Original Article

Sociodemographic Determinants of Overweight and Obesity in Adults Attending a Tertiary Hospital in Rivers State, Nigeria

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Abstract

Background: There has been an increase in the prevalence of obesity in developing countries with a concomitant rise in morbidity and mortality. The sociodemographic factors of an individual may play a role in his or her body weight. This study aims to determine the relationship between overweight/obesity and sociodemographic characteristics among adults attending the Family Medicine Clinic of a tertiary health centre in Nigeria. **Materials and Methods:** This was a descriptive, hospital-based study. Interviewer-administered questionnaires were used to obtain the sociodemographic variables (age, sex, social class, highest educational level attained, average monthly income, and marital status). A clinical examination was performed to assess the body mass index (BMI), waist circumference (WC), and waist/hip ratio (WHR). Fisher's exact test was used to test for associations between overweight/obesity and the various sociodemographic determinants and the level of significance was set at $P < 0.05$. **Results:** With the BMI, overweight was present in 32.5% of the study population while 36.6% was obese. The WC was increased (>94 cm and >80 cm, respectively) in 43.5% of males and 92.8% of females. The WHR was increased (>0.90 and >0.85) in 52.2% of males and 80.8% of females. The only sociodemographic factor independently associated with being overweight or obese BMI in this study was the female gender ($P = 0.011$). **Conclusion:** No region of the world has been successful at reversing the obesity epidemic once it has begun. This study highlights how sociodemographic factors may influence obesity and measures to modulate this disease can be targeted to certain groups.

Keywords: Nigeria, obesity, overweight, sociodemographic factors

Introduction

Much of the world's population resides in countries with more of the population being overweight or obese as opposed to underweight, with the former accounting for a higher degree of mortality than the latter.[1,2] Globally, about 3.4 million adult deaths occur annually because of overweight and obesity.[3]

Overweight and obesity were in the past considered a problem in high-income countries, however, in recent times, there has been a dramatic increase in their prevalence in low- and middle-income countries, especially among urban dwellers.[3] The issues of overweight and obesity in most of these high-income countries have been well publicised, whereas the recent increases in the low- and middle-income countries, are less recognised,[4] although, a recent study reports the increasing trend of obesity in Nigeria.[5] Obesity has been termed "The developing world's new burden" by the Food and Agricultural Organisation of the United Nations.[6] The body stated that as the developing world populace becomes more affluent, they experience the advantages of industrialisation as well as its disadvantages, among which includes overweight/obesity.[6]

In 2013, it was estimated that one-third of adults globally were either overweight or obese, with more than half the adult population obese in certain countries.[7] In 2008, 35% of females and 34% of males over the age of 20 years were overweight, whereas 14% of females and 10% of males in the same age group were obese.[8]

Obesity rates are also on the rise in the African sub-region, with the number of overweight and obese children rising

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from 5.4 million in 1990 to 10.6 million in 2014.[1] A study by Finucane *et al*. revealed that between 1980 and 2008, the age-standardised mean global body mass index (BMI) increased by 0.4–0.5 kg/m^2 per decade in both sexes.[9] A systematic review carried out by Agyemang *et al*. also reported an increase in obesity rates in all the regions of Africa with a prevalence that ranged between 3.5% in Eritrea and about 64% in Seychelles.[10] In South Africa, the prevalence of obesity increased from 23.5% in 2008 to 27.2% in 2012,[11] whereas in Nigeria, a recent study reported a pooled estimate of overweight as 26.0% and obesity at 15%, but the authors noted the increasing prevalence, especially among urban dwellers.[5]

The etiology and presentation of obesity and overweight are multifaceted and complex predisposing to many comorbidities and medical complications.[12] These comorbidities include diabetes and prediabetes, hypertension, dyslipidaemias, coronary artery disease, and obstructive sleep apnoea.[13] These diseases also are leading risks for global deaths.[6]

The prevalence and patterns of overweight/obesity can vary depending on income, educational level, age equal to or >40 years, sex, marital status, physical activity level, family history, and residing in urban areas.[14] These patterns may differ between high-income and low-income countries.[15]

The socio-demographic factors of an individual may play a role in his or her body weight. Hulsegge *et al*. reported an unfavorable shift in BMI and obesity concerning increasing age.[16] Other studies have corroborated this positive association between obesity and age, concluding that obesity increases from age 35 to 64 years but declines afterward.[17] In women, obesity rates have been positively linked to both childhood and adulthood poverty,[18] A study by Levine in the United States revealed that the poorest counties were associated with the greatest sedentariness, and therefore, obesity implicating poverty as a predisposing factor to overweight/obesity.[19]

The socio-demographic factors as they relate to overweight/obesity in our locality must be adequately studied to provide an evidence-based approach to addressing these disorders in future.

