

## Prevalence of Childhood and Adolescent Overweight and Obesity in Kano State, Nigeria

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**Received:** January 22, 2018; **Published:** March 05, 2018

### Abstract

**Background:** Overweight and obesity are potential health problems in developing countries in spite of their poor socio-economic situation. There is a high demand worldwide for the prevention of overweight and obesity especially in children due to the low success rate of treatment of adult obesity.

**Objective:** To determine the prevalence of overweight and obesity in school children and adolescents.

**Design:** Cross-sectional descriptive study.

**Methods:** A total of 720 children and adolescents were enrolled. In all cases, weight and height were measured and used to compute the Body Mass Index (BMI). Overweight and obesity were defined using the International Obesity Task Force (IOTF) in children. Data were analysed using SPSS version 20 statistical software.

**Result:** The prevalence of overweight and obesity were 8.9% and 3.3% respectively. Subjects from higher social class were more overweight and obese compared to their counterparts in lower social class with a significance difference ( $\chi^2 = 4.41$ ,  $df = 3$ ,  $p < 0.001$ ). Females (10.9%) were overweight and 3.6% were obese while 7% of their male counterparts were overweight and 3% were obese, with a significant difference for overweight ( $\chi^2 = 10.18$ ,  $df = 2$ ,  $p < 0.002$ ). The prevalence of overweight and obesity among the subjects from private schools were 12.8% and 5.8% respectively while among the subjects from public schools overweight were 5.0% and 0.8% respectively, and the difference was also significant ( $\chi^2 = 4.43$ ,  $df = 2$ ,  $p < 0.001$ ). At bivariate analyses level, gender ( $p = 0.016$ ), Social class ( $p < 0.001$ ) and type of school ( $p < 0.001$ ) were associated with high prevalence of overweight and obesity. However regression analysis showed only social class ( $p < 0.0001$ ) is an independent predictor of overweight/obesity. Among the adolescent subjects, 10.7% and 4.2% were overweight and obese respectively. Females of the adolescent age group had higher prevalence of overweight (10%) and obesity (4.2%) compared with their male counterparts who had 7.1% overweight and 2.0% obesity. This was statistically significant ( $\chi^2 = 12.16$ ,  $df = 2.32$ ,  $p = 0.001$ ).

**Conclusion:** Prevalence of overweight and obesity is on the increase, and that female sex and high social class are risk factors for obesity.

**Keywords:** Prevalence; Overweight; Obesity; Childhood; Adolescent; Nigeria

## Introduction

Overweight and obesity have been variously defined [1-3]. Obesity has been defined as a condition of excessive adiposity [1]. Obesity has also been defined in relation to the body mass index (BMI) [2,3]. A BMI that is greater than or equal to the 95<sup>th</sup> percentile for age and sex is regarded as obesity [2]. Overweight on the other hand is defined as BMI that is greater than or equal to 85<sup>th</sup> percentile for age and sex.

The prevalence of obesity in children is increasing rapidly worldwide [1]. In Nigeria, using BMI as designed by the International Obesity Task Force in children, different studies reported different prevalence of overweight and obesity; Abah, *et al.* [4] reported prevalence of 8.6% and 1% for overweight and obesity respectively in a study in Ekpoma, Edo State, Nigeria. Danladi, *et al.* [5] reported a prevalence of 9.7% and 1.8% for overweight and obesity respectively among school children, while Mustapha and Sanusi [6] reported 5.8% and 1.1% for overweight and obesity in a school based study in 2031 adolescents population.

Obesity is associated with several risk factors for chronic diseases such as heart disease, metabolic syndrome and early atherosclerosis [7]. These risk factors may operate through the association between child and adult obesity, but they may also act independently [8].

Knowledge of the prevalence of overweight and obesity will help to identify the magnitude of the problem and determine the burden. The low success rate of treatment of adult obesity points to the need to develop preventive measures in children [9]. This is because eating and physical activity practices are formed early in life and may be carried into adulthood. Knowledge of their prevalence and predisposing factors will lead to timely intervention, thereby reducing morbidity and mortality from overweight and obesity.

## Aim of the Study

The aim of this study, therefore, is to determine the prevalence of overweight and obesity among school children and adolescents in Tarauni Local Government Area (LGA), Kano, Nigeria.

