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# Underweight, overweight and obesity in adults Nigerians living in rural and urban communities of Benue State

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## Abstract

**Objective:** To assess the prevalence of underweight, overweight and obesity among Nigerians aged 18–45 years, living in urban and rural settlements in one state in Nigeria.

**Materials and Methods:** Four hundred and thirty-five subjects between 18 and 45 years of age were recruited for height, weight and waist circumference (WC) measurements. Body mass index (BMI) was calculated (weight/height$^2$, kg/m$^2$); WHO criteria determined BMI and WC categories.

**Results:** Based on BMI, about 2% of the study population was underweight, 22% was overweight and 4% was obese. There were more normal weight persons in rural than in urban settlement. About 40 and 30% of females in urban and rural settlement, respectively, were either overweight or obese. Based on WC of the sample population, 10.34% had increased risk for metabolic syndrome [action level I (defi ned as WC ≥94 cm in men and ≥80 cm in women)] and 2.8% had substantially increased risk [action level II (defi ned as WC ≥102 cm in men and ≥88 cm in women)]. At action level II, there was no obese male.

**Conclusion:** This study revealed that underweight, overweight and obesity exist in young adults, but overweight and obesity are more prevalent. Therefore, concerted efforts should be made to control this in young adults for their present well-being and to possibly avoid the risk of disease later in life.

**Keywords:** Adult, body mass index, obesity, overweight, underweight

## Résumé

**Objectif:** Afin d'évaluer la prévalence de l'insuffisance pondérale, le surpoids et l'obésité chez les Nigérians. ans urbaine, vivant dans les colonies urbaines et rurales dans un État au Nigéria.

**Matériaux et procédés:** Quatre cents et trente-five sujets âgés de 18 à 45 ans ont été recrutés pour les mesures de hauteur, poids et taille circonférence (WC). Corps a été calculé l'indice de masse (IMC) (poids/taille$^2$, kg/m$^2$) ; Critères de l'OMS déterminé IMC et catégories.

**Résultats:** Basé sur IMC, environ 2% de la population de l'étude était insuffisant, 22% était surpoids et 4% était obèse. Il y avait personnes de poids plus normales en rural qu'en milieu urbain règlement. Environ 40 et 30% des femelles en règlement urbain et rural, étaient respectivement, surcharge pondérale ou d'obésité. Basé sur les WC de l'échantillon de population, 10,34% avait augmenté le risque de syndrome métabolique [action de niveau I (defi ned comme WC ≥94 cm chez les hommes et ≥80 cm chez les femmes)] et 2,8% a augmenté considérablement le risque [niveau d'action II (defi ned comme WC ≥102 cm chez les hommes et ≥88 cm chez les femmes)]. Au niveau II de l'action, il y n'avait aucun mâle obèse.

**Conclusion:** Cette étude a révélé qu'il existe des poids insuffisant, le surpoids et l'obésité chez les jeunes adultes, mais le surpoids et l'obésité sont plus fréquents. Par conséquent, efforts concertés devraient faire pour contrôler

cela chez les jeunes adultes pour leur bien-être actuel et peut-être éviter le risque de maladie plus tard dans la vie.

**Mots clés:** Adulte, indice de masse corporelle, l'obésité, le surpoids, insuffisance pondérale



## Introduction

The people of Africa are often thought of as being hungry and thin. However, overweight and obesity (as defined by the WHO) are becoming more common in poor and middle-income countries.[1-3] These conditions increase the risk of arterial hypertension, ischemic heart disease, cerebrovascular disease, dyslipidemia and Type-2 diabetes.

Studies to determine the prevalence of obesity have been conducted in several parts of Nigeria,[4-6] but there is little information about the prevalence of obesity in adult Nigerians living in rural areas of the country. This study was carried out to determine the prevalence of obesity based on body mass index (BMI) and waist circumference (WC) among adults in rural (Adikpo) and Urban (Makurdi) communities of Benue State located in the middle belt region of Nigeria, where much agricultural activity is being carried out.

## Materials and Methods

A meeting was held with the community leaders on the purpose of the study and their subjects were adequately informed. Each subject gave a written consent, and where applicable, verbal consent was given after thorough understanding of the procedure. The Ethical Committee of Benue State University gave its clearance before the study commenced. One hundred and eighty-nine adults in the age bracket of 18–45 years from a rural community (Adikpo) and 246 adults of the same age bracket from an urban community (Makurdi), both in Benue State, Nigeria, were recruited for this study. In the rural settlement, the community had six subdivisions commonly referred to as quarters; about 30 subjects were randomly recruited from each quarter for this study. For the purpose of this study, the urban area (Makurdi) was subdivided into 24 quarters and at least 10 subjects, which comprised males and females, were randomly recruited for the study.

