ORIGINAL ARTICLE

Prevalence and Characteristics of Overweight and Obese Adolescents in Egor L.G.A, Edo State, Nigeria

Nosakhare J. Iduoriyekemwen, Alphonsus N. Onyiriuka, Wilson E. Sadoh, Moses T. Abiodun

ABSTRACT

Background: Global childhood obesity prevalence reports a rise, especially in the adolescent age group. Since adolescence is a critical transitional period to adulthood, tracking changes in the characteristics of obesity in this group of children is essential to aid policy formulation on the prevention of obesity. Thus, this study was carried out to determine the prevalence and the characteristics of overweight and obese adolescents in Egor Local Government Area, Edo State, Nigeria.

Method: The cross-sectional study included 1036 adolescents aged 10 -17 years from two secondary schools in Egor Local Government Area, Edo State, Nigeria. The weight and height of these adolescents were measured, and the body mass index computed. Using the United States Center for Disease Control body mass index growth chart, the participants were categorised into three groups, namely normal weight (5^{th} to $<85^{th}$ percentile); overweight (85^{th} to $<95^{th}$ percentile); and obese ($\geq 95^{th}$ percentile).

Results: The combined prevalence of overweight and obesity among the participants was 8.9%. The prevalence rates of the overweight and obese were 5.9% and 3.0%, respectively. The proportion of overweight and obese participants was higher in pubertal than pre-pubertal female adolescents, while the opposite was observed amongst males. The proportion of overweight and obese adolescents was significantly more in participants from upper-class families than the middle- and lower-class families ($p = 0.007$).

Conclusions: The prevalence of overweight/obesity in Nigerian adolescents revealed in this study is low. However, children from upper-class families were proportionately more affected than other classes. Targeted health educational programmes are advocated.

Keywords: Adolescence, Overweight, Obesity, Prevalence.

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Introduction

Obesity has become a public health concern worldwide, and the World Health Organisation notified as far back as 1990 that the burden on both adults and children were in epidemic proportions.[1] Global reports reveal that the prevalence of excess weight (overweight combined with obesity) amongst adolescents varies from country to country.[2] These reports also show that developed countries [2-4] and countries experiencing economic change with significant rise in per capita income, such as China in the Far East [2,5] and the Gulf countries (Kuwait, Saudi Arabia etc.) in the Middle East, [6] report the highest global prevalence of 13- 46%.[2] In Nigeria, the adolescent prevalence for overweight range from 1.0-8.6% and that for obesity is 0.0- 2.8%.[7]

Obesity results from an imbalance in energy intake and energy expenditure favouring energy intake.[8] Thus, environmental factors especially, changes in nutrition (i.e. excessive consumption of high fat, high

caloric dense, low fibre fast food and sugar-sweetened carbonated drinks) coupled with increased physical inactivity due to predominantly sedentary lifestyle and modern mode of transportation, have been identified as the obesogenic factors that propagate the disease in affluent societies.[9] Paradoxically, in low and middle-income countries, obesity is known to co-exist with malnutrition, especially in the relatively affluent urban areas where the environmental transition to a more westernised lifestyle has been adduced as the cause of obesity in these countries.[1, 10]

The clinical significance of obesity is that it is associated with a myriad of adverse health consequences. Obesity as it advances results in the development of cardiovascular disease (CVD) risk factors, such as dyslipidaemia, hyperinsulinaemia and hypertension. These CVD risk factors propagate the multi-systemic chronic co-morbidities, such as type 2 diabetes mellitus (T2DM), coronary heart disease, stroke, and nonalcoholic fatty liver disease (NALD).[11] Other health consequences of obesity include sleep apnea, orthopaedic related issues-osteoarthritis, slipped capital femoral epiphysis, bowing of long bones and psychological problems, such as low self-esteem and depression.[11,12] Another important consequence of childhood obesity is that it tracks into adulthood.[13,14] In the study by Guo and Chumlea,[13] they observed that an obese 4years old has a 20% chance of becoming obese as an adult, while an obese teenager has up to 80%. Therefore, if the obesity epidemic continues, the high prevalence of obesity complications in paediatric and adult populations will further add burden on the health systems.

Childhood is a critical period for preventing obesity because habits formed during early life are easily carried into adulthood. Since adolescence is a critical transitional period to adulthood, it means that tracking developments in obesity in this age group would aid in informing policy formulation on the prevention of obesity. Therefore, this study was carried out to determine the prevalence and describe the characteristic of overweight and obese adolescents in Egor Local Government Area (LGA), Edo State.