## Subjects and Methods

The study was conducted in Tarauni LGA of Kano State. Kano is one of the original Hausa States dating from AD 900. It has an estimated population of 9.3 million and population density of 450 people per square kilometer according to 2006 census estimate [10]. Tarauni LGA is one of the eight metropolitan local government areas that make up Kano city. It has a population of 221,367 according to 2006 census. There are 57 primary schools (22 public and 35 private) and 50 junior/senior secondary schools (20 public and 30 private) in the local government area. The study was a school-based, cross-sectional survey. Inclusion criteria include apparently healthy school children and consent by parent/guardian of the child as well as assent from children of eight years and above. Exclusion criteria were severe illness at the time of study and an unwillingness to participate in the study either by students or parent/guardian. Prior to the commencement of the study an ethical clearance was sought and obtained from the Research and Ethical Committee of the Aminu Kano Teaching hospital, and written permission was also sought from the Local Inspectorate of Education.

A total of 720 subjects were selected using multistage sampling technique from both primary and secondary schools. Ten-percent (10%) which was one-tenth of the population was taken as representative of the entire population which also displayed the statistical properties of that population. Thus, 10% of the number of primary and secondary schools in Tarauni LGA was used (i.e. 10 schools). Of the 10 schools, using proportionate representation of ratio 57:50 = 1.1:1. Five primary and five secondary schools were selected. The five primary schools were also sampled using proportionate ratio of 22 public: 35 private = 2:3. Therefore, 2 public and 3 private primary schools were selected. The five junior secondary schools were also sampled using the same principle i.e. 20 public: 30 private = 2:3, thus 2 public and 3 private junior secondary schools were selected. Of the 5 junior secondary schools (2 public and 3 private) 2 boys' schools (1 public and 1 private each) and 3 girls' schools (1 public and 2 private) were selected. Social classes of parents were also determined using the method described by Oyediji [11], which has I – V social classes, however for the purpose of the study, the subjects were grouped into two social classes of I – III (High) and IV – V (Low) in a modification of the Oyediji social classification. The subjects' ages as at their last birthdays were used to avoid fractions, and these were cross checked with the school records.

### Anthropometric measurements

All measurements were conducted by the investigator and trained assistants who received training before the commencement of the study. For each child, the height and weight were taken, body mass index (BMI) was calculated and documented. Weight was measured using the digital weighing scale (Hana, Model BR9011, 120 x 0.01 kg, China). Weighing scale was standardized by the technicians, and weight was taken based on internationally accepted standards for weight measurements. The weighing scales were reassessed for proper calibration each morning before weighing was done. Weight (in light clothing) was taken with the students wearing only the under garments and no shoes. Weight was measured to the nearest 0.1 kg. Height was measured with wooden stadiometer mounted on a vertical wall in barefooted subjects with the individual standing straight and erect against the wall on a straight horizontal floor; with the feet put together, the chest out and neck extended till the student is looking horizontally straight ahead (Frankfurt Plane). The height was taken to the nearest 0.1 cm.

BMI ( $\text{kg}/\text{m}^2$ ) was calculated using the formula:  $\text{weight} \div \text{height}^2$  [7]. The prevalence rates for overweight and obesity was determined using cut off points of the International Obesity Task Force (IOTF) for children, where BMI above the 85<sup>th</sup> and 95<sup>th</sup> percentiles represented overweight and obesity respectively.

### Statistical analysis

Data was analyzed using the statistical package for social sciences (SPSS) version 20.0. Armonk, NY: IBM Corp. Results are presented in prose and illustrations such as tables and figures as necessary. Means, standard deviations, range, proportions and percentages were determined as applicable. The means and standard deviations (SD) were calculated for continuous variables while proportions were calculated for categorical variables. Means(SD) were compared using the Student's 't' test while proportions were compared using the Chi-squared ( $\chi^2$ ) tests, values less than 5 in one or more cells had Yate's correction done. The level of statistical significance was calculated to get the p-value. For the purpose of the study a p-value of  $< 0.01$  was taken as significant.