This study aims to determine the relationship between overweight/obesity and sociodemographic factors in patients attending a Family Medicine clinic in a tertiary institution. These findings may provide a window of opportunity for strengthening healthcare delivery in Nigeria as the family physician is at a vantage position to arrest and possibly reverse the increasing obesity rates in our environment.

Materials and Methods

This study was a descriptive, cross-sectional, hospital-based study carried out at the Family Medicine Department of the Braithwaite Memorial Specialist Hospital (BMSH), Port Harcourt. Port Harcourt is the capital city of Rivers State, located in the Niger Delta region of Nigeria.

Participants

A total of 204 respondents aged 18 years and above attending the family medicine clinic were selected through the systematic sampling technique over eight weeks. Critically ill patients and pregnant women were excluded from the study.

Sample size determination

A hospital-based cross-sectional study among adult patients attending the Family Medicine clinic of the University of Port Harcourt Teaching Hospital in Rivers state reported a prevalence of overweight and obesity was 14%.[20] The sample size was determined using the following formula:

$n = Z^2\ pq/d^2$

Where n = Desired sample size; z = The standard normal deviate, usually set at 1.96 which corresponds to the 95% confidence interval; p = The proportion in the target population estimated to have a particular characteristics; $q = 1.0 - p$ and d = The degree of accuracy desired usually set at 0.05.

$n = (1.96)^2(0.14)\ (0.86)/(0.05)^2 = 176.86.$

To allow for nonrespondents and incomplete data, 10% was added giving a minimum sample size of 195. A total of 204 respondents were recruited.

Ethical approval was obtained from the ethical board of the hospital. Documented informed consent was given by all the participants.

Data collection instruments and procedure

Interviewer-administered questionnaires were used to obtain demographic variables following documented informed consent from each participant. The socio-demographic information included age, sex, social status, highest educational level attained, average monthly income, and marital status. The stated occupation was used to divide respondents into five social classes based on the Registrar General's Scale of social classes as follows:[21]

- Social class 1: Senior public servants, highly skilled professionals, (e.g., doctors, engineers, lecturers), top government, and business executives
- Social class 2: Managerial and technical occupations intermediate grade public servants, e.g., senior schoolteachers, nurses, and technicians
- Social class 3: Skilled occupations, junior grade public servants, drivers, artisans, junior clerks, rank, and file of the police force
- Social class 4: Partly skilled occupation, petty traders, labourers, messengers, etc
- Social class 5: Unskilled, unemployed, full-time homemakers, students, and subsistence farmers.

A clinical examination was performed to assess the height, weight, waist circumference (WC), and waist/hip ratio (WHR). The BMI was calculated as weight in kilograms divided by the square of the height and expressed in kilograms/meter^2 and subjects were classified using the WHO classification of obesity.[22]

Increased WC was defined as WC ≥94 cm and ≥80 cm for men and women, respectively, while increased WHR was defined as WHR above 0.90 for males and above 0.85 for females.[23]

Statistical analysis

The results obtained were coded and entered into an Excel worksheet and analysed using the IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. The results have been expressed using percentages and tables. Fisher's exact test was used to test for associations between overweight/obesity and the various sociodemographic determinants. The confidence interval was set at 95% ($P = 0.05$).

Results

A total of 204 respondents were recruited for the study, but due to incomplete data, only 194 of the respondents were included (the response rate was 95%).

The mean age of the subjects was 44.9 ± 13.8 years, with a range of 20–82 years. The age category with the largest proportion of respondents was the 30–39 years' age group with 28.4% (55 persons) while there was no respondent in the category below 20 years. Females constituted most of the respondents, accounting for 64.4% (125) of the population with a female-to-male ratio of 1.8:1. The sociodemographic characteristics of the respondents are shown in Table 1.

