio	0.84±0.13	.0.024	S

Table 3. Illustrate that across the designed age interval majority of the respondents were observed to have a normal BMI (within 18-24), it was followed by overweight, underweight and obese were observed with a low frequency, the age of 22-25 years had normal weight as predominance, followed by the overweight and underweight. The obese were few among the interval. but examining the WHR, it resulted that the age interval of 22-25 years was observed more obese (abdominal fat) 46(24.5%), it was followed by the age interval of 18-21 years 20(25%) and age interval between 26-29 and 34-37 years were observed at a minimum. Table 3, also expressed that there was a significant age difference and BMI and the WHR showed insignificant age difference (P>0.05).

Table 4, showed the association of BMI and WHR between the Ikwerre and Okrika ethnic groups, the association showed insignificant ethnic differences with BMI and also insignificant using WHR assessment. The frequency of the BMI among the Ikwerre showed that 70.2% were normal weight, and 10.7% of the Ikwerre population were overweight and obese. Only 8.3% were observed to be underweight. While the okirika showed that 75%, 9.1%, 8.3 and 7.6% were normal weight, overweight, underweight, and obese respectively. The WHR of Ikwerre showed that 74.4 are normal while 25.6% showed accumulation of abdominal fat but in okirika only 28% are obese and 72% are normal. Table 5, showed that BMI and WHR are correlational significant.

4. DISCUSSION

The present study expresses the BMI categories in the male and female populations studied. The results show that a majority of the male population (76.4%) had a normal weight, while 11.8% were underweight, 7.5% were overweight, and only 4.3% were obese. In contrast, a smaller proportion of the female population (67.6%) had a normal weight, with 4.3% being underweight, 12.9% being overweight, and 15.1% being obese. According to Kooistra et al. [14], an individual BMI is essential in the determination of potential future health issues. The finding of the study agrees with a study by Jaiyeoba-Ojigho, [15], who reported that among south southern Nigeria, normal weight predominates over the overweight, underweight, and obese. A report from Fernald et al. [16] contradicts the finding of the study, they reviewed a high level of overweight and obesity among the Mexican population. In Portugal, Carmo et al. [17], also reported that over half of the population had excessively overweight/obese BMI. The study further shows a sexual dimorphism of BMI, which concur with Filozof et al. [18], that the women in urban area had a reduced BMI which was significant with the male in the American population. In Saudi Arabia, Al-Nuaim et al. [19], also report a significant variation between the male and females. The finding further suggests that the majority of the respondents will likely have fewer joint and muscle pains, better regulation of bodily fluid and blood pressure, increase blood circulation, enhances better sleep, and reduce risk for cardiovascular diseases. But Oliveros et al. [20] in their review introduce a concept that an individual might have a normal weight by body mass index but still be obese, stating that body fat assessment can be measured with other techniques direct or indirect, like bioelectrical impedance, hydrostatic plethysmography, isotope dilution techniques, dual x-ray absorptiometry, skinfold method, body impedance measures with over the counter scales, and air displacement plethysmography [21], other than body mass index, so, therefore, the present study assesses the prevalence of normal weight, underweight, overweight and obese using waist-to-hip ratio.

The waist-to-hip ratio is essential in assessing abdominal fat or abdominal obesity and most often time the health of an individual is affected by where the adipose is stored [22]. Our study evaluates the WHR and it explores that the waist-to-hip ratio was within the normal range for the majority of both male and female populations studied. Specifically, 69.6% of males and 77.7% of females had a waist-to-hip ratio within the normal range, while 30.4% of males and 21.6% of females showed an accumulation of abdominal fat. These findings concur with Kurpad et al. [23] and Jaiyeoba-Ojigho [15] both stated the prevalence of normal waist-to-hip ratio in Asia and south southern Nigeria population

though Jaiyeoba-Ojigho, [15] reported that there is a significant difference between the male and female population. Environmental factors together with lifestyle affect the WHR. According to Lönn et al. [24], they stated that high alcohol consumption, physical inactivity, and smoking were attributed to both a relatively large waist and relatively narrow hips. This could be attributed to geographic location, having known that Ikwerre and Okirika in Rivers State Nigeria is a settlement. The study shows no sexual dimorphism within the designated age interval of the study.

In Table 3, it explores the different age categories associated with BMI and WHR, there was no significant age difference between BMI and WHR. This further expressed that the prevalence of obesity increases as the age increase. This finding suggests that as individual increases by age, size, and even diet tends to increase body fat though it is similar to WHR but the abdominal adipose is not determined by age. Okati-Aliabad et al. [25] on the Prevalence of Obesity and Overweight among Adults in the Middle East Countries from 2000 to 2020: A Systematic Review and Meta-Analysis. Strongly agree with the current finding that obesity increases alongside age.

Our study further evaluates the prevalence of categories of BMI and WHR amongst the Ikwerre and Okirika ethnic groups in Rivers State Nigeria. Both ethnicities bear some similarities in their geographical mapping, and linguistics but differ in culture and lifestyle. It was revealed from our study that their association with BMI and WHR has no ethnic difference. Though there has been a contemporary issue in the association of BMI and WHR. Jaiyeoba-Ojigho, [15] correlated BMI and WHR and it was reported to be significant. So agreed with our study that the correlation of BMI and WHR in evaluating the central adiposity or total body fat is significant.

In conclusion, our study has shown some similarities and differences in the prevalence of categories of BMI and WHR, and Another related study which could be attributed to environmental, race, methodology, age, and diet factors.

5. CONCLUSION

Prevalence of categories of BMI and WHR had shown that the majority of the Ikwerre and Okirika had a normal weight BMI and WHR. BMI showed significant gender differences. Age was considered not significant with BMI and WHR though the correlation of BMI and WHR was significant with a probability less than 0.05 ($P< 0.05$).

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s)..

ETHICAL APPROVAL

The study was approved by the ethical research committee of the University of Port-Harcourt, Port-Harcourt, Nigeria.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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