ORIGINAL RESEARCH ARTICLE

Socio-Demographic Correlates of Overweight and Obesity among Women of Reproductive Age in Nigeria

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Abstract

The prevalence of excess adiposity is increasing in less developed countries. This study explored the associations of socio-demographic factors with increased BMI among Nigeria women aged 20-49 years using secondary data collected for the 2008 NDHS. Anthropometric and socio-demographic variables of interest were extracted from the data and analyzed with SPSS version 15.0. χ^2 Was used to compare categorical variables and multi-nominal logistic regression was used to examine for correlates. The prevalence of overweight (BMI 25 to 29.9kg/m2) and obesity (BMI 30kg/m^2 and above) in this population were 18.1% and 7.1% respectively. The prevalence of overweight/obesity was highest among Igbo women. Multivariable logistic regression revealed increased frequency of watching television, belonging to a particular ethnic group, having a tertiary education and increased parity as risk factors for increased BMI. This study confirms a high prevalence of overweight and obesity among Nigerian women and identifies high risk groups for excessive weight gain. *(Afr J Reprod Health 2013; 17[4]: 66-76).*

Keywords: Obesity, correlates, women, reproductive age, Nigeria

Résumé

La prévalence de l'excès d'adiposité est en augmentation dans les pays moins développés. Cette étude a exploré les associations de facteurs socio -démographiques avec l'augmentation de l'IMC chez les femmes nigérianes âgées de 20-49 ans Nigeria à l'aide des données secondaires collectées pour l'exercice de l'ENDS de 2008 . Les variables anthropométriques et sociodémographiques valables ont été extraites des données et analysées avec la version SPSS 15.0 et ont été utilisé pour comparer les variables catégorielles tandis que l'on s'est servi de la régression logistique multinomiale pour examiner des corrélats. La prévalence du surpoids (IMC de 25 à 29.9kg/m2) et l'obésité (IMC 30kg/m2 et ci-dessus) dans cette population étaient respectivement de 18,1% et 7,1%. La prévalence du surpoids / obésité était plus élevée chez les femmes igbo. La régression logistique multi variée a révélé une fréquence accrue de regarder la télévision, d'appartenir à un groupe ethnique particulier, d'avoir acquis une éducation tertiaire et une parité élevée comme des facteurs de risque qui favorisent l'IMC. Cette étude confirme une forte prévalence du surpoids et de l'obésité chez les femmes nigérianes et identifie les groupes à haut risque pour le gain de poids excessif. *(Afr J Reprod Health 2013; 17[4]: 66-76).*

Mots clés: obésité, corrélats, femmes, âge de procréer, Nigeria

Introduction

Seventeen percent of the world population is overweight or obese[1]. Once thought to be a problem of the western world, the problem of overweight and obesity is increasingly becoming common in less developed countries. In many Sub-Saharan African countries, there has been a marked increase in the prevalence of obesity as well as many chronic diseases associated with it[2]. In addition, overweight and obesity have also been shown to be associated with negative reproductive health outcomes[3,4]. Ovulatory dysfunction resulting from excess adiposity is often associated with increased risk of menstrual irregularities. Obesity not only causes infertility due to anovulation it also reduces the effectiveness of infertility treatment. The risk of spontaneous abortion has been shown to be higher in people with higher Body Mass Index (BMI) both in

normally achieved pregnancies and pregnancies following fertility treatment. High pre-pregnancy weight is associated with increased risk of pregnancy-induced hypertension, gestational diabetes, thromboembolism, urinary tract infections, the need for induction of labour, instrumental delivery, caesarean section, anaesthetic and postoperative complications including uterine infections. Effects of overweight and obesity are not limited only to the woman as high maternal adiposity has been linked to increased risk of neural tube and heart defects in the foetus. Similarly high maternal BMI have been associated with increased risk of macrosomia, thereby increasing the risk of birth trauma. The risk of neonatal death is also higher for foetuses whose mothers are overweight.

