International Journal of Medical Science and Clinical Research
www.journalofmedical.com
Online-ISSN: 2664-7761, Print ISSN: 2664-7753
Received: 15-05-2025, Accepted: 14-06-2025, Published: 30-06-2025
Volume 7, Issue 1, 2025, Page No. 26-32

Prevalence and family factors associated with obesity among adult patients seen in a primary care clinic in Benue state, North-Central Nigeria

Izeji RI[1]*, Atokolo GE1, Ervihi-Uva L[1], Rimamnunra GN[2], Aganyi PI[3]
[1] Consultant Family Physician, Department of Family Medicine, Benue State University Teaching Hospital, Makurdi, Benue, Nigeria
[2] Consultant Public Health Physician, Department of Epidemiology and Community Health, College of Health Sciences, Benue State University Makurdi, Benue, Nigeria
[3] Consultant Family Physician, Department of Family Medicine, Federal Medical Centre, Makurdi, Benue, Nigeria

Abstract
Background: Obesity is a growing public health concern that is attracting global attention as one of the leading causes of preventable morbidity and mortality. Worldwide, the number of obese people is increasing at an alarming rate, with attendant high economic burden on the health care systems. Many factors have been identified to be associated with obesity. Some of these factors are found within the context of the family. This study aimed to assess the prevalence of obesity and identify the relevant family factors associated with it among adult patients in North-Central Nigeria.
Method: This was a hospital-based cross-sectional analytical study conducted between December 2018 and April 2019 involving 392 patients aged 18 years and above who attended the General Outpatient Clinic of the Benue State University Teaching Hospital, Makurdi. The participants were selected by systematic random sampling method. Data was collected by interviewer-administered questionnaires. Clinical measurements of weight(kg) and height(cm) were taken, and BMI (kg/m^2) calculated. Data was analysed with the Statistical Package for Social Sciences (SPSS®) version 17 software.
Results: A total of 392 consented patients were recruited. There were 229 females (58.4%) and 163 males (41.6 %). The mean age of the patients was 41.46 ± 1.33 years. The proportion of those with obesity was 25.3% and the mean body mass index (BMI) was 27.29 ± 0.79 kg/m^2. Living arrangement and source of financial support were the family factors significantly associated with obesity (Fisher's exact; $p< 0.001$ and $\chi^2=44.474$, df = 4, $p< 0.001$ respectively)
Conclusion: More than a quarter of the participants were obese. This underscores its high prevalence in general urban population and the need for primary care physicians to increase efforts at counselling patients on obesity and related factors.

Keywords: Obesity, prevalence, family factors, adult patients, Benue State

Introduction

The World Health Organization (WHO) defines obesity as a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health [1]. However, it has also been defined as the storage of excess calories as fat [2, 3]. This definition differentiates weight which is a measure of total body mass from obesity which is a measure of body fat [2].

Worldwide, the number of obese people is increasing at an alarming rate, making it a growing public health issue of concern [4]. The classification of weight that has fewest limitations, is most practical for adults and is most widely accepted is that published by the World Health Organization [5]. This is based on the body mass index (BMI). The Body Mass Index is a weight for height measure which is calculated by dividing the body weight in kilogram (kg) by the square of the height in metre (m)^2. Obesity is thus a BMI of 30 kilogram per metre square(kg/m^2) or more [5]. Obesity is further classified into class I when the BMI is 30.0 kg/m^2 – 34.9 kg/m^2; class II when it is 35.0 kg/m^2 – 39.9 kg/m^2; and class III or morbid obesity when it is 40.0 kg/m^2 and above.

Although BMI is the most widely acceptable classification of body weight as it is the same for both sexes and for all ages of adults, it has been criticised for its difficulty in differentiating between body fat, lean mass and fluid [1, 5]. Therefore, it has been found not to be an accurate method for the assessment of overweight and obesity in pregnant women, athletes with well-built muscles and in individuals with significant oedema or gross ascites [2]. It should thus be interpreted with caution in these individuals.