Social class two had the highest proportion of respondents which was 29.9% (58 persons), while the social class with the least proportion of respondents was social class one with 8.2% (16 persons). The majority of the respondents, 61.3% (119 persons) were married while none were divorced. The highest proportion of respondents, 34% (66 persons) earned between N20,000 – N49,000 monthly while the lowest proportion 3.6% (7 persons) were those who earned ≥N200,000. Most of the respondents, 54.1% (105 persons) had attained a tertiary level of education while 6.2% (12 persons) had no formal education. All the respondents were Christians.

The mean BMI was 28.7 ± 6.3 kg/m^2 with a range of 16.2 kg/m^2–46.7 kg/m^2. Among the respondents, 5 (2.6%) were underweight, 55 (28.4%) were of normal weight, 63 (32.5%) were overweight, 36 (18.5%) had class 1 obesity, 27 (13.9%) had class 2 obesity, and 8 (4.1%) were morbidly obese. The prevalence of overweight and obesity in this study population was 69.1% with overweight accounting for 32.5% and obesity 36.6%.

The mean WC was 96.3 ± 13.8 cm with a range of 63.0 cm to 135.0 cm. The WC was increased (>94 cm and >80 cm, respectively) in 30 (43.5%) males and 119 (92.8%) females. The mean WHR was 0.91 ± 0.1. Most (36 [52.2%]) of the males had abnormal WHR (≥0.90); similarly, the majority (101 [80.8%]) of the females also had abnormal WHR (≥0.85).

The relationship between the sociodemographic characteristics of the respondents and the BMI is shown in Table 2. The highest proportion of respondents in the ≤29, 60–69, and 70–79 age groups was in the normal weight class with percentages of 59.1%, 32.0%, and 36.4%, respectively. In the age categories 30–39, 40–49, and 50–59, the highest proportion of respondents was found to be in the overweight class with the values of 40%, 37.2%, and 27.6%, respectively. The only respondent in the category aged ≥80 was overweight. The association between BMI and age was not statistically significant ($P = 0.240$).

Of the males included in this study, 42% (29) were in the normal weight category, while 2 (2.9%) were underweight. The highest proportion of females 31.2% (39) was in the overweight class. The association between sex and BMI was statistically significant ($P = 0.011$).

Regarding social class, of those in social classes I, II, and IV, the highest proportions were in the overweight class with values of 43.8%, 44.8%, and 27.1%, respectively. While among those in

Table 1: Sociodemographic characteristics of respondents ($n = 194$)

SDCs	Frequency, *n* (%)
Age groups (years)	
≤20–29	22 (11.3)
30–39	55 (28.4)
40–49	51 (26.3)
50–59	29 (14.9)
60–69	25 (12.9)
70–79	11 (5.7)
≥80	1 (0.5)
Sex	
Male	69 (35.6)
Female	125 (64.4)
Social class	
Class I	16 (8.2)
Class II	58 (29.9)
Class III	50 (25.9)
Class IV	48 (24.7)
Class V	22 (11.3)
Marital status	
Single	44 (22.7)
Married	119 (61.3)
Widowed	28 (14.5)
Separated	3 (1.5)
Divorced	0
Monthly income	
<20,000	53 (27.3)
20,000–49,000	66 (34.0)
50,000–99,000	36 (18.6)
100,000–199,000	32 (16.5)
≥200,000	7 (3.6)
Educational level	
No formal education	12 (6.2)
Primary education	27 (13.9)
Secondary education	50 (25.8)
Tertiary	105 (54.1)

SDCs: Sociodemographic characteristics

Table 2: The relationship between the sociodemographic characteristics of the respondents and their body mass index