These reproductive health effects of excess body fat also have their implications. In Nigeria for instance, infertility is associated with social, economic and psychological effects and women tend to bear the brunt when a couple is infertile. Women have been shown to suffer physical abuse, economic deprivation and abandonment due to infertility[5,6]. Pregnancy induced hypertension is positively correlated with eclampsia one of the major causes of maternal mortality in Nigeria. Over 90% of Nigerian women who experienced spontaneous abortion have been reported to demonstrate symptoms of depression with as much as 14% of them showing symptoms of severe depression[7]. The need for prolonged hospital stay due to the deleterious effects of high maternal adiposity on the new born as well as following operative delivery all exert extra pressure on the already scarce resources of the Nigerian health care system and also increase the health care costs for the affected individual or family.

Given these reproductive health consequences of excess adiposity, and the very high prevalence of overweight and obesity among women in Nigeria as reported by several studies including the nationally representative Nigeria Demographic and Health Survey of 2008[8-10] there is therefore the need to investigate the factors associated with overweight and obesity among women of reproductive age in Nigeria.

The associations between excess body fat and socio-demographic, environmental, familial, behavioural factors as well as racial and ethnic differences have been demonstrated for several populations by different authors but these have not been documented for the Nigerian population[11-19]. This study therefore intends to explore the social and demographic factors associated with overweight and obesity among adult women of reproductive age in Nigeria and as such provide information that could help identify the most at risk group for targeted intervention.

Methods

This study is based on a review of the Nigeria Demographic and Health Survey (NDHS) data of 2008. The survey was designed to provide population and health indicators at the national, zonal, and state levels. A brief description of the study design, data collection and data processing as implemented by the National Population Commission (NPC) is given below.

Sample design

The sampling frame used for the 2008 NDHS was the 2006 Population and Housing Census of the Federal Republic of Nigeria conducted in 2006, provided by the National Population Commission (NPC). The primary sampling unit (PSU), referred to as a cluster for the 2008 NDHS was defined on the basis of enumeration areas (EA) from the 2006 EA census frame. The 2008 NDHS sample was selected using a stratified two-stage cluster design consisting of 888 clusters, 286 in the urban and 602 in the rural areas. A representative sample of 36,800 households distributed proportionately among urban and rural areas in each state was selected for the 2008 NDHS. A complete listing of households and a mapping exercise were carried out for each cluster from April to May 2008, with the resulting lists of households serving as the sampling frame for the selection of households in the second stage. The NPC listing enumerators were trained to use Global Positioning System (GPS) receivers to take the coordinates of the 2008 NDHS sample clusters. In the second stage of selection, an average of 41 households was selected in each cluster, by equal probability systematic sampling. All women age 15-49 who

were either permanent resident of the households or visitors present in the households on the night before the survey were eligible to be interviewed. In a sub-sample of half of the households, all men age 15-59 that were either permanent residents of the households or visitors present in the households on the night before the survey were eligible to be interviewed.

Questionnaires

Three questionnaires were used for the 2008 NDHS. They are the Household Questionnaire, the Women's Questionnaire, and the Men's Questionnaire. These questionnaires were adapted to reflect the population and health issues relevant to Nigeria. In addition to English, the questionnaires were translated into three major Nigerian languages: Hausa, Igbo, and Yoruba. The Household Questionnaire was used to list all the usual members and visitors of selected households. Some basic information was collected on the characteristics of each person listed, including his or her age, sex, education, and relationship to the head of the household. The data on the age and sex of household members obtained in the Household Questionnaire was used to identify women and men who were eligible for the individual interview. Additionally, the Household Questionnaire collected information on characteristics of the household's dwelling unit, such as the source of water, type of toilet facilities, materials used for the floor of the house, ownership of various durable goods, and ownership and use of mosquito nets. The Household Questionnaire was also used to record height and weight measurements for children age 0-59 months and women age 15-49. The Women's questionnaire was used to collect information from all eligible women age 15-49 and the Men's questionnaire was administered to all men age 15-59 in every second household in the 2008 NDHS sample. The Men's questionnaire collected much of the same information found in the Women's questionnaire, but was shorter because it did not contain a detailed reproductive history or questions on maternal and child health or nutrition.

Data collection

Thirty-seven interviewing teams carried out data collection for the 2008 NDHS. Each team consisted of 1 supervisor (team leader), 1 field editor, 4 female interviewers, 2 male interviewers, and 2 drivers. Nineteen senior staff members from NPC, designated as zonal coordinators, coordinated and supervised fieldwork activities. Data collection took place over a four-month period from June to October 2008.