Other measures of obesity include abdominal or central obesity which is assessed by measuring the waist and hip circumferences in centimetre (cm) and estimating the waist-hip ratio [6]. However, due to its significant variations with sex, age and ethnicity, it is not traditionally used to diagnose obesity [6].

It is estimated that the worldwide prevalence of obesity more than doubled between 1980 and 2014 [1]. In 2014, more than 1.9 billion adults aged 18 years and older were overweight. Of these, over 600 million adults were obese [1]. In 2016, about 13% of the world's adult population (11% of men and 15% of women) were reported to be obese [1].

Obesity rates are rapidly increasing in the African region, as in most parts of the world [1]. Obesity rates in West Africa are estimated to be 10% and in urban West Africa, rates have more than doubled in the last 15 years [7]. This could be as a result of globalization and the adoption of western lifestyles in these countries.

In Nigeria, a systematic review showed that the prevalence of obesity ranged from 8.1%–22.2% [8]. This shows variation across the different regions of the country. In the South-South, South-Eastern, South-Western and North-Western regions of the country, obesity rates of 5.5%, 26.9%, 48,5% and 21% respectively have been reported [9, 10, 11, 12]. In Benue state, North-Central Nigeria, a prevalence of 21.9% has been documented among adults aged 18 to 45 [13].

From the foregoing, it is obvious that low and middle-income countries like Nigeria may be facing a double

burden of disease. These countries are now experiencing a rapid increase of non-communicable diseases such as obesity and overweight amidst infectious diseases and under nutrition [7]. Consequently, it may not be surprising to also find under-nutrition and obesity coexisting within the same household in these countries.

Obesity contributes significantly to the burden of chronic medical diseases and these diseases place a high economic burden on the health care systems [4]. The problems of obesity are of public health importance because they are associated with increased risk for many chronic medical conditions including low back pain, hypertension, type 2 diabetes, coronary heart disease, depression and certain cancers prostate, breast and colon [2].

Obesity is most commonly caused by a combination of excessive food intake, lack of physical activity, and genetic susceptibility [1]. A Cochrane Collaboration Review postulates that weight gain is due to a decrease in physical activities and increased intake of high-calorie diets [2].

Obesity tends to run in families, and in many individuals, the family is pivotal in effecting positive changes both in themselves and in other members of the family. Furthermore, some factors associated with obesity are found within the context of the family. These family factors such as fewer or no family mealtime, unhealthy dietary practices, sedentary behaviours, living arrangement, high family income, decreased sleep, genetic susceptibility, fewer children and inadequate family support have been associated with the development and maintenance of obesity [14, 15, 16].

Obesity is largely a preventable condition achievable through lifestyle choices and behavioural changes, with modification of diets and physical exercise being the major remedies [1].[1] Medications and surgical intervention may be used if the measures above are not effective, or in severely obese individuals [17, 18].

This study was undertaken to assess the prevalence and family factors associated with obesity in North-Central Nigeria. Understanding the family factors could help in targeted family interventions in curbing the rising menace of obesity and its complications.

Materials and Methods

This was a hospital-based cross-sectional analytical study conducted between December 2018 and April 2019 involving 392 patients aged 18 years and above who for any reason, attended the General Outpatient Clinic of the Benue State University Teaching Hospital, Makurdi.

The minimum sample size (n) of 384 was calculated using the formula below:

$$n = \frac{Z^2 pq}{d^2}$$

Where;

n = Minimum sample size.

Z = Standard normal deviate, taken to be 1.96 for this study and which corresponds to a confidence level of 95%.

p = prevalence of obesity taken as 48.5% (from another study in Ibadan, Nigeria) [11].

q = 1- p

d = Degree of accuracy desired (0.05).

$$\text{Therefore } n = \frac{1.96^2 \times 0.485 \times 0.515}{0.05^2}$$

n= 384

However, since the entire population (5,100) during the period of the study was less than 10,000, the required sample size was corrected to 357 using the formula below [19].

$$nf = \frac{n}{1+\frac{n}{N}}$$

Where;

nf = desired sample size when population is less than 10,000.

n = the desired sample size when the population is more than 10,000 which was 384.