Method

This cross-sectional study was carried out over two months (1st May to 30th June 2016) in two secondary schools in Egor LGA of Edo State. Egor LGA is one of the three LGAs in Benin City; the others are Oredo and, Ikpoba-Okha. This LGA is predominantly an urban setting with ten political wards, of which two are rural. The inhabitants' main occupation includes farming, trading, and civil services, while the language of communication is Bini, English, and Pidgin English.

Inclusion and exclusion criteria:

Subjects were all apparently healthy adolescents aged 10-17 years.

Excluded from the study were children below 10 years of age as well as those with positive history or obvious evidence of chronic illness, e.g. chronic kidney disease, sickle cell anaemia, and diabetes mellitus.

Ethical approval/ consent:

Ethical approval was obtained from the Research and Ethics Committee of the College of Medical Sciences, University of Benin. Permission from the administrative heads of the selected schools and the Ministry of Education were obtained. Written informed consents were obtained from the parents/ caregivers of the study subjects and verbal accents from each of the adolescents.

Participants' selection and data acquisition:

One school each was randomly selected from the lists of public and private secondary schools in Egor LGA. The total population of students in the two schools was 1200. In the two selected secondary schools, all the children were each given a consent form (explaining the nature of the study and reason for the study) and a questionnaire to give to their parent(s) who signed the consent form and filled the questionnaire. Information obtained via the questionnaire includes the child's age, gender, parental occupation, and educational status. The documents were placed in envelopes to ensure confidentiality, and the children were informed to return the signed and filled documents in those envelopes.

For socioeconomic class determination, each participants' family was classified using the scoring system described by Olusanya *et al*.[15], based on the mothers' educational status and father's occupation. In this social classification system, there are five classes. Class I and II represent the high social class, Class III represents the middle social class, while

Class IV and V represent the low social class. In this way, the participants' families were categorized into upper, middle, and lower socioeconomic classes.

One thousand and thirty-six adolescents met the inclusion criteria, and their returned questionnaires were filled. The anthropometric measurements of these adolescents were thereafter measured. The weight was measured using a Seca® scale (Seca gmbh & Co, Germany) with a sensitivity of 0.1kg. The weight was measured after all heavy clothing and accessories such as school cardigans or blazers, belts, wrist watches, and shoes had been removed, and the pockets of their school uniform had been emptied. The scale was recalibrated after every 10th student to ensure accuracy. The height was measured using a stadiometer. Each child stood erect on the stadiometer, looking straight ahead with hands on the side, feet (without shoes) placed together, and their occiput and buttock resting on the stadiometer. The lever was then lowered to the vertex, and the height was read off the calibrated scale. All anthropometric measurements were performed with a chaperone in attendance.

Body Mass Index (BMI) was determined using the formula weight (Kg)/Height^2 (M^2).[16] Based on their BMI percentile on the United States Center for Disease Control (CDC) BMI growth chart, the adolescent were categorised based on their age and gender as normal weight if their BMI percentile was between 5th - <85th percentile, overweight if their BMI percentile was 85th but < 95th percentile and obese if it was ≥ 95th percentile.[16]

Data Analysis

The data were analysed using Statistical Package for the Social Sciences (SPSS) version 20 (SPSS) for Window Inc; Chicago, LL, USA) statistical software. Continuous data (i.e., the age) was summarised as mean ± standard deviation (SD), while categorised data such as age group, gender and socioeconomic class were represented as proportions. Pearson's chi-square or Fishers Exact tests were used to compare categorised data, while One-way Analysis of Variance (ANOVA) was used in comparing multiple means of the overweight, obese and normal weight adolescent groups. A p-value of < 0.05 was considered significant for each test.

Results

A total of 1200 questionnaires were distributed to the students. However, the information for 164 children was not complete, so they were excluded from the analysis. As a result, the data on the remaining 1036 adolescents were further analysed. Six hundred and nineteen (59.7%) were females and 417 (40.3%) males. The mean age of the study population was 13.8 ± 1.9year, ranging between 10 -17years.