In all, 34,644 households were found to be occupied and interviews were successfully completed in 34,070 households. In the interviewed households, a total of 34,596 women were identified to be eligible for the individual interview, and 33,385 of them were successfully interviewed. For men, 16,722 were identified as eligible in half the households, and 15,486 of them were successfully interviewed.

Data processing

All completed questionnaires for the 2008 NDHS were returned to the NPC headquarters office in Abuja for data processing, which consisted of office editing, coding of open-ended questions, data entry, and editing computer-identified errors. The data were processed by a team of 30 data entry operators, 3 data coders, 4 data entry supervisors, and 8 secondary editors. Data entry and editing were accomplished using the CSPro software. The processing of data was initiated in July 2008 and completed in February 2009.

Analysis

This author received a complete data set of the 2008 NDHS in SPSS format. Body Mass Index (BMI) was already calculated in the data set received with an assumed 2 decimal places for all non-pregnant women who did not have a delivery in the two months preceding the day of the interview and measurement and who had complete anthropometric measurements. BMI was subsequently converted to 1 decimal place and was categorized and defined in the following ways: BMI of less than 18.5 kg/m^2 was defined as underweight, 18.5 to 24.9 kg/m^2 was defined as

normal weight, 25 to 29.9 kg/m^2 was defined as overweight and a BMI of 30 kg/m^2 and above was defined as obesity. The results from this study are based on this classification. Since the World Health Organization (WHO) and the Centres for Disease Control and Prevention (CDC) consider the use of fixed cut-off as inappropriate for defining weight in children and adolescents[20,21], respondents age 15-19 years were also excluded from the analyses resulting in a data set of 18,107 women age 20-49 years. Relevant socio-demographic variables of interest were dummy coded prior to analysis. Analyses were performed with SPSS version 15.0. Chi-square (χ^2) test was use to compare categorical variables for associations while multi-nominal logistic regression was used to examine correlates. Statistical significance was set at $p< 0.05$ and 95% confidence interval.

Results

The socio-demographic characteristics of the respondents are presented in Table 1. Eighteen thousand one hundred and seven women aged 20 to 49 years were included in the analyses. Mean age was 33.5 years (SD=8) and women less than 30 years of age constituted the majority (36%) of the study population. The Hausa/Fulani, Yoruba and Igbo ethnic groups accounted for almost 60% of the study population.

Half (50.2%) of the women were of the Islamic faith while 47% practiced the Christian religion. Twenty three percent of the study population had a primary education, 22% had a secondary education and only 7% reported that they received a tertiary education. Seventy percent of the women reported that they were employed. Nine out of ten women were married and median number of childbirth among this study population was four (range= 1-17). Sixty five percent (n= 11814) had five or less births, four percent (n= 632) have had eleven or more births while the remaining one-third (n=5661) had between 6 and 10 children.

Surprisingly, of the four hundred and two women who reported that they have never been married none was nulliparous.

Twenty five percent (n=4559) of the study population had a BMI equal to or greater than 25kg/m^2 and were classified as overweight if BMI was 25-29.9kg/m^2 (18.1%) or Obese if BMI was 30 kg/m^2 and above (7.1%). Mean BMI was 22.9 (SD=4.6 kg/m^2). The proportion of women who were overweight/obese (BMI >25kg/m^2) varied with background characteristics as shown in Table 2.

Table1. Socio-demographic characteristics of respondents (n=18107)

Age	**n (%)**
20-24	2662 (14.7)
25-29	3767 (20.8)
30-34	3259 (18)
35-39	3105 (17.1)
40-44	2656 (14.7)
45-49	2658 (14.7)
Total	**18,107 (100)**
Religion	
Catholic	1705 (9)
Other Christian	6823 (38)
Islam	9093 (50.2)
Traditionalist	353 (2)
Other	31 (.2)
Missing	102 (.6)
Total	**18,107 (100)**
Ethnicity	
Hausa/Fulani/Kanuri/Beriberi	6196 (34)
Yoruba	2579 (14)
Igbo	2080 (11.5)
Others	7151 (39.5)
Missing	101 (1)
Total	**18,107 (100)**
Educational status	
No Education	8734 (48)
Primary Education	4223 (23)
Secondary Education	3952 (22)
Tertiary	1198 (7)
Total	**18,107 (100)**
Marital status	
Never Married	402 (2)
Married	16242 (90)
Living together	248 (1)
Widowed	713 (4)
Divorced	224 (1)
Not living together	278 (2)
Total	**18,107 (100)**
Occupational status	
Working	12745 (70)
Not working	5253 (29)
No response	109 (1)
Total	**18,107 (100)**