N = the estimate of the population size =5,100.

$$\text{Hence, } nf = \frac{384}{1+\frac{384}{5100}} = 357.$$

Providing for a 10% non-response rate, it was rounded off to the final sample size of 392 patients.

A sampling interval of 13 was calculated by dividing the sample frame (5,100) by the sample size (392). The participants were selected by systematic random sampling method. All patients who presented were given health education on prevention and treatment of obesity as the case might be. Participants aged 18 years and above who gave written-informed consent were recruited into the study. Those who were too ill to participate, pregnant women and those with ascites or oedema were excluded.

Ethical clearance was obtained from the Health Research Ethics Committee of the Benue State University Teaching Hospital, Makurdi (BSUTH/MKD/HREC/2013B/2018/0012). Participants were assured of confidentiality and were free to withdraw from the study at any point without consequences.

Data on socio-demographic characteristics, lifestyle habits and relevant family factors of obesity were collected using pre-tested semi-structured interviewer-administered questionnaires. Body weight (kg) was measured in light clothing to the nearest 0.5kg with a Standard weighing scale "ZT-120 health scale". A known weight of 5kg was weighed after every 5 measurements while the zero mark of the scale was checked for the position of the pointer before and after every reading for accuracy. Height (cm) was measured with the participants barefooted and without a cap or head tie using a stadiometer mounted on the 'ZT-120 health scale'. The body mass index (BMI) was obtained by dividing the weight (in kilogram) by the square of the height in metre. The World Health Organization's BMI grading was used to classify BMI as follows: BMI of less than 18.5kg/m^2 was referred to as 'underweight'; BMI of 18.5kg/m^2 – 24.9kg/m^2 was considered 'Normal'; 'Overweight' was BMI of 25.0kg/m^2 – 29.9kg/m^2 and 'Obesity as BMI of 30.0kg/m^2 or more [5].

All analyses were done by the use of Statistical Package for Social Sciences (SPSS®) version 17 software. Descriptive statistics were used to summarise the data in tables. Chi-square and Fisher's exact tests were used to test association between variables. All analyses were done at a 5% level of significance, while the p-value of significance was set at 0.05.

Results

A total of three hundred and ninety-two (392) adult patients were recruited for the study. The mean age of the respondents was 41.6±1.33 years with majority of them aged 31 - 40 years (26.8%). Higher proportion of the participants were females 229 (58.4%) with female to male ratio of 1.4:1. More than 60% of the participants were married. Those who lived with spouse and children constituted the highest 166 (42.3%), while those who earned above N100,000:00 per month had the highest frequency 140 (35.7%)

Table 1: Socio-demographic characteristics of the respondents (n=392)

Socio-demographic characteristics	Frequency	Percent
Age (in years)		
18-30	97	24.7
31-40	105	26.8
41-50	91	23.2
51-60	64	16.3
61-70	26	6.6
71-80	8	2.1
>80	1	0.3
Gender		
Male	163	41.6
Female	229	58.4
Marital status		
Single	96	24.5
Married	265	67.6
Separated	4	1.0
Divorced	3	0.8
Widowed	24	6.1
Highest Educational Level		
No formal education	14	3.6
Primary	28	7.1
Secondary	82	20.9
Tertiary	268	68.4
Occupation		
Professional	5	1.3
Civil servant	149	38.0
Retired	27	6.9
Farmer	53	13.5
Unemployed	27	6.9
Business executive	22	5.6
Student	59	15.0
Others[×]	50	12.8
Ethnicity		
Tiv	286	73.0
Idoma	46	11.7
Igede	16	4.1
Igbo	16	4.1
Hausa	2	0.5
Yoruba	7	1.8
Others[××]	19	4.8
Religion		
Christianity	386	98.5
Islam	6	1.5

[×]Others include artisans [××]Others include Igala, Etulo etc.