SDC	Under weight (*n*=5), *n* (%)	Normal weight (*n*=55), *n* (%)	Over weight (*n*=63), *n* (%)	Obesity I (*n*=36), *n* (%)	Obesity II (*n*=27), *n* (%)	Obesity III (*n*=8), *n* (%)	Total, *n* (%)	χ^2 (*P*)
Age category (years)								
≤29	0	13 (59.1)	4 (18.3)	3 (13.6)	1 (4.5)	1 (4.5)	22 (100)	35.076
30–39	2 (3.6)	13 (23.6)	22 (40.0)	10 (18.3)	7 (12.7)	1 (1.8)	55 (100)	(0.240)
40–49	0	10 (19.6)	19 (37.2)	11 (21.6)	8 (15.7)	3 (5.9)	51 (100)	
50–59	0	7 (24.1)	8 (27.6)	7 (24.1)	5 (17.3)	2 (6.9)	29 (100)	
60–69	3 (12.0)	8 (32.0)	7 (28.0)	2 (8.0)	4 (16.0)	1 (4.0)	25 (100)	
70–79	0	4 (36.4)	2 (18.2)	3 (27.2)	2 (18.2)	0	11 (100)	
≥80	0	0	1 (100)	0	0	0	1 (100)	
Sex								
Male	2 (2.9)	29 (42.0)	24 (34.8)	8 (11.7)	3 (4.3)	3 (4.3)	69 (100)	14.819
Female	3 (2.4)	26 (20.8)	39 (31.2)	28 (22.4)	24 (19.2)	5 (4.0)	125 (100)	(0.011*)
Social class								
Class I	0	4 (25.0)	7 (43.8)	3 (18.7)	2 (12.5)	0	16 (100)	11.809
Class II	1 (1.7)	17 (29.3)	26 (44.8)	7 (12.2)	5 (8.6)	2 (3.4)	58 (100)	(0.923)
Class III	2 (4.0)	14 (28.0)	11 (22.0)	11 (22.0)	8 (16.0)	4 (8.0)	50 (100)	
Class IV	2 (4.2)	10 (20.8)	13 (27.1)	12 (25.0)	9 (18.7)	2 (4.2)	48 (100)	
Class V	0	10 (45.5)	6 (27.3)	3 (13.6)	3 (13.6)	0	22 (100)	
Educational level								
No formal education	0	2 (16.7)	3 (25.0)	3 (25.0)	4 (33.3)	0	12 (100)	18.609
Primary	3 (11.1)	6 (22.3)	7 (25.9)	3 (11.1)	7 (25.9)	1 (3.7)	27 (100)	(0.232)
Secondary	1 (2.0)	14 (28.0)	11 (22.0)	14 (28.0)	6 (12.0)	4 (8.0)	50 (100)	
Tertiary	1 (1.0)	33 (31.4)	42 (40.0)	16 (15.2)	10 (9.5)	3 (2.9)	105 (100)	
Income								
<20,000	2 (3.8)	19 (35.8)	11 (20.8)	13 (24.5)	7 (13.2)	1 (1.9)	53 (100)	11.162
20,000–49,000	2 (3.0)	16 (24.2)	25 (37.9)	10 (15.2)	9 (13.6)	4 (6.1)	66 (100)	(0.942)
50,000–99,000	1 (2.8)	10 (27.8)	11 (30.5)	4 (11.1)	8 (22.2)	2 (5.6)	36 (100)	
100,000–199,000	0	9 (28.2)	13 (40.6)	8 (25.0)	1 (3.1)	1 (3.1)	32 (100)	
≥200,000	0	1 (14.3)	3 (42.9)	1 (14.3)	2 (28.5)	0	7 (100)	
Marital status								
Married	2 (1.7)	31 (26.1)	42 (35.3)	23 (19.3)	15 (12.6)	6 (5.0)	119 (100)	12.151
Single	1 (2.3)	18 (40.9)	13 (29.5)	8 (18.2)	3 (6.8)	1 (2.3)	44 (100)	(0.668)
Widowed	1 (3.6)	5 (17.9)	8 (28.5)	5 (17.9)	8 (28.5)	1 (3.6)	28 (100)	
Divorced	0	0	0	0	0	0	0 (100)	
Separated	1 (33.3)	1 (33.3)	0	0	1 (33.3)	0	3 (100)	

*Statistical significance. SDC: Sociodemographic characteristics

social classes III and V, the largest proportion of respondents was in the normal weight class with the values of 28% and 45.5%, respectively. The relationship between social class and BMI was however not statistically significant ($P = 0.923$).

Concerning the educational level of the respondents, the highest proportions of those with no formal education (33.3%) were in the obesity class II category. There were equal proportions of respondents (25.9%) in both the overweight and obesity class II categories who had attained a primary level of education. The highest proportions of respondents with a secondary level of education were in the normal weight and obesity I class with values of 28% each. Among those who had attained a tertiary level of education, the highest proportion (40%) was in the overweight class. The association between educational level and BMI was not statistically significant ($P = 0.232$).