Table2. Proportion of women who are overweight/obese (BMI >25gk/m^2) by background characteristics of respondents (n=18107)

Age	Number of women in the sample	Number and percent of overweight women within each category
20-24	2662	350 (13%)
25-29	3767	718 (19%)
30-34	3259	851 (26%)
35-39	3105	946 (31%)
40-44	2656	871 (33%)
45-49	2658	823 (31%)
Total	**18,107**	**4559 (25%)**
Religion		
Catholic	1705	558 (33%)
Other Christian	6823	2246 (33%)
Islam	9093	1647 (18%)
Traditionalist	353	66 (19%)
other	31	10 (32%)
Missing	102	32 (31%)
Total	**18,107**	**4559 (25%)**
Ethnicity		
Hausa/Fulani/ Kanuri/Beriberi	6196	886 (14%)
Yoruba	2579	918 (36%)
Igbo	2080	814 (39%)
Others	7151	1915 (27%)
Missing	101	26 (26%)
Total	**18,107**	**4559 (25%)**
Educational status		
No Education	8734	1395 (16%)
Primary Education	4223	1122 (27%)
Secondary Education	3952	1414 (36%)
Tertiary	1198	628 (52%)
Total	**18,107**	**4559 (25%)**
Marital status		
Never Married	402	85 (21%)
Married	16242	4043 (25%)
Living together	248	82 (33%)
Widowed	713	212 (30%)
Divorced	224	53 (24%)
Not living together	278	82 (30%)
Total	**18,107**	**4559 (25%)**
Occupational status		
Working	12745	3485 (27%)
Not working	5253	1052 (20%)
No response	109	22 (20%)
Total	**18,107**	**4559 (25%)**

The proportion of women with BMI >25kg/m^2 tended to increase as age increased similarly the proportion of overweight/obese women increased as educational status increased. The proportion of women with BMI >25kg/m^2 was highest among those of the Christian faith (33%) and those of the Igbo ethnic group (39%).

Table 3 compares the respondents' place of residence to their Body Mass Index. Women who lived in an urban area or in the southern part of Nigeria demonstrated statistically significant relationships with a higher body weight.

Table 4 shows the relationship between socio-demographic factors and overweight and obesity. Ethnicity was found to be significantly associated with overweight and obesity. Women of the Ibibio, Igala, Igbo, Ijaw, and Yoruba ethnic groups were significantly more likely to be overweight or obese compared to women of the Hausa ethnic group. The Igala women were the most likely to be overweight (OR= 2.231, 95% CI 1.631-3.054) followed by the Igbo (OR=1.672, 95% CI 1.380-2.026) and Yoruba (OR=1.605, 95% CI 1.365-1.887) women. Women of the Igbo ethnic group were however, more likely to be obese (OR=2.039, 95% CI 1.526-2.723) than other women compared to the Hausa's. Fulani women were forty two percent and thirty eight percent less likely to be overweight or obese when compared to Hausa women.

Women who were employed had 1.003 odds (95% CI 0.910-1.106) of being overweight and 1.153 odds (95% CI 0,989-1.345) of being obese compared to unemployed women. This was however, statistically not significant.

Educational status also demonstrated a significant relationship with overweight and obesity. When compared to those with no education, women with only a primary education were the least likely to be either overweight (OR= 1.276, 95% CI 1.135-1.434) or obese OR=1.706 95% CI 1.410-2.066) respectively).