Table 1(cont'd): Socio-demographic characteristics of the respondents (n=392)

Socio-demographic characteristics	Frequency	Percent
Average family income per month in Naira (N)		
Less than 18,000	26	6.6
18,000-58,999	127	32.4
59,000-99,999	99	25.3
100,000 and above	140	35.7
Living arrangement		
Alone	67	17.1
With spouse only	54	13.8
With relation	42	10.7
With friends	7	1.8
With spouse and children	166	42.3
With children and relations	12	3.1
With children only	44	11.2
Number of children		
0-3	151	38.5
4 and above	241	61.5
Financial support		
Self	132	33.7
Spouse	141	35.9
Parent	59	15.1

Children	40	10.2
Friends and other relatives	20	5.1

Lifestyle Habits of Respondents

Table 2: Lifestyle habits of the respondents

Variables	Frequency	Percent
Cigarette smoking		
Yes	12	3.1
No	380	96.9
Alcohol intake		
Yes	104	26.5
No	288	73.5
Do you exercise		
Yes	133	33.9
No	259	66.1
Physical activity		
Sufficient	66	16.8
Insufficient	326	83.2
Exercise with family (n = 133)		
Yes	26	19.5
No	107	80.5

Only twelve (3.1%) of the participants smoked, while two hundred and eighty-eight (73.5%) of the participants did not take alcohol. Only 133 respondents (33.9%) engaged in regular exercise, of these, only twenty-six (19.5%) exercised with their family.

Clinical Measurements of the Respondents

Table 3: Clinical measurements of the respondents

Variables	Frequency	Percent
Body mass index (BMI)		
Underweight (<18.5) Normal (18.5-24.9)	0 151	0 38.5
Overweight (25-29.9)	142	36.2
Obese (≥30)	99	25.3
Mean (SD) = 27.29 (0.79)		

About a quarter (25.3%) of the respondents were obese and the mean BMI was 27.29 ± 0.79kg/m^2.

Relationship Between Obesity and Socio-Demograhic Variables

Table 4: Association between obesity and socio-demographic variables

Variables (n)	Non-Obese	Obese	Test statistics	Df	p Value
Age (in years)					
18-30	64 (66.0)	33 (34.0)	Fisher's exact		< 0.001
31-40	39 (37.1)	66 (62.9)			
41-50	20 (22.0)	71 (78.0)			
51-60	13 (20.3)	51 (79.7)			
61-70	5 (19.2)	21 (80.8)			
71-80	0 (0.0)	8 (100.0)			
>80	0 (0.0)	1 (100.0)			
Mean (SD) = 41.46 (1.33)					
Gender					
Male	67 (41.1)	96 (58.9)	χ^2=3.194	1	0.074
Female	74 (32.3)	155 (67.7)			
Marital status					
Single	64 (66.7)	32 (33.3)	Fisher's exact		< 0.001
Married	68 (25.7)	197 (74.3)			
Separated	1 (25.00	3 (75.0)			
Divorced	2 (66.7)	1 (33.3)			
Widowed	6 (25.0)	18 (75.0)			
Highest Educational Level					
No formal education	5 (35.7)	9 (64.3)	χ^2=4.319	3	0.229
Primary	5 (17.9)	23 (82.1)			
Secondary	31 (37.8)	51 (62.2)			
Tertiary	100 (37.3)	168 (62.7)			