The normal weight adolescents were 944 (91.1%), while the overweight/obese adolescents were 92 (8.9%). The overweight adolescents were significantly younger than the normal weight adolescents. (Mean age ± SD, 13.2± 1.9 vs 13.8 ± 1.9 years p = 0.044). Similarly, the obese adolescents were also significantly younger than the normal weight children (Mean age ± SD 12.3± 1.6 vs 13.8 ± 1.9 years p = <0.0001). Also, the obese adolescents were younger than the overweight adolescent; however, this was not statistically significant. (Mean age ± SD 13.2± 1.9 vs 12.3± 1.6 years p = 0.079). The demographic characteristics of the overweight and obese and normal weight adolescents are shown in table 1. Most of the adolescents studied were in the early adolescent stage, the age group 10-14 years; however, significantly more overweight and obese adolescents were in this age group than normal weight adolescents (p = 0.0017). The Socioeconomic class was significantly associated with the nutritional status of the adolescents studied (p =0.007). The proportion of overweight and obese adolescents were more in the participants from upper-class families than the middle and lower-class families. (Table 1)

The prevalence of overweight adolescents was 5.9%, and that of obese adolescents was 3.0%. Prevalence of overweight and obese adolescents amongst the 10-14 years age group was 4.3% and 2.6%, respectively, while that of the 15-17 years age group was 1.5% and 0.4%, respectively. The prevalence of overweight and obesity was higher in females than males, 8.2% vs 2.4% and 3.1 vs 2.9%, respectively. Amongst the female adolescents, the prevalence of overweight was higher than the obesity (8.2% vs 3.1%), but it was similar amongst the male overweight and obese adolescents (2.4% vs 2.9%) with slightly more obesity than overweight. The prevalence of overweight and obesity decreased with increasing age in both genders. The age-specific prevalence for overweight peaked at

11years in females and 12 years in males (figure 1), while obesity peaked at 11years for both genders (figure 2). The prevalence of overweight and obesity reduced with decreasing social class; this was not consistent for overweight. As shown in figure 3, the lower the socioeconomic status, the lower the prevalence of obesity.

Table I. Demographic Characteristics of the Overweight, Obese and Normal Weight Adolescents

Characteristics	Overweight Adolescents (N=61)	Obese Adolescents (N=31)	Normal weight Adolescents (N=944)	P-value
Mean Age, years	13.2 ±1.9	12.3 ± 1.6	13.8 ±1.9	<0.0001*
Age Group				
10-14 years	45 (73.8)	27 (87.1)	571 (60.5)	0.0017**
15-17years	16 (26.2)	4 (12.9)	373 (39.5)	
Gender				
Female	51(83.6)	19 (61.3)	549 (58.2)	0.0004**
Male	10 (16.4)	12 (38.7)	395 (41.8)	
Socioeconomic class				
Upper	24 (39.3)	15 (48.4)	243 (25.7)	
Middle	18 (29.5)	12 (38.7)	408 (43.2)	0.007*
Lower	19 (31.1)	4 (12.9)	265 (28.3)	

*ANOVA, **Chi-square test

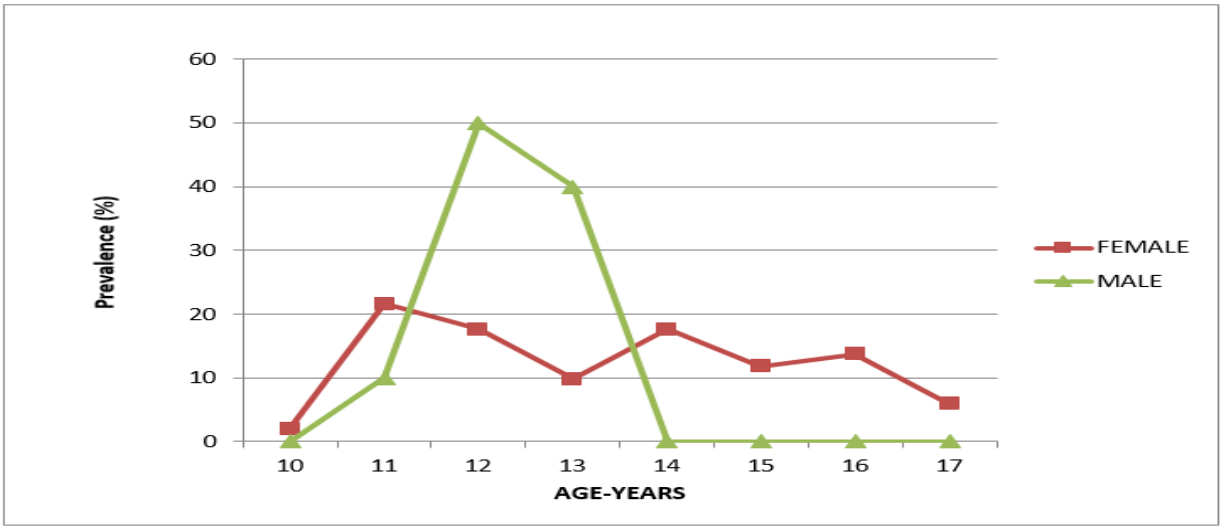

Figure 1: Age-specific prevalence of overweight adolescents by gender.