Regarding the income of respondents, the highest proportion (35.8%) of those with a monthly income of <N20,000 was in the normal weight category. The highest proportions of respondents in all the other income brackets were in the overweight class. The relationship between monthly income and BMI was however not statistically significant ($P = 0.942$).

Among the married respondents, the highest proportion (35.3%) was in the overweight class, while the normal weight class had the highest proportion (40.9%) of single respondents. The majority of the widowed respondents were either in the overweight or obesity class II categories with proportions of 28.5% each. The relationship between marital status and BMI was not statistically significant ($P = 0.668$).

Discussion

Overweight and obesity may be influenced by the sociodemographic characteristics of an individual and there have been few studies that assessed the sociodemographic

determinants among overweight and obese individuals. This descriptive, cross-sectional, hospital-based study was therefore designed to identify the socio-demographic characteristics among overweight/obese patients attending the Family Medicine Clinic of BMSH.

Various studies have reported a link between increasing age and a rise in the BMI predisposing to overweight and obesity.[10,17,24] The relationship between age and BMI in this study was not a statistically significant one. However, it was found that among respondents aged 20–29 years, the majority 59.1% were of normal weight. Similarly, among respondents in the age groups 60–69 years and 70–79 years, a greater proportion was found to be of normal weight. Among the respondents in the age categories 30–39, 40–49, and 50–59 years, overweight and obesity were found to be prevalent. The findings from this study therefore indicate that the prevalence of overweight and obesity begin to rise from age 30 years up to age 59 after which it declines.

This trend mirrored the findings by Akarolo-Anthony *et al*. in a cross-sectional study among adults in Abuja Nigeria.[24] Their findings showed that the prevalence of both overweight and obesity increased from age 30 years and peaked at 45 years, after which there was a decline. Similarly, Agyemang *et al*. in their systematic review on obesity in sub-Saharan Africa reported that the prevalence of obesity increased from the age of 35 to 64 years and declined afterward.[10]

The results obtained in this study are contrary to a cross-sectional study in Europe by Marques *et al*. where they reported that older adults were significantly more overweight or obese in comparison to middle-aged and younger adults.[25] In contrast also to the findings from this study was that by Adedoyin *et al*. in a cross-sectional community-based study in Western Nigeria where there was a peak in both overweight and obesity in older adults between the ages of 60 and 69 years.[26] The disparity between the figures in this study and the European figures may be attributed to the fact that the indices for measuring height and weight were self-reported by the respondents who could have given inaccurate figures used in computing their BMI.

This study revealed that out of a total of 69 men, 24 (34.7%) were overweight while 39 (31.2%) out of the 125 women were overweight. In contrast, the results for obesity revealed that 14 (20.3%) of the men were obese and 57 (45.6%) of the women were obese. The association between BMI and gender in this study was statistically significant. The same results were obtained by Maruf and Udoji in a cross-sectional study on the prevalence and socio-demographic determinants of overweight and obesity in Nnewi, Nigeria where it was reported that 32.3% and 19.6% of males and 29.8% and 36.0% of females were overweight and obese respectively.[27] Similarly, Akarolo-Anthony *et al*. in a cross-sectional study in Abuja reported that 32% of females were overweight as opposed to 42% of males and 42% of females as opposed to 15% of males were obese.[24]

On the contrary, Wahab *et al*. in a cross-sectional study involving 300 adult respondents which were conducted in an urban area in Katsina, Northern Nigeria reported that both overweight and obesity were more prevalent in women. They observed that among the respondents, 62% of the females and 41.9% of the males were overweight, while 29.8% of the females and 9.3% of the males were obese.[28]

Sun *et al*. in a retrospective analysis among adults in the urban city of Nanjing, China contrary to all the above findings reported that for all ages, the males had a higher prevalence of both overweight and obesity than the females.[29] They reported that 42.8% of the males were overweight as opposed to 23.9% of the females, while 13.2% of males and 6.6% of the females were obese. A possible reason for this difference from the result obtained in the present study may be because of a much larger sample size of 384,061 respondents in the Chinese study. It may also be due to a higher percentage of males, (56.1%) in that study as opposed to 35.6% in the present study. Another possible explanation for the disparity may be racial differences between the two populations. The women in the present study were all of African descent, whereas those in the Chinese study were of Asian descent. Being above normal BMI has been associated with the African race, particularly in women.