Table 3: Relationship between area of residence and Body Mass Index

Place of residence	Underweight (BMI<18.5kg/m^2) n (%)	Normal weight (BMI 18.5 to 24.9kg/m^2) n (%)	Overweight/obese (BMI>25kg/m^2) n (%)	Number of women in the sample	Chi-square	P-value
Rural	1646 (12.9)	8583 (67.4)	2499 (19.6)	12728	739	.000
Urban	374 (7.1)	2847 (54.4)	2016 (38.5)	5237		
Not de jure resident	10 (7)	88 (62)	44 (31)	142		
Total	**2030**	**11,518**	**4559**	**18,107**		
Region of residence						
North	1628 (14.3)	7534 (66.3)	2195 (19.3)	11357	712	.000
South	392 (5.9)	3896 (59)	2320 (35.1)	6608		
Not de jure resident	10 (7)	88 (62)	44 (31)	142		
Total	**2030**	**11,518**	**4559**	**18,107**		
Geopolitical zone						
North Central	240 (7)	2271 (65.8)	939 (27.2)	3450	1088	.000
North East	610 (17.2	2403 (67.7)	535 (15.1)	3548		
North West	778 (17.8)	2860 (65.6)	721 (16.5)	4359		
South-South	114 (5)	1382 (60)	806 (35)	2302		
South East	115 (7)	955 (58)	576 (35)	1646		
South West	163 (6.1)	1559 (58.6)	938 (35.3)	2660		
Not de jure resident	10 (7)	88 (62)	44 (31)	142		
Total	**2030**	**11,518**	**4559**	**18,107**		

Table 4: Multinomial regression analysis of the socio-demographic correlates of overweight and obesity

	Overweight (BMI 25 to 29.9kg/m^2)				Obesity (BMI > 30kg/m^2)			
	Odds ratio	95% CI		P-value	Odds ratio	95% CI		P-value
		Lower bound	Upper bound			Lower bound	Upper bound	
Ethnicity								
Ekoi	.970	.690	1.364	.863	.825	.488	1.397	.475
Fulani	.583	.465	.731	.000	.617	.416	.915	.016
Ibibio	1.557	1.151	2.107	.004	1.671	1.093	2.555	.018
Igala	2.231	1.631	3.054	.000	1.932	1.192	3.133	.008
Igbo	1.672	1.380	2.026	.000	2.039	1.526	2.723	.000
Ijaw	1.580	1.230	2.031	.000	1.592	1.096	2.311	.015
Kanuri	.642	.457	.903	.011	.766	.444	1.322	.339
Tiv	.905	.667	1.227	.521	.531	.304	.928	.026
Yoruba	1.605	1.365	1.887	.000	1.603	1.245	2.065	.000
Other tribes	1.285	1.113	1.484	.001	1.025	.805	1.305	.840
Hausa (ref)					.	.	.	
Marital status								
Married	1.899	1.416	2.546	.000	1.794	1.180	2.726	.006
Living together	2.336	1.547	3.527	.000	1.251	.637	2.456	.516
Widowed	1.956	1.379	2.775	.000	2.111	1.289	3.457	.003
Divorced	1.857	1.163	2.967	.010	1.841	.919	3.691	.085
Not living together	1.813	1.195	2.749	.005	1.592	.866	2.928	.135
Never married (ref)					.	.	.	
Employment status								
Employed	1.003	.910	1.106	.950	1.153	.989	1.345	.069
Unemployed (ref)					.	.	.	
Educational status								
Primary	1.276	1.135	1.434	.000	1.706	1.410	2.066	.000

Secondary	1.861	1.643	2.108	.000	3.193	2.628	3.881	.000
Tertiary	3.262	2.760	3.856	.000	6.953	5.509	8.775	.000
No education (ref)					.	.	.	
Parity								
11 or more children	2.231	1.809	2.751	.000	1.968	1.354	2.859	.000
6 to 10 children	1.296	1.181	1.422	.000	1.652	1.439	1.896	.000
1 to 5 children (ref)					.	.	.	

The reference category is: Normal weight

The odds of being overweight and obese increased as educational status increased. Women who were living with their partners though not married were the most likely to be overweight compared with unmarried women (OR=2.336, 95% CI 1.547-3.527). Married women and those who had once been married also had significantly increased odds of being overweight. However, only married and widowed women had a significant odds of being obese (OR= 1.794, 95% CI 1.180-2.726) and (OR=2.111, 95% CI 1.289-3.457) respectively).

Parity was also significantly associated with the risk of being overweight or obese. The odds of being overweight or obese were highest among women who had more than ten children (OR= 2.231, 95% CI 1.809-2.751 and OR=1.968, 95% CI 1.354-2.859 respectively) compared to those who had less number of births.

