Prevalence of Obesity and Associated Factors in Benue State, Nigeria: A Population-Based Study

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Abstract

Background: The prevalence of obesity has risen to over 650 million adults in 2016, and accounts for 41 million deaths globally. It is a major contributor to the burden of noncommunicable diseases. We determined the prevalence and associated factors of obesity to inform policy decisions toward developing robust prevention and management strategies. Materials and Methods: We conducted a population-based cross-sectional study in July 2017 among 1265 adults in urban and rural communities in Benue State. We used multistage sampling technique in selecting the participants. The WHO standardized and validated tool were used to collect information on sociodemographic and anthropometric measurements. We calculated age standardized prevalence of obesity and determined factors associated with obesity using logistic regression at 5% level of significance. Results: The age standardized prevalence of obesity was 11.1% (rural 4.2%, urban 14.3%). The odds for obesity was higher among females (adjusted odds ratio [aOR]: 3.4; 95% confidence interval [CI]: 2.27–4.99), those with tertiary education (aOR: 3.3; 95% CI: 1.61–6.95), married (aOR: 2.1; 95% CI: 1.37–3.36), and those residing in urban areas (aOR: 3.0; 95% CI: 1.73–5.05) compared to rural dwellers. Conclusions: The prevalence of obesity was high among adults in Benue State. It is more prevalent among females, married, educated, and urban dwellers. Interventions targeted at healthy lifestyle choices should be directed at these populations for effective control.

Keywords: Age standardization, Benue, obesity, population-based, prevalence

Résumé

Contexte: La prévalence de l’obésité est passée à plus de 650 millions d’adultes en 2016 et représente 41 millions de décès dans le monde. C’est un majeur contribuant au fardeau des maladies non transmissibles. Nous avons déterminé la prévalence et les facteurs associés de l’obésité pour éclairer les décisions politiques vers l’élaboration de stratégies solides de prévention et de gestion. Matériel et méthodes: Nous avons réalisé une analyse transversale basée sur la population étude réalisée en juillet 2017 auprès de 1265 adultes des communautés urbaines et rurales de l’État de Benue. Nous avons utilisé une technique d’échantillonnage à plusieurs degrés pour sélectionner les participants. L’outil normalisé et validé de l’OMS a été utilisé pour collecter des informations sur les mesures sociodémographiques et anthropométriques. Nous avons calculé la prévalence.

Introduction

Obesity is a major risk factor for cardiovascular disease, diabetes mellitus (DM), musculoskeletal disorders and cancers which all constitute a significant proportion of all noncommunicable diseases (NCDs).1 It is also associated with poorer mental health outcomes and reduced quality of life.2,3

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How to cite this article: Osunkwo DA, Nguku PM, Mohammed A, Umeokonkwo CD, Kamateeka M, Ibrahim M, et al. Prevalence of obesity and associated factors in Benue state, Nigeria: A population-based study. Ann Afr Med 2021;20:9-13.

Submitted: 12-Jul-2019 Revised: 13-May-2020 Accepted: 24-Aug-2020 Published: 13-Mar-2021
standardised according to age and determined the factors associated with obesity by using a regression logistique to a level of 5% of importance. **Résultats:** The prevalence of obesity normalised according to age was 11.1% (rural: 4.2%, urban: 14.3%). The probabilities of obesity were higher in women (adjusted odds ratio [aOR]: 3.4; confidence interval [CI]: 2.27-4.99), those who had higher education (aOR: 3.3; CI 95%: 1.61-6.95), married (aOR: 2.1; CI 95%: 1.37-3.36) and those residing in urban zones (aOR: 3; CI 95%: 1.73-5.05) compared to the residents of the rural areas. **Conclusions:** The prevalence of obesity was higher among adults in the State of Benue. It is more prevalent in women.

**Mots-clé:** normalisation de l’âge, Bénoué, obésité, population, prévalence

**Materials and Methods**

**Study setting, population, and sampling technique**

The study was conducted in Benue State, Nigeria. The state is largely agrarian and is tagged “food basket of the nation.” The study population included 1265 adults aged at least 18 years of age. We used multistage sampling method to recruit the participants. In stage one, a list of local government areas (LGA) in each senatorial district was made and stratified into rural and urban LGAs. One rural and one urban LGA were selected by balloting from each of the three senatorial districts. In stage two, a list of enumeration areas (EA) were made, and 33 EAs were selected by balloting using probability proportionate to size. In each EA, systematic sampling technique was used to select households for the study. In each household selected in stage three, a list of eligible adults was made and one eligible adult was selected by simple random sampling to participate in the study. The study was conducted from July to August 2017. Other details of the sampling and study setting have earlier been reported.