### Measurement of body fat

Standardized measures were taken of height using portable stadiometers and weight using Salter electronic scales (model numbers 9028SV3R). The protocols for these measures were taken from the World Health Organization manual.[7] Standing height was measured without shoes, in the Frankfort horizontal plane and at full stretch, to the nearest 0.1 cm. Body weight was measured to the nearest 0.1 kg. BMI was derived as weight (kg)/height $(m)^2$. WC was measured at the narrowest part of the torso as seen from the front, measured midway between the lowest rib and the iliac crest using a non-stretchable tape.

### Definition of cut-off

Overweight, obesity and abdominal obesity were classified according to WHO criteria. Abdominal obesity (WC) cut-off was based on WHO action levels. At action level I defined as increased risk for metabolic syndrome, WC of ≥94 cm for men and ≥80 cm for women was used, while for action level II defined as substantially increased risk for metabolic syndrome, WC of ≥102 cm for men and ≥88 cm for women was used.[7,8]

### Method of data analysis

The data generated were analyzed using descriptive statistics. The differences between the mean age, weight, height, BMI and WC were determined using independent sample Student's *t*-test. All data analysis was performed using SPSS statistical package (version 15.0) and the level of statistical significance for analysis was set at $P < 0.05$.

## Results

### Mean anthropometric, body mass index and waist circumference in sample population

Four hundred and thirty-five adults comprising 298 males and 137 females of age between 18 and 45 years were studied. The mean age of the studied population was 24.2 ± 0.2 years. As shown in Table 1, there was no significant difference ($P > 0.05$) between the observed anthropometric data of residents of urban and rural communities.

Based on BMI classification, about 2% of the sample population was underweight, 72% was of normal weight, 22% was overweight and 4% was obese. As shown in Table 2 and Figure 1, there were more obese individuals in rural than in urban settlements.

Based on WC, at action level I, 10.3% of the studied population had abdominal obesity. Increased risk for metabolic syndrome (action level I) was higher in rural (11.6%) than in urban (9.3%) settlement. At

action level II, 2.8% of the studied population had abdominal obesity, as shown in Table 2.

### Mean anthropometric, body mass index and waist circumference in sample population based on sex

Table 3 shows that there was no significant difference in the age and height of males and females in the sample population studied ($P > 0.05$), but the weight and WC were significantly higher ($P < 0.05$ and $P < 0.01$, respectively), while the BMI was significantly higher in females than in males ($P < 0.05$).

**Table 1: Mean anthropometric, body mass index and waist circumference in sample population**

| | Total sample population | |
|---|---|---|
| Age (years) | 24.2 ± 0.2 | |
| Height (cm) | 166.4 ± 0.4 | |
| Weight (kg) | 65.3 ± 0.5 | |
| BMI (kg/m$^2$) | 23.6 ± 0.1 | |
| WC (cm) | 76.8 ± 0.3 | |
| | Urban | Rural |
| Age (years) | 24.2 ± 0.3 | 24.2 ± 0.4 |
| Height (cm) | 168.6 ± 0.5 | 163.5 ± 0.6 |
| Weight (kg) | 67.1 ± 0.7 | 62.9 ± 0.7 |
| BMI (kg/m$^2$) | 23.6 ± 0.2 | 23.5 ± 0.2 |
| WC (cm) | 76.3 ± 0.5 | 77.4 ± 0.5 |

BMI = Body mass index, WC = Waist circumference

**Table 2: Body mass index classification of sample population in Benue State**

| | Total sample population (%) | |
|---|---|---|
| Underweight | 1.8 | |
| Normal | 72.2 | |
| Overweight | 22.1 | |
| Obesity | 3.9 | |
| Action level I | 10.3 | |
| Action level II | 2.8 | |
| | Urban (%) | Rural (%) |
| Underweight | 2.4 | 1.1 |
| Normal | 69.9 | 75.1 |
| Overweight | 24.0 | 19.6 |
| Obesity | 3.7 | 4.2 |
| Action level I | 9.3 | 11.6 |
| Action level II | 2.8 | 2.6 |

**Table 3: Mean anthropometric, body mass index and waist circumference in different sexes**

| | Male (n = 298) | Female (n = 137) |
|---|---|---|
| Age (years) | 25.1 ± 0.3 | 22.4 ± 0.4 |
| Height (cm) | 169.3 ± 0.4 | 159.9 ± 0.7 |
| Weight (kg) | 67.4 ± 0.5 | 60.8 ± 0.9* |
| BMI (kg/m$^2$) | 23.5 ± 0.2 | 23.8 ± 0.3* |
| WC (cm) | 77.3 ± 0.4 | 75.6 ± 0.7# |

BMI = Body mass index, WC = Waist circumference, *Significant compared with males ($P < 0.05$); #Significant compared with males ($P < 0.01$)

Based on BMI, there was no underweight among the males studied in rural settlement of Makurdi. Overweight was higher in urban males and females, and there were more obese females in urban (8.3%) than in rural (5.2%) settlement, but obesity among males was higher in rural (3.6%) than in urban (2.2%) settlement as shown in Table 4.