Occupation					
Professional	2 (40.0)	3 (60.0)	Fisher's exact		< 0.001
Civil servant	40 (26.8)	109 (73.2)			
Retired	6 (22.2)	21 (77.8)			
Farmer	14 (26.4)	39 (73.6)			
Unemployed	14 (51.9)	13 (48.1)			
Business executive	8 (36.4)	14 (63.6)			
Student	39 (66.1)	20 (33.9)			
Others	18 (36.0)	32 (64.0)			
Ethnicity					
Tiv	106 (37.1)	180 (62.9)	Fisher's exact		0.135
Idoma	17 (37.0)	29 (63.0)			
Igede	4 (25.0)	12 (75.0)			
Igbo	5 (31.3)	11 (68.8)			
Hausa	1 (50.0)	1 (50.0)			
Yoruba	0 (0.0)	7 (100.0)			
Others	8 (42.1)	11 (57.9)			
Religion					
Christianity	138 (35.8)	248 (64.2)	Fisher's exact		0.344
Islam	3 (50.0)	3 (50.0)			

Table 4 shows the bivariate analysis of socio-demographic characteristics and obesity.

The prevalence of obesity increased with age and was highest in those aged 71 years and above (100%). This trend was statistically significant (p<0.001). The prevalence of obesity was higher in the female respondents when compared to the males, but this was not statistically significant (67.7% vs 58.9%, p = 0.47).

Table 5: Association between obesity and family factors.

Variables (n)	Non-Obese	Obese	Test statistics	Df	p Value
Average family income per month in Naira (N)					
Less than 18,000	14 (53.8)	12 (46.2)	χ^2=6.038	3	0.110
18,000-58,999	50 (39.4)	77 (60.6)			
59,000-99,999	34 (34.4)	65 (65.7)			
100,000 and above	43 (30.7)	97 (69.3)			
Living arrangement					
Alone	39 (58.2)	28 (41.8)	Fisher's exact		< 0.001
With spouse only	18 (33.3)	36 (66.7)			
With relation	27 (64.3)	15 (35.7)			
With friends	2 (28.6)	5 (71.4)			
With spouse and children	37 (22.3)	129 (77.7)			
With children and relations	6 (50.0)	6 (50.0)			
With children only	12 (27.3)	32 (72.7)			
Number of children					
0-3	61 (40.4)	90 (59.6)	χ^2=2.091	1	0.148
4 and above	80 (33.2)	161 (66.8)			
Financial support					
Self	56 (42.4)	76 (57.6)	χ^2=44.474	4	< 0.001
Spouse	27 (19.1)	114 (80.9)			
Parent	39 (66.1)	20 (33.9)			
Children	11 (27.5)	29 (72.5)			
Friends and other relatives	9 (45.0)	11 (55.0)			
Exercise with family (n=133)					
Yes	6 (23.1)	20 (76.9)	χ^2=3.187	1	0.074
No	40(37.4)	67 (62.6)			

There was a trend of increasing prevalence of obesity with increasing family income. Respondents with family income of less than N18,000 had less prevalence of obesity (46.2%, n = 26), while those with family income of N100,000 and above had the highest prevalence of obesity (69.3%, n = 140) but it was not statistically significant (p = 0.110). Obesity was highest among those living with spouse and children (77.7%, n = 166) and this was statistically significant (p< 0.001). There was no statistically significant association between the number of children and obesity, even though the prevalence of obesity was higher in respondents in a family with at least four children (66.8% vs 59.6%, χ^2=2.091, p = 0.148). Respondents that exercised with their family had the highest prevalence of obesity (76.9%, n = 26) but this was not statistically significant (p = 0.074)

Discussion

The mean age of the respondents was 41.46±1.33 years which was a bit lower than findings from other Nigerian states of Ebonyi and Enugu where the mean ages were 45.8±1.67 years and 45 years respectively [20, 21]. The different study designs could account for the difference.

In this study, the male to female ratio was 1:1.40. This conforms to the findings of Eyichukwu and Ogugua who reported more females than males in a ratio of 1.5:1 in

Enugu.[21] The female preponderance in this study could be due to their better health-seeking behaviour when compared to their male counterparts. However, this result was in contrast to the report by Omoke and colleagues in Abakaliki who reported slightly higher male preponderance with male to female ratio of 1.04:1 [20].