**Study tool and data collection**

We used a standardized and validated WHO STEPwise tool to collect information on participants’ sociodemographic characteristics and anthropometric measurements. The anthropometric measurements were standing height, weight, and waist circumferences. We measured height without shoes and hat in an upright position with the aid of the stadiometer (ASCO height measuring floor model stadiometer). The height of the participants was measured to the nearest 0.1 cm. Validated electronic weighing scale (OMRON BF212), set to the nearest 0.1 kg was used to measure weight. Waist circumference was measured to the nearest 0.1 cm using measuring tape, placed directly over the skin or light clothing at the level of the midpoint in between the inferior margin of the last rib and iliac crest along the mid axillary line. Data were collected by trained research assistants.

**Definition of terms**

Body mass index (BMI, kg/m²) was calculated using the formula below, for each participant we used the weight in kilogram and height in meters.
We categorized the participants based on their BMI (underweight [BMI <18.5 kg/m²], normal weight [BMI 18.5–24.9 kg/m²], overweight [BMI 25–29.9 kg/m²], and obesity [BMI ≥30 kg/m²]). For the purpose of bivariate and multivariate analysis, we dichotomized BMI classification into two: BMI ≥30 kg/m² as obese and BMI <30 kg/m² as non-obese.

**Statistical analysis**

The analysis was done using Epi info version 7.2 (US CDC). We estimated the prevalence of obesity among the participants. We calculated age-specific standardization of the prevalence of obesity using the 2006 Benue State census population [Table 1]. We also calculated the standardized urban and rural prevalence of obesity in Benue [Table 2] and determined the relationship between sociodemographic characteristics and obesity using univariable logistic regression. The factors that were significant were modeled in a multivariable logistic regression at 5% level of significance. The adjusted odds ratio and the 95% confidence interval (CI) were reported.

**Ethical approval**

We obtained ethical approval from the National Health Research Ethics Committee of Nigeria Federal Ministry of Health (NHREC/01/01/2007-22/12/2016). Written informed consent was obtained from each participant.

**Results**

Among our respondents, 22.1% were overweight, 5.4% were underweight, and 59.1% were normal [Figure 1]. The prevalence of obesity was 13.5% among the respondents. However, after standardizing for age using Benue State population as the reference population, the age standardized prevalence of obesity was 11.1%. The urban and rural age standardized prevalence of obesity was 14.3% and 4.2%, respectively [Figure 2]. There is a statistically significant association between age, sex, tertile education, marital status, occupation, and place of residence with obesity [\( P < 0.001 \), Table 3].

The odds for obesity was 3.4 times higher among females (adjusted odds ratio [aOR]: 3.4; 95% CI: 2.27–4.99) compared to males. Those with tertiary education (aOR: 3.3; 95% CI: 1.61–6.95) had 3.3 times odds of having obesity compared with those with no formal education. The odds of being obese was twice higher among married (aOR: 2.1; 95% CI: 1.37–3.36) compared with unmarried. The odds for obesity was about 3 times greater among those in the urban (aOR: 3.0; 95% CI: 1.73–5.05) compared to those in the rural settings [Table 4].

**Discussion**

The prevalence of obesity was generally high among the respondents. The prevalence was higher than earlier reported in Benue state[14] and elsewhere in Nigeria.[15] The high prevalence of obesity observed could probably be due to continued epidemiological transition ongoing in the population. The calculated age standardized prevalence of obesity was higher among urban than rural respondents. This could be attributed
to the adoption of poorer nutritional habits and lifestyle choices. The higher prevalence of obesity observed in the urban compared to the rural dwellers has earlier been reported and attributed to sedentary lifestyle, and dietary options.\textsuperscript{16,17}

Table 3: Relationship between sociodemographic characteristics with obesity among respondents in Benue state

| Characteristics       | Presence of obesity | COR (95% Confidence Interval) | P     |
|-----------------------|---------------------|-------------------------------|-------|
|                       | Yes     | No |                               |       |
|                       | (n=171) | (n=1094) |                           |       |
| Age                   |         |    |                               |       |
| <20                   | 4 (6.5) | 58 (93.5) | Reference                  |       |
| 20-29                 | 19 (5.7) | 314 (94.3) | 0.9 (0.29-2.67) | 0.818 |
| 30-39                 | 42 (13.6) | 267 (86.4) | 2.3 (0.79-6.61) | 0.129 |
| 40-49                 | 39 (20.2) | 154 (79.8) | 3.7 (1.26-10.73) | 0.017 |
| 50-59                 | 45 (25.1) | 134 (74.9) | 4.9 (1.67-14.17) | 0.004 |
| ≥60                   | 22 (11.6) | 167 (88.4) | 1.9 (0.63-5.77) | 0.252 |
| Sex                   |         |    |                               |       |
| Female                | 54 (8.8) | 559 (91.2) | 2.3 (1.6-3.2) | <0.001 |
| Male                  | 117 (18.0) | 534 (82.0) | Reference                  |       |
| Level of education    |         |    |                               |       |
| None                  | 13 (8.0) | 149 (92.0) | Reference                  |       |
| Primary               | 25 (10.8) | 207 (89.2) | 1.4 (0.69-2.80) | 0.363 |
| Secondary             | 35 (7.6) | 425 (92.4) | 0.94 (0.49-1.83) | 0.864 |
| Tertiary              | 98 (23.8) | 313 (76.2) | 3.6 (1.95-6.60) | <0.001 |
| Marital status        |         |    |                               |       |
| Unmarried*            | 18 (7.6) | 391 (92.4) | Reference                  |       |
| Married               | 139 (16.5) | 703 (83.5) | 2.0 (1.6-4.3) | <0.001 |
| Occupation            |         |    |                               |       |
| Unemployed            | 40 (11.8) | 299 (88.2) | Reference                  |       |
| Employed              | 131 (14.1) | 795 (85.9) | 1.2 (0.84-1.80) | 0.279 |
| Place of residence    |         |    |                               |       |
| Rural                 | 20 (4.9) | 385 (95.1) | Reference                  | <0.001 |
| Urban                 | 151 (17.6) | 709 (82.4) | 4.1 (2.5-6.6) |       |