Table 5 presents the association between Body Mass Index and the frequency of watching television. The odds for being overweight or obese increased as the frequency of watching television increased. Women who watched the most television had the greatest odds of being overweight or obese (OR=2.831, 95% CI 2.564-3.125 and OR=6.359, 95% CI 5.492-7.362) respectively). The role of inactivity in weight gain was also demonstrated when the analysis was stratified by frequency of watching television. The odds of being overweight or obese generally increased across the socio-demographic variables of interest with women in the group that do not watch television at all being the least likely to be overweight or obese and those who watch television almost on a daily basis being most likely to be overweight or obese.

Table 5: Multinomial logistic regression of overweight and obesity by frequency of watching television

	Overweight (BMI 25 to 29.9kg/m^2)				**Obesity (BMI > 30kg/m^2)**			
	Odds ratio	**95% CI**		**P-value**	**Odds ratio**	**95% CI**		**P-value**
		Lower bound	Upper bound			Lower bound	Upper bound	
Almost every day of the week	2.831	2.564	3.125	.000	6.359	5.492	7.362	.000
At least once a week	2.353	2.100	2.637	.000	4.143	3.486	4.925	.000
Less than once a week	1.642	1.443	1.868	.000	2.882	2.371	3.503	.000
Not a tall (ref)								

The reference category is: Normal weight

Discussion

This study shows a prevalence of 18.1% and 7.1% for overweight and obesity respectively among adult women of reproductive age in Nigeria. This finding supports the 16.1% and 6% of overweight and obesity reported by the Nigeria Demographic and Health Survey of 2008[6]. Findings from this study however, are lower than the 53.3% and 21% (overweight and obesity) recently reported by Wahab et al (2011) in a study conducted among an urban population in northern Nigeria[22]. This may be due to the fact that the Wahab study was conducted among an urban population. Secondly,

the study population was of convenience sampling. Nigeria is witnessing both demographic and epidemiologic transitions and these could be some of the possible reasons for the high prevalence of overweight and obesity observed in this present study. Fast food outlets are also rapidly springing up in many parts of Nigeria with high patronage, leading to the consumption of energy-dense foods which is probably also fuelling the high prevalence.

Lehmann et al (2000) in a prospective study among Swedish women, Amoah (2003) in a Ghanaian study population and Antronette et al (2003) in a study among lesbian women in the United States, demonstrated an increasing weight with age[23-25]. Findings from this current study were also in support of this trend as the proportion of women who were overweight or obese increased with advancing age up to 44 years. Studies have shown that people who watch television very frequently tend to be heavier than those who do not watch television as much. It is thought that people tend to eat more while watching television and as such take in more calories coupled with the reduced amount of time available to engage in any sort of physical activity. All these work together to encourage weight gain[26-32].

Several studies (cross sectional and longitudinal) have demonstrated the influence of the frequency of watching television, lack of physical activity and inadequate diet on weight gain[30-34]. In the present study, the odds of being overweight or obese increased as the frequency of watching television increased. Women who watched television almost on a daily basis were six times more likely to be obese compared to women who reported that they do not watch television at all.

Overweight or obesity is often associated with affluence in Nigeria and educational status is often times used as a proxy indicator for socioeconomic status. It is therefore not surprising that the prevalence of overweight and obesity greatly increase as educational status increased among this study population. Women with a tertiary education were three times more likely to be overweight and almost seven times more likely to be obese compared to those with no education. Similarly, people with primary and secondary education had progressively higher odds of being overweight and obese compared to those with no education. This finding is in agreement with the result from other studies conducted in Ghana and China[24,35]. A likely explanation for this could be that, with higher educational level people are likely to have better income and as such are able to adopt a more westernized way of life which has been severally reported to be fuelling the obesity epidemic. Urban women had a significantly higher BMI compared to their rural counterpart, probably because of the availability and access to more fast food outlets, as well as availability of more social amenities that encourage a sedentary way of life. Amoah in 2003 also reported that overweight and obesity was higher among the urban high-class residents compared with the low class residents and in urban than in rural subjects in Ghana[24]. People with higher educational level are also more likely to live in urban areas due to their search for a better quality of life in the form of better jobs, better schools for their children and better business opportunities.