In Table 4 it is also seen that based on WC, less than 3% of males in both settlements, and 31.7 and 24.7% of females in urban and rural settlements, respectively, were at increased risk of metabolic syndrome (action level I). About 11.7 and 6.5% of females in urban and rural settlements, respectively, are at substantially increased risk of metabolic syndrome (action level II).

## Discussion

The results of this study reveal that underweight, overweight and obesity existed in the studied population. Based on BMI, more than a quarter (26%) of the total population studied was either overweight or obese while 1.8% of the population was underweight. The percentage of obese individuals in this population was lower than those studied in Edo State[9] and in suburban northern Nigeria,[10] although they did not report the age bracket of the

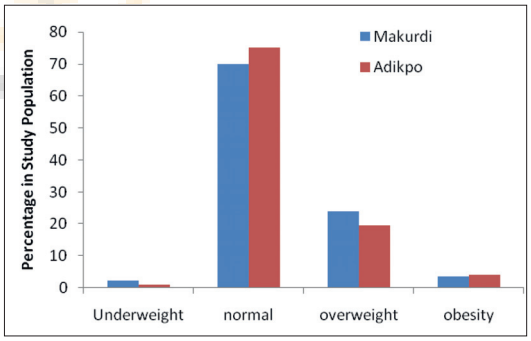


**Figure 1:** Percentage distribution of body mass index in the study population

**Table 4: BMI and WC classification of sample population by sex in rural and urban settlements of Benue State**

| | Male | | Female | |
|---|---|---|---|---|
| | Urban (%) | Rural (%) | Urban (%) | Rural (%) |
| Underweight | 1.6 | 0 | 5 | 2.6 |
| Normal | 74.7 | 80.4 | 55.0 | 67.5 |
| Overweight | 21.5 | 16.1 | 31.7 | 24.7 |
| Obesity | 2.2 | 3.6 | 8.3 | 5.2 |
| Action level I | 2.2 | 2.7 | 31.7 | 24.7 |
| Action level II | 0 | 0 | 11.7 | 6.5 |

BMI = Body mass index, WC = Waist circumference

population they studied. The rural community tends to be more actively involved in farming than people in urban areas who do more of office work and hence are more sedentary. Higher number of overweight and obesity in urban settlement has been attributed to nutritional transition, i.e. the shift from a diet of simple and, sometimes, traditional foods with little variation to a diet more reliant on processed foods, animal-source foods, fat, and sugar.[11,12]

The prevalence of obesity between both sexes was lower in this study than that reported by Bakari.[10] Only 55% of females living in the urban area had normal weight and 40% were either overweight or obese. Obesity appears to be a problem of urban women. In South Africa, 56% of females are reported to be obese,[13] and 32.6% are reported to be obese among the urban women of Gambia.[14]

The association between urbanization and obesity in people of West African origin has been documented,[15] although it is not clear why this association is more marked among women. This sexual dimorphism may point to behavioral factors because most males and females are exposed to the same environmental factors. Moreover, it is believed in some parts of Africa that being fat is a sign of affluence.

WC is an aggregate measurement of the actual amount of total and abdominal fat accumulation; it is a crucial correlate of abnormal syndromes found among obese and overweight patients.[16] Indeed, many are now advocating WC as a valid alternative to BMI for health promotion and the basis for alert values for those at risk of cardiovascular diseases.[17-19] About 10% of the studied population has WC above normal, a value lower than that reported in Rivers State, Nigeria, where 31.7 and 16.9% were obese based on WC in Okrika and Port Harcourt, respectively.[6] Rivers State is one of the oil producing states in the country, and thus being one of the richest states may account for this difference.

There is no consensus on the WC cut-off points for abdominal adiposity. The most commonly cited cut-off points for abdominal adiposity were developed for health promotion purposes to give optimal enlightenment of individuals in need of weight management because of overweight/obesity or because of central fat distribution. The cut-off points were proposed originally by Lean *et al*,[20] and subsequently by Han *et al*,[8] at level I (increased risk for metabolic syndrome), lifestyle modifications were recommended, while at level II (substantially increased risk for metabolic syndrome), professional help is required.

Mortality and morbidity ratio varies with the distribution of body fat, with the highest risk linked to excessive abdominal fat, usually called central obesity or android/visceral obesity.[21,22] Studies indicate that intra-abdominal fat/android obesity (characterized by increased WC) is associated with an increased risk for a number of diseases, including cardiovascular diseases (CVD), Type-2 diabetes mellitus, and gall bladder disease. The importance of this research lies in the fact that the population studied is within the age range of 18–45 years, with a mean age of 24 years. Although underweight, overweight and obesity were observed, overweight and obesity appears to be of concern, especially in urban females, because obesity predisposes them now and in the future to diseases.[9]

In conclusion, underweight, overweight and obesity existed in the studied population, but the prevalence of overweight and obesity appears to be high. Therefore, obesity at these ages is not only prevalent in an affluent country, but also prevalent in a developing country which calls for public concern.

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