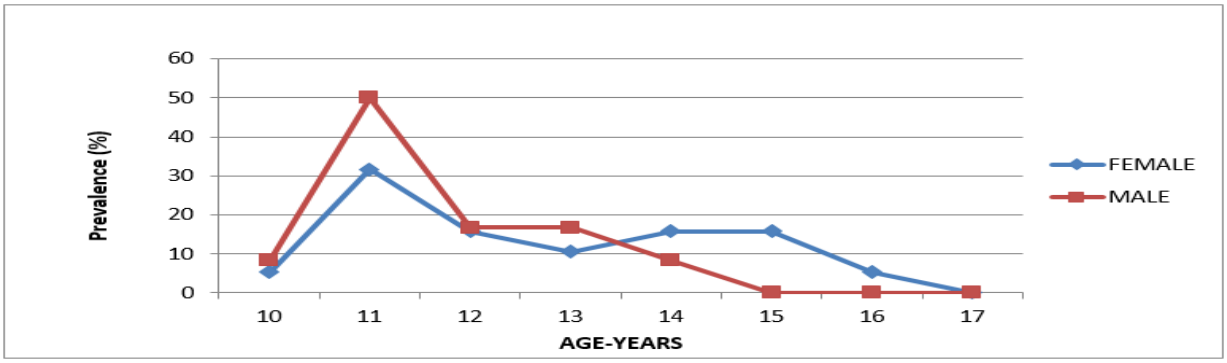

Figure 2*:* Age-specific prevalence of obese adolescents by gender.

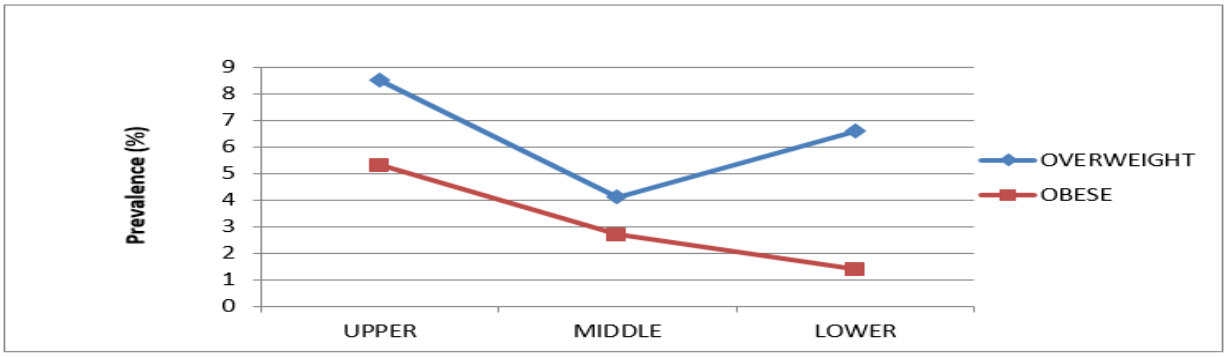

Figure 3*:* Prevalence of Overweight and Obese categorised by socioeconomic class

Discussion

The prevalence rates of overweight and obesity found in this study are comparable to those of previous Nigerian studies.[17-22] The public health implication is that the burden of overweight/obesity has remained unchanged in Nigeria. The report of a review of Nigerian studies of over three decades (1983-2013)[7] supports our view. Specifically, comparing the prevalence of this study to studies previously published from this same locale as ours, we observed that the prevalence of both overweight and obesity in this study is also low. Omuemu *et al.* [23] reported a prevalence of obesity of 5.7% in their study conducted in 2005 in Oredo LGA. While Sadoh *et al.* [24] documented the prevalence of overweight and obesity as 7.1% and 5.7%, respectively, in the same LGA as this study in 2011. The observed difference in prevalence may be due to differences in study design.

In general, all the studies from Edo state[23,24] shows that the prevalence rates of overweight/obesity in adolescents, especially for obesity, have remained low and fairly stable over the years. This is in contrast to the reported increase in the prevalence of overweight/obesity in Western countries.[3,4] Similarly, an increase in the prevalence of overweight/obesity has been reported from countries like China, Kuwait, Saudi Arabia,[6] which are experiencing economic changes with significant rise in per capita income and social change such as abandoning their traditional lifestyle and diet for more western cultures.[5,6] In the USA, from 1980 to 2016, prevalence rates of obesity in adolescents increased from 5.0% to 20.5%.[3] In the UK, overall prevalence, i.e., the combination of overweight plus obesity, is still as high as 37% in the adolescent age group of 11-15years.[4] In a meta-analysis of studies on Chinese adolescents, covering from 1981 to 2010, the prevalence of overweight and obesity were 1.8% and 0.3% respectively, which increased to 11.4 % to 7.9% respectively.[5] While in most Gulf countries, the overall prevalence for adolescents is as high as 20-46%.[6] The reason for the differences in prevalence compared to ours may be because of differences in socioeconomic developmental transition, dietary patterns and eating behaviours.