Flegal *et al*. in a cross-sectional study using data from the NHANES program of the National Centre for Health Statistics and Centres for Disease Control and Prevention in the United States of America, however, reported no statistically significant difference in overweight/obesity between the sexes.[30] The difference between the USA study and the present study may be attributable to the fact that they had a high proportion of Caucasian women and fewer women of African descent as opposed to the present study. It has been reported that women of African descent are more predisposed to higher BMI than other races.

Results from this study show that of the respondents in social classes I and II, the highest proportions of 43.8% and 44.8% respectively were in the overweight group. Whereas in social classes III and IV, the largest proportion of respondents fell within the obese category. In social class V, the largest proportion of the respondents was in the normal weight category. Also, in the present study, there were no underweight individuals in the social classes I and V. These findings indicate that being overweight is more prevalent in the higher social classes, while obesity is more prevalent in the middle social class while being in the lowest social class is associated with being of normal BMI. The association between BMI and social class in this study was however not statistically significant ($P = 0.923$).

Those in social classes I and II constitute the upper social class and are more likely to be engaged in highly skilled professions which are associated with sedentary lifestyles and limited physical activity. They may also be aware of the demerits of being obese but engage in lifestyle measures such as the consumption of dense carbohydrates and unhealthy

fatty meals in portions small enough to prevent them from being obese but not so much as to prevent them from being overweight. It may also be that being in the higher social classes, being slightly above normal BMI may be perceived as a sign of affluence.

The high proportion of obesity in social classes II and IV may be attributable to their being residents in the urban area; they may have become victims of the "nutrition transition" in developing countries and are likely to have adopted the Western dietary pattern of high dense carbohydrate meals.[31] These individuals may also be misinformed about these unhealthy diets, and because they reside in urban areas, are unable to afford healthy fruits and vegetables which are relatively more expensive in towns. They may therefore for easy satiety consume large portions of unhealthy fats and dense carbohydrates. It is a possibility that they may be residents in neighborhoods that do not promote engaging in physical activity probably secondary to increased crime rates or poor environmental conditions.

The finding of the highest proportion of respondents in social class V being of normal weight could be because these respondents constitute the urban poor with limited resources for feeding and therefore may have very low daily caloric intake. They may also engage in the most physically demanding of occupations making them the most physically active of the population. The findings of this study are in keeping with another cross-sectional study in Rivers State, Nigeria, where the highest percentage of obese adults was seen amongst fishermen followed by civil servants and the least in artisans.[31] These findings are similar to those of Maruf and Udoji in Nnewi, Nigeria where there were no professionals in the underweight category, where overweight was prevalent, and the largest proportion of skilled individuals was obese while the largest proportion of the unskilled population was of normal weight.[27]

However, these findings differ from the cross-sectional study by Sartorius *et al*. in South Africa who reported that a higher social class increased the odds of obesity.[11] The difference in their findings may have been due to the inclusion of children in the study as childhood obesity in developing countries is commoner among richer households.[32]

Results from this study show that the highest proportions of respondents who had no formal education were obese. Similarly, the highest proportions of respondents who had attained only primary or secondary levels of education were obese. Among the respondents who had attained a tertiary level of education, the highest proportion was found in the overweight category. The association between educational level and overweight/obesity was not statistically significant in this study ($P = 0.232$). These findings however suggest that although both diseases are prevalent among the participants, obesity is associated with lower educational levels while overweight was associated with the highest educational level.

These results may be because those less educated may be unaware of the health implications of obesity and therefore unconsciously adopt lifestyle practices such as not engaging in physical exercise which fosters the development of the disease. They may also be of the notion that "bigger is better" and deliberately consume meals high in dense carbohydrates and unhealthy fats to gain weight. Corroborating the findings in this study is the report from a cross-sectional study by Ward *et al*. in an urban Brazilian city.[33] They concluded that obesity was inversely related to educational status.

On the contrary, Diete-Spiff *et al*. in a cross-sectional study among adult patients attending a tertiary hospital in Rivers State, Nigeria reported that both diseases were more prevalent in participants who had not attained a tertiary level of education.[34] Both the results from the present study and that by Diete-Spiff *et al*.[34] are in contrast to the findings in a cross-sectional study by Sartorius *et al*[11] and a systematic review by Dinsa *et al*[35] who reported that in low-income countries, a higher educational level is associated with obesity.