Respondents who did not exercise with their family had the highest frequency (80.5%, n= 107) while those that exercised with their family had frequency of (19.5%, n=26). This finding aligns with that of Ogunbode and his colleagues in South-Western Nigeria [22].

The prevalence of obesity in the present study (25.3%) was higher than the national prevalence of 8.1%-22.2% reported by Chukwuonye and colleagues in a systematic review of articles on obesity from online databases [8], Delta state where a prevalence of 5.5% was reported by Agofure *et al* [9], South-Eastern states where prevalence of 6.5% was found by Ukegbu and colleagues [23], Benue state where Adediran *et al* reported prevalence rates of 4% and 22% [24], and Kano state where Wahab and colleagues found a prevalence of 21% [12]. Most of these studies were done in rural settings and among different age ranges which could be responsible for the divergent findings. However, compared to this study, higher prevalence rates have been reported in developed nations of USA (39.8%) and in England (29%) by Conolly and colleagues [25, 26]. These higher findings may be as a result of increased consumption of high calorie diets and sedentary lifestyle in these countries.

The age-related prevalence in this study showed increased prevalence with ageing. This finding agrees with that of Craig and colleagues from the United State who stated that body weight increases with age [25], as well as that of Sally *et al* in Abuja which reported that individuals who were older than 30years were more likely to be overweight or obese than younger persons [27]. The association between BMI and age is likely due to natural changes in body composition and decreased level of metabolism as well as increased sedentary lifestyle which comes with ageing.

The female gender had a higher prevalence of obesity (67.7%, n = 229) but, it was not statistically significant (p = 0.074). This is similar to reports from other local and international studies [24, 26, 28, 29, 30]. The reason for this may not be unconnected with the socio-cultural roles of females who are expected to stay at home as home keepers. It could also be from the effects of fats gained during pregnancy.

We found a trend of increasing prevalence of obesity with increasing family income, even though there was no significant association between average family income and obesity (p= 0.110). This finding is in line with reports from the USA by CDC, Tanzania by Shayo *et al*, Abuja by Sally *et al* as well as Anambra and Kano states [10, 12, 25, 29]. This may be as a result of more purchasing power and increased food intake as well as the tendency for sedentary lifestyle associated with high income earners.

The findings from this study showed that respondents who lived with spouse and children had a higher prevalence (77.7%) of obesity. Similar findings have been recorded in Myanmar by Hong and colleagues [31] and Dada and colleagues in Oyo state, South-Western Nigeria [32]. This could be because individuals who live alone tend to eat less and exercise more than couples living together.

The prevalence of obesity was higher in respondents in a family with at least four children (66.8%, p=0.148), those who had financial support from spouse (80.9%, p<0.001), and respondents who exercised with their family (76.9%, p=0.074). However, this finding is at variance with the study in Pakistan by Mushtaq and colleagues with a larger sample size of 1,860 which could have accounted for the difference in findings [33].

Conclusion

The relatively high prevalence of obesity observed in this study should serve as a warning that obesity and its related complications are on the increase even in low-and-middle income countries that are already faced with poverty and infectious diseases. Interestingly, some of the factors influencing this rising trend of obesity are well within the context of the family. Hence, any effort directed at preventing and curbing obesity and its complications should give priority to the specific family factors.

Recommendations

Primary care physicians as first contact physicians, and indeed all clinicians and health workers should increase efforts as advocates at creating awareness of the general population on the importance, prevention and treatment of obesity with particular attention to the family factors associated with it. This can also be achieved with the use of the WHO global strategy on healthy diets, physical activity and harmful use of substance through lifestyle modifications. Furthermore, this study could serve as basis for future longitudinal studies on the relationship between obesity and its associated family factors.