### Results

The number of children studied was 720 all aged between 6-18 years. The mean age was  $13.1 \pm 3.3$  years. Males were 361 and females were 359 with male to female ratio of 1:1. The number of subjects from public schools was 360 and from private schools also 360 with the ratio 1:1. Of the total number of 720 subjects, 37.5 % (270) was from high social class, and 62.5 % (450) from low social class (Table 1). Out of the 720 subjects studied, 42.5 % (306) were underweight, 45.3 % (326) had normal weight, 8.9 % (64) were overweight and 3.3 % (24) were obese (Table 2). The prevalence of overweight and obesity among the subjects from high social class was 15.6 % (42) and 7.0 % (19) respectively while for low social class was 5.1 % (23) and 1.1 % (5) respectively and the difference was significant ( $\chi^2 = 4.41$ ,  $df = 3$ ,  $p < 0.001$ ) as shown in table 3. Subjects from private schools, 12.8 % (46) and 5.8 % (21) were overweight and obese respectively while 5.0 % (18) and 0.8 % (3) of their counterparts from public schools were overweight and obese respectively with a significant difference ( $\chi^2 = 4.43$ ,  $df = 2$ ,  $p < 0.001$ ) (Table 4). Female subjects were found to have higher prevalence of overweight and obesity than their male counterparts; prevalence in female subjects was 10.9% (39) and 3.6% (13) respectively while the prevalence in their male counterparts was 7.0% (25) and 3.0% (11) respectively. The difference was statistically significant for overweight ( $\chi^2 = 10.18$ ,  $df = 2$ ,  $p < 0.002$ ) as shown in table 5. At bivariate analyses level, gender ( $p = 0.016$ ), Social class ( $p < 0.001$ ) and type of school ( $p < 0.001$ ) were associated with high prevalence of overweight and obesity. However regression analysis showed only social class ( $p < 0.0001$ ) is an independent predictor of overweight/obesity (Table 6). There were 469 of the subjects in the adolescent age-group (10 - 18 years). Out of that total number, 37.5 % (176) were underweight. 55.4 % (260) had normal weight 4.9 % (23) of them were overweight and 2.1 % (10) were obese (Table 7).

Age in years	Number	Percentage
6	64	8.9
7	63	8.8
8	64	8.9
9	60	8.3
10	58	8.1
11	60	8.3
12	63	8.8
13	44	6.1
14	50	6.9
15	48	6.7
16	46	6.4
17	50	6.9
18	50	6.9
Total	720	100

**Table 1:** Age distribution of the study subjects.

BMI Percentile	Number	Percentage
< 5 <sup>th</sup>	306	42.5
5 <sup>th</sup> - 84 <sup>th</sup>	326	45.3
85 <sup>th</sup> - 94 <sup>th</sup>	64	8.9
> 95 <sup>th</sup>	24	3.3
Total	720	100.0

**Table 2:** Distribution of BMI percentile of the subjects.

< 5<sup>th</sup> = Underweight, 5<sup>th</sup> - 84<sup>th</sup> = Normal weight, 85<sup>th</sup> - 94<sup>th</sup> = Overweight, > 95<sup>th</sup> = Obese

Social class	BMI Percentile				Total
	< 5 <sup>th</sup> % (n)	5 <sup>th</sup> -84 <sup>th</sup> % (n)	85 <sup>th</sup> -94 <sup>th</sup> % (n)	> 95 <sup>th</sup> % (n)	
I-III (High)	39.2 (106)	38.2 (103)	15.6 (42)	7.0 (19)	270
IV-V (Low)	44.2 (199)	49.6 (223)	5.1 (23)	1.1 (5)	450
Total	83.4 (305)	87.8 (326)	20.7 (65)	8.1 (24)	720

**Table 3:** BMI percentiles according to social class of the subjects.

$$\chi^2 = 4.41, df = 3, p < 0.001$$

Schools	BMI Percentile				Total
	< 5 <sup>th</sup> % (n)	5 <sup>th</sup> -84 <sup>th</sup> % (n)	85 <sup>th</sup> -94 <sup>th</sup> % (n)	> 95 <sup>th</sup> % (n)	
Public	81.1(292)	13.1 (47)	5.0 (18)	0.8 (3)	360
Private	3.9 (14)	77.5 (279)	12.8 (46)	5.8 (21)	360
Total	85 (306)	90.6 (326)	17.8 (64)	6.6 (24)	720

**Table 4:** BMI percentiles of subjects according to type of school.

$$\chi^2 = 4.43, df = 2, p < 0.001$$

Gender	BMI Percentile				Total
	< 5 <sup>th</sup> % (n)	5 <sup>th</sup> -84 <sup>th</sup> % (n)	85 <sup>th</sup> -94 <sup>th</sup> % (n)	> 95 <sup>th</sup> % (n)	
Male	36.8 (133)	53.2 (192)	7.0 (25)	3.0 (11)	361
Female	47.3 (170)	38.2 (137)	10.9 (39)	3.6 (13)	359
Total	84.1 (303)	91.4 (329)	17.9 (64)	6.6 (24)	720