The relationship between income and BMI in this study presented a mixed picture. There were equal proportions of participants who earned a monthly income above N200,000 in both the overweight and obese categories; however, there were none in the underweight category. Obesity was more prevalent in those participants who earned N50,000 to N99,000 monthly and those who earned <N20,000 monthly. Among the respondents who earned N100,000 to N199,000, the highest proportion was overweight with no respondents in the underweight category. The finding of no underweight participants in the more affluent subclasses buttresses the fact that in low-income countries, both overweight and obesity are associated with wealth. Sartorius *et al*. in South Africa reported similar findings following their cross-sectional study.[11] Similarly, Alaba and Chola in a cross-sectional study found a statistically significant association between wealth and obesity.[36]

This study also found an association between low income and obesity. Similarly, several studies have purported that wealth is inversely related to obesity.[37,38] Kim *et al*. in a systematic review and meta-analysis aimed at identifying the relationship between income and obesity reported that earning a low income was associated with obesity.[37] The possible explanation for the finding of obesity being prevalent among the lowest income cadre may that the low-income earners constitute the urban poor. Financial constraints may therefore cause them to opt for meals high in dense carbohydrates to achieve satiety as opposed to healthy fruits, vegetables, and proteins which are expensive in the urban areas.

The findings from this study show that the highest proportions of married participants were in the overweight and obese categories. Among the single respondents, the highest proportion was in the normal weight category. Of the respondents who were widowed, the highest proportions were also in the obese and overweight categories. The outcome

of this study suggests therefore that while both overweight and obesity are prevalent among the married and widowed, being single is associated with being of normal weight. The relationship between marital status and BMI in this study was not statistically significant ($P = 0.668$).

The possible explanation for the findings may be that the single subjects in this study are likely to have been in the younger age groups in which overweight and obesity are less likely to be prevalent. It may also be that these unmarried respondents may be more conscious of their body image, and therefore, actively adopt lifestyles that foster being of normal weight. Conversely, the married and widowed participants are probably in the middle to older age categories which are associated with both diseases. Another likely reason why both overweight and obesity are prevalent among married couples is that being married, these couples may as part of their bonding practices share mealtimes encouraging them to have more frequent meals than they would if they did not have a spouse.

The findings in this study are supported by Iwuala *et al*.[14] in their cross-sectional study among health service providers in Lagos, Musaiger[39] in their systematic review of overweight and obesity in the Eastern Mediterranean Region and Diete-Spiff *et al*.[34] in Rivers State Nigeria who reported statistically significant associations between being married and the development of obesity and overweight. The findings of this study are also in keeping with that by Alaba and Chola in South Africa who reported that single participants were less likely to be obese than the married.[36] Anyabolu and Okoye also in a community-based, cross-sectional study in a marketplace population in Eastern Nigeria reported a statistically significant higher prevalence of obesity in married participants than in single, widowed, and divorced combined.[40]

Conclusion

Obesity and overweight are on the increase in developing nations. While measures to combat already existing health challenges such as infections, infestation, and malnutrition are yet to reach optimal status, overweight/obesity and the associated comorbidity put additional stresses on an already overwhelmed health-care system. Simple measures such as education on the predisposing factors to overweight and obesity and ways to modulate them, the risk associated with having increased BMI, knowledge, and adaptation of locally grown and easily accessible healthy food options as opposed to high caloric and processed meals, and correcting the perceived notion that "bigger is better" will go a long way in reducing the already rising prevalence.

This study reported the sociodemographic determinants of overweight and obese individuals in a Family Medicine Clinic in a tertiary hospital. Family physicians are appropriately placed in the frontline of health-care delivery and therefore are at a vantage position to arrest and possibly reverse the increasing obesity rates in our environment.

Limitations

1. This was a hospital-based study; therefore, the respondents may not be a truly representative sample of the community so caution should be applied when extrapolating to different populations
2. Some variables not included in the study such as familial predispositions, physical activity levels, dietary patterns, and the effect of drug therapy may confound the results.

Statement of informed consent

Written informed consent was obtained from the proposed study participants before recruitment per ethical principles.

Statement of ethical approval

Ethical approval was given by the Rivers State Health Research Ethics Committee (November 2017).

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Conflicts of interest

There are no conflicts of interest.

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