Limitations

This was a hospital-based study which was limited to the general outpatient clinic. Therefore, the findings might not be a complete representation of what may be obtainable in the general population as well as other clinics/hospitals. Also, this study, like other cross-sectional studies, has inherent weakness or difficulty in ascertaining temporal relationship. Thus, any inference from the observed association should be made with caution.

Source of Funding: None
Conflict of Interest: None

References

1. World Health Organization. Obesity and overweight [webpage on the internet]. Geneva, Switzerland: World Health Organization, 2015. [cited 2017 Jul 29]. Available from URL: http://www.who.int/mediacentre/factsheet/fs311/en/print.html.
2. Derek T, Tom S, Ellen D. Obesity and low back pain - a review of the literature [internet]. ggpbs, 2009, 1. [cited 2017 Aug 27]. Available from URL: http://www.nhsggc.org.uk
3. Gomez-Ambrosi J, Silva C, Galofre JC, Escalada J, Santos S, Millan D, *et al*. Body mass index classification misses subjects with increased cardiometabolic risk factors related to elevated adiposity. Int J Obes,2012:36:286–94.
4. Rahman S, Jaro K, Paivi L, Svetlana S. The association between obesity and low back pain. a meta – analysis. Am J Epidemiol,2010:171(2):135–54.

5. Heikki F, Svetlana S, Pertti M, Harri P, Markku H, Eira V. Role of overweight and obesity in low back disorders among men: a longitudinal study with a life course approach. BMJ,2015:5:e007805. doi:10.1136/bmjopen-2015-007805.
6. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, Switzerland: World Health Organization, 2008. [cited 2018 Oct 29].
7. Available from URL: https://www.who.int/nutrition/publications/obesity/WHO_report_waistcircumference_and_waisthip_ratio/en/
8. Ellulu M, Abed Y, Rahmat A, Ranneh Y, Ali F. Epidemiology of obesity in developing countries: challenges and prevention. Glob EpidemiObes [serial online], 2014, 2(2) [cited 2018 Jan 07]. Available from URL: http://www.hoajonline.com/journals/pdf/2052-5966-2-2.pdf
9. Innocent IC, Abali C, Collins J, Kenneth AO, Miracle EI, Samson EI, *et al*. Prevalence of overweight and obesity in adult Nigerians – a systematic review. Diabetes MetabSyndr Obesity,2013:6:43–7.
10. Agofure O. Prevalence of obesity among adults in Issele-Uku, Delta state Nigeria. Alexandria J Med,2018:54(4):463–8.
11. Maruf FA, Udoji NV. Prevalence and socio-demographic determinant of overweight and obesity in a Nigerian population. J Epidemiol,2015:25(7):475–81.
12. Afolabi WA, Addo AA, Sonibare MA. Activity pattern, energy intake and obesity among Nigerian urban market women. Int J Food Sci Nutr,2004:55(2):85–90.
13. Wahab KW, Sani MU, Yusuf BO, Gbadamosi M, Gbadamosi A, Yandutse MI. Prevalence and determinants of obesity – a cross-sectional study of an adult Northern Nigerian population. Int Arch Med,2011:4:10–4.
14. Eru E, Ibu J, Onahinon C. Assessment of the prevalence of overweight, and obesity risk factors among adult Nigerians in Makurdi, North Central Nigeria. Int J Innov,2018:5(3):22–6.
15. Gruber KJ, Haldeman LA. Using the family to combat childhood and adult obesity. Prev Chronic Dis,2009:6(3):1–6.
16. Blake LJ, Barbara HF, The strong kids team. Parent routines, child routines, and family demographics associated with obesity in parents and preschool-aged children. Front Psychol,2014:5(374):1–11. [cited 2018 Oct 28]. Available from URL: http://www.frontiersin.org/journal/10.3389/fpsyg.2014.00374