Studies in the United States and China have associated ethnicity with BMI[36-38]. Similarly, Amoah (2003) and Biritwum et al (2005) have also independently associated ethnic disparities with body fat in Ghana[24,39]. In this study, ethnic variation in BMI levels was also observed. When the three major tribes of Nigeria were compared, women of the Igbo tribe were more than one and half times and twice as likely to be overweight and obese when compared to Hausa women. Women of the Yoruba tribe were one and half times more prone to being overweight and obese when compared to the Hausa ethnic group. The Ibibio, Igala and Ijaw women all demonstrated a higher tendency to be overweight and obese when compared to the Hausa's. The prevalence of overweight and obesity was highest among the Igbo's at 39% followed by the Yoruba's at 36% and only 14% of the Hausa/Fulani women were overweight or obese. This is not surprising because the way of life of the Hausa and Fulani people generally does not encourage weight gain as compared to Yoruba and Igbo's who see fatness as a sign of affluence. Ojofeitimi et al (2007) in a study conducted among women in a university community in south western Nigeria reported that,

women perceive obesity as conferring respect, demonstrates evidence of good living, makes them look mature and attractive[40]. A high prevalence of overweight has been reported among South African black community who also associate overweight body type with happiness, beauty, affluence, health and a negative HIV/AIDS status [41].

Married women were significantly more likely to be overweight or obese than never married women. Women in other categories of marital status were also more likely to be overweight or obese compared to never married women. This result is in agreement with findings that have been reported by studies in Akwa Ibom state of Nigeria and in Morrocco[42,43]. Cohabitation (the equivalence of marriage among heterosexual women) among lesbian women in the United States was also reported by Antronette et al (2003) to be significantly associated with overweight and obesity. Similarly, parity was also significantly associated with increasing BMI in this study. Women who have had 11 or more births were twice more likely to be overweight and obese compared to women with between 1 and 5 births. Women with 6 to 10 births also had significant odds of being overweight and obese.

Although not statistically significant, women in employment were more likely to be overweight and obese compared to unemployed women. This result however, is in agreement with the findings of Biritwum et al. (2005) who reported a higher BMI among those employed compared to those not working in a Ghanaian population.

Limitations

Although the sample is broadly representative of the Nigeria female population, it omits institutionalized individuals, and excluded cases due to missing/inconsistent data, which may vary across ethnic groups and influence observed differences.

Although body mass index (BMI) is a reasonable indicator of overweight and obesity for the general population, it is not as good a measure of body fatness among certain groups, such as individuals with highly developed musculature. BMI, even when calculated from measured height and weight, is an imperfect measure of body fat stores and its accuracy may vary between ethnic groups[44]. However, BMI has been shown to provide a well-documented dose-response relationship with increased risk of mortality for the general population[45].

The observed relationships may also have been influenced by or contingent upon other variables that were not available in the NDHS data or that were collected in such a way that they could not be used for this analysis like neighbourhood environments, family meal patterns, smoking habits and physical activity. Considerable further investigation is required to understand the relative influence of socio-demographic, environmental, lifestyle and personal factors on obesity and healthy lifestyle practices among various segments of this diverse group.

Conclusions

Place of residence, ethnicity, marital status, parity, educational status and the frequency of watching television were found to be independently associated with excessive weight gain This study also indicates that at least eight million Nigerian women of reproductive age are either overweight or obese. This situation is very worrisome given the reproductive health challenges associated with overweight and obesity.

In the light of this, there is therefore an urgent need to mount intensive public health interventions to reduce the present unacceptably high prevalence of overweight and obesity among women of reproductive age in Nigeria. These interventions could be in the form of policies and actions that will:

1. Reduce food insecurity, increase coping skills and create more supportive social and physical environments for physical activity and healthy eating.
2. Address couple and family constraints as well as target women during the postpartum period especially for women who are still overweight or obese at the 6 weeks postpartum visit.
3. Create a viable and effective nutrition surveillance system to constantly monitor

changes in dietary patterns, thereby providing warning signs of impending undesirable nutritional and health outcomes

Contribution of Authors

I, Osabohien Mathew Okoh declare that the conceptualization, analysis and preparation of this manuscript were solely done by me using a secondary dataset that was originally collected for the 2008 NDHS by the National Population Commission.

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