*Unmarried=Never married, separated, divorced, and widowed.
COR=Crude odds ratio, CI=Confidence interval

Table 4: Logistic regression showing sociodemographic predictors of obesity among respondents in Benue state

| Characteristics       | Presence of obesity | aOR (95% Confidence Interval) | P     |
|-----------------------|---------------------|-------------------------------|-------|
|                       | Yes     | No |                               |       |
|                       | (n=171) | (n=1094) |                           |       |
| Age                   |         |    |                               |       |
| <20                   | 4 (6.5) | 58 (93.5) | Reference                  |       |
| 20-29                 | 19 (5.7) | 314 (94.3) | 0.4 (0.11-1.17) | 0.089 |
| 30-39                 | 42 (13.6) | 267 (86.4) | 0.8 (0.24-2.50) | 0.674 |
| 40-49                 | 39 (20.2) | 154 (79.8) | 1.4 (0.41-4.49) | 0.615 |
| 50-59                 | 45 (25.1) | 134 (74.9) | 1.8 (0.54-5.85) | 0.344 |
| ≥60                   | 22 (11.6) | 167 (88.4) | 1.2 (0.35-4.14) | 0.760 |
| Sex                   |         |    |                               |       |
| Female                | 54 (8.8) | 559 (91.2) | 3.4 (2.27-4.99) | <0.001 |
| Male                  | 117 (18.0) | 534 (82.0) | Reference                  |       |
| Level of education    |         |    |                               |       |
| None                  | 13 (8.0) | 149 (92.0) | Reference                  |       |
| Primary               | 25 (10.8) | 207 (89.2) | 1.4 (0.63-2.91) | 0.432 |
| Secondary             | 35 (7.6) | 425 (92.4) | 1.3 (0.58-2.81) | 0.546 |
| Tertiary              | 98 (23.8) | 313 (76.2) | 3.3 (1.61-6.95) | 0.001 |
| Marital status        |         |    |                               |       |
| Unmarried*            | 18 (7.6) | 391 (92.4) | Reference                  |       |
| Married               | 139 (16.5) | 703 (83.5) | 2.1 (1.37-3.36) | <0.001 |
| Occupation            |         |    |                               |       |
| Unemployed            | 40 (11.8) | 299 (88.2) | Reference                  |       |
| Employed              | 131 (14.1) | 795 (85.9) | 1.2 (0.78-1.90) | 0.374 |
| Place of residence    |         |    |                               |       |
| Rural                 | 20 (4.9) | 385 (95.1) | Reference                  | <0.001 |
| Urban                 | 151 (17.6) | 709 (82.4) | 3.0 (1.73-5.05) |       |

*aOR=Adjusted odds ratio, CI=Confidence interval

Obesity was higher among females and among married respondents. It was also higher among the married females compared to the unmarried. These have been reported in earlier studies.\textsuperscript{10,11,18-22} This could be due to pregnancy and hormonal changes in females. It could also be associated with
more involvement of males in physical activities compared to females. In addition, obesity is associated with wealth, beauty, good health strength, and respect among African women. This perspective of “healthy obesity” may fuel the epidemic and may also account for the lack of attention given to obesity.

Obesity increases with age with a slight decline after 60 years. Other studies reported similar findings.[2,23,24] This may be due to changes occurring with advancing age. As people advance in age, they become less active physically. Physical inactivity has been associated with risk of obesity. However, the relationship between aging, physical inactivity, and obesity has not been fully understood. Obesity was higher among those with tertiary education compared to those with no formal education and has been reported.[25] Those that had attained tertiary education were more likely to lead a sedentary lifestyle, more likely to be employed, live in urban area and eat westernized foods hence are more at risk of developing obesity compared to the uneducated that are more likely to engage in manual and unskilled work requiring more physical activity, less access to westernized food and hence less prone to obesity.

**Conclusions**

The prevalence of obesity was high among adults in Benue State, and it is more prevalent among females, married, educated, and urban residents. Policy and intervention should target these populations for effective control. The interventions should be targeted at younger people to help model their lifestyle and nutritional choices.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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