17. Anderson B, Rafferty AP, Lyon-Callo S, Imes G. Fast-food consumption and obesity among Michigan adults. Prev Chronic Dis, 2011, 8(4). [cited 2018 Oct 28]. Available from URL: http://www.cdc.gov/pcd/issues/2011/jul/10_0186.htm
18. Yanovski SZ, Yanovski JA. Long-term drug treatment for obesity: a systematic and clinical review. JAMA,2014:311(1):74–86.
19. Binwu S, Chaoling F, Donglan Z, Hugh S, Lu S. Associations between obesity and spinal diseases: A medical expenditure panel study analysis. Int J Environ Res Public Health,2017:14:182–93.
20. Aroaye MO. Research methodology with statistics for health and social sciences. Ilorin: Nathadex, 2004, 115–22.
21. Omoke NI, Amaraegbulam PI. Low back pain as seen in orthopedic clinics of a Nigerian teaching hospital. Niger J ClinPract,2016:19:212–7.
22. Eyichukwu O, Ogugua PC. Epidemiology of low back pain in Enugu, Nigeria. Niger Ortho Trauma,2012:11(1):1–4.
23. Ogunbode AM, Adebusoye LA, Alonge TO. Prevalence of low back pain and associated risk factors amongst adult patients presenting to a Nigerian family practice clinic - a cross sectional study. Afr J Prm Health Care Fam Med,2013:5(1):433–41.
24. Ukegbu PO, Uwaegbute AC, Echendu CA, Ejike C, Anyika-Elekeh J, Asumugha VU, *et al*. Obesity and associated factors in young adults attending tertiary institutions in South-Eastern Nigeria. South Afr J ClinNutr,2017:30(2):43–8.
25. Adeniyi OS, Adediran OS, Jimoh AK, Alao OO. Underweight, overweight and obesity in adults Nigerians living in rural and urban communities of Benue state. Ann Afr Med,2011:10(2):139–43.
26. Hales CM, Carroll MD, Fryar CD, Ogden CL. Prevalence of obesity among adults and youth: United States, 2015–2016. Centre for Disease Control and Prevention, 2017. [cited 2020 Aug 20]. Available from: https://stacks.cdc.gov.view/cdc/49223
27. Conolly A, Davies B. Health survey for England 2017 adult and child overweight and obesity. National Health Service, 2018. [cited 2020 Aug 17]. Available from: https://healthsurvey.hscic.gov.uk/media/78619/HSE17-Adult-child-BMI-rep.pdf
28. Sally N, AkaroloA, Walter CW, Adebamowo CA. Obesity epidemic has emerged among Nigerians. BMC Public Health,2014:14(1):455. doi:10.1186/1471-2458-14-455.
29. Ajayi IO, Adebamowo C, Adami H, Dala S, Diamond M, Bajunirwe F, *et al*. Urban-rural and geographic differences in overweight and obesity in four sub-Saharan African adult populations: a multi-country cross-sectional study. BMC Public Health,2016:16:1126–38.
30. Shayo GA, Mugusi FM. Prevalence of obesity and associated risk factors among adults in Kinondoni municipal district, Dar es Salam Tanzania. BMC Public Health,2011:11:365–71.
31. Castano LS, Goez-Rueda JD, Carreno-Aguirre C. Social and economic factors associated with obesity: the effects from inequality and poverty. Rev GerencPolitSalud,2012:11(23):98–110.
32. Hong SA, Peltzer K, Lwin KT, Aung LS. The prevalence of underweight, overweight and obesity and their related socio demographic and lifestyle actors among adult women in Myanmar, 2015–2016. PLoS ONE,2018:13(3):e0194454.
33. Dada IO. The meal pattern and incidence of overweight and obesity among market women in a South-West community, Nigeria. Saudi J Obesity 2017:5:70–6.
34. Mushtaq MU, Gull S, Shahid U, Shafique MM, Abdullah HM, Shad MA. Family-based factors associated with overweight and obesity among Pakistan primary school children. BMC Pediatrics,2011:11(114):1–9.