The gender difference was observed in this study, with females having a higher prevalence of excess weight than males. This finding is similar to that reported in several Nigerian studies[17-19,21,22, 25] and studies from other parts of Africa.[26-28] Several factors

have been proposed for the gender disparity, including differences in energy needs of males and females, level of physical activity, behavioural and cultural practice and timing of sexual maturation. However, this finding contrasts with studies from developed countries that report a higher prevalence in males than females.[3-5,29] The reason for this difference may be because Nigerian female children are culturally confined to the home environment as part of their upbringing in becoming future mothers and wives. Thus, they are more prone to a sedentary lifestyle than their male counterparts, who freely engage in regular outdoor activities like walking around the neighbourhood and neighbourhood sporting activities such as football. In support of this view, in other countries where females are also culturally more confined to the home, such as in Saudi Arabia[30], and some other gulf countries[6], the prevalence of obesity was also skewed in favour of females.

In this study, an inverse relationship was observed between age and overweight/obesity for both male and female adolescents; such finding has been documented previously in Nigeria. Chinedu et al.[19] studied children 2-19 years, reported that the prevalence of overweight/obesity reduced as the age of the children increased. This inverse relationship between age and excess weight was also observed in Brazil by Silva et al. [31] and Zayed et al.[32] amongst Jordanian adolescents who studied adolescents in the same age range as this study. This finding is divergent from that of several studies [3, 4, 20, 21, 26, 33] that report that the prevalence of overweight and obesity increases with age. The reason for our finding may be that as children get into the older adolescent age, they are likely to become more aware of their body size and image. So, they engage in activities to control excess weight development. Also, older adolescent males are generally more active as they are allowed to lead a more independent life than younger adolescents. The absence of overweight after the age of 13 years and obesity after 14 years in males observed in this study supports this notion. This study also showed that overweight and obesity in females were highest in the pubertal age while in males, it was pre-puberty. These observed gender trends have also been reported by Yuca et al.[34] amongst Turkish adolescents. This finding suggests that the hormonal influence of fat deposition may be an additional factor to increased sedentary lifestyle in females' development of excess weight.

The influence of socioeconomic status on the prevalence of overweight/obesity in this study is similar to the finding of several Nigerian studies that reported a higher prevalence of overweight and obesity amongst children from upper social class families.[35] Our finding is, however, in contrast, to reports from high-income countries such as the US and the UK, which show that over the years, the prevalence of overweight/obesity is higher amongst children of low social class families.[3,37] The reason adduced for this observation in western societies is that children of low social class families are likely to participate more in obesogenic dietary and lifestyle patterns than upper-class families.[3,37] These lifestyle patterns include regular consumption of high fat, high energy-dense but low fibre foods and sugar-sweetened carbonated drinks (because they are cheap and readily available) and engaging in sedentary activities such as indulging in long hours of screen time (video games, television watching and internet browsing) daily and exercising less. 38 In Nigeria, fast food restaurants and vendors have recently increased in our major cities; however, the cost of patronising them regularly can only be sustained by families of high socioeconomic status. This practice may be fuelled by the perception that regular consumption of fast food and sugar-sweetened carbonated drinks is a status symbol of affluence. In addition, ownership of computer games and other handheld gaming devices which encourage a sedentary lifestyle are also mainly affordable by upper-class families. Children from these families are also less likely to be allowed to do house chores as the parents can afford to pay others to do them. In this study, these factors may be likely responsible for the high prevalence of overweight and obesity in adolescents of upper socioeconomic class families.

A limitation of this study is that direct questioning was used to obtain information about the adolescent health history. This may explain why no student was excluded based on the exclusion criteria.

Conclusion

The prevalence of overweight/obesity among adolescents in Egor L.G.A, Edo state is low, and children from upper-class families appear to be mainly affected. Targeted health educational

programmes for children and parents, especially affluent families, are needed. These programmes must emphasise the detrimental effect of excess weight on children and the entire family. In addition, the programmes should teach proper nutrition and physical activities that can prevent overweight/obesity.

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