**Table 5:** Distribution of BMI percentiles according to gender of the subjects.

$$\chi^2 \text{ (for overweight)} = 10.18, df = 2, p = 0.002$$

Socio-Demographic Factor	Bivariate analysis of socio-demographic analysis and BMI percentiles of underweight, normal weight, overweight and obesity	Multinomial regression analysis for variables significant in bivariate analyses
	p-value for bivariate analysis	p-value for regression analysis
<b>Gender</b>		
Male	0.016*	0.457
Female		
<b>Social class</b>		
I-III	<0.0001*	<0.0001*
IV-V		
<b>School Type</b>		
Public	<0.0001*	0.052
Private		

**Table 6:** Regression analysis to determine independent predictor(s) of obesity and overweight.

Statistically significant ( $p < 0.05$ )

Adolescents	BMI Percentile				Total
	< 5 <sup>th</sup>	5 <sup>th</sup> -84 <sup>th</sup>	85 <sup>th</sup> -94 <sup>th</sup>	> 95 <sup>th</sup>	
N (%)	176 (37.5)	260 (55.4)	23 (4.9)	10 (2.1)	469 (100)

**Table 7:** BMI percentile of the adolescents among the subjects.

**Definition:** Adolescents are individuals 10-18 years of age [11].

## Discussions

The prevalence of overweight and obesity in this study was 8.9% and 3.3% respectively. Our finding is similar to a study conducted in four urban towns (Lagos, Port Harcourt, Nsukka, and Aba) in southern Nigeria, involving 1,599 children and adolescents 5 to 18 years of age. It showed prevalence rates of 11.4% and 2.8% for overweight, obesity respectively [12]. Similarly, Abah., *et al.* reported similar finding in Edo State, Nigeria [4]. It is however in contrast to an earlier study from Kano metropolis on adolescents where Yusuf., *et al.* reported prevalence of 0.84% and 1.98% for obesity and overweight respectively [13]. This difference of findings from the same environment could be due to the fact that increase in obesity globally is linked to increase in development, increase in disposable income, urbanisation, mechanization, globalisation of food markets, changes in lifestyles and behaviours [14]. And over the last few years there is increased in negative lifestyles and behaviours in this environment, such as sedentary life styles due to decrease of outdoor activities by children, utilization of fast-food restaurants and abandonment of traditional meals and increased exposure and usage of energy dense and fatty meals.

We observed more females (10.9%) with overweight when compared to the males (7.0%) and the difference was statistically significant ( $p = 0.002$ ). This is consistent with the findings in a Port Harcourt study by Buowan [15] in 2010, which showed more females (2.4%) being overweight than males (0.42%), similarly Ibadan [16] and Edo [4] studies, also revealed higher prevalence of overweight and obesity among females compared to their male counterparts. These findings are in keeping with normal human physiology which explains the accelerated growth of females compared to males during adolescence. During puberty and throughout adolescence, females lay down a lot of subcutaneous fat which is responsible for the rotundity noticed in them. The high levels of testosterone in their male counterpart inhibit this process.

This study also documented significantly higher prevalence of overweight and obesity of 12.8% and 5.8% respectively among the subjects from the private schools compared with their counterparts in the public school with prevalence of 5.0% and 0.8% respectively. In private schools there is limited space for outdoor activities and there is higher tendency of exposure to energy dense and fatty meals. These findings are consistent with the findings in the study by Ebenizer [17] which also showed a higher prevalence of overweight and obesity in students of private schools (4.5% and 1.2% respectively) compared to their counterparts in public schools (2.3% and 0.0% respectively). Similarly, Edo study [4] also reported higher prevalence of overweight and obesity (11.59% and 1.45% respectively) in the subjects from private schools compared to their counterparts in public schools (5.71% and 0.95% respectively).

Another finding in this study is the strong association between overweight and social class ( $p < 0.001$ ). The study showed the prevalence of overweight and obesity in the subjects in high social class as 15.6% and 7.0% respectively, while the prevalence in the subjects from the low social class was 5.1% and 1.1% respectively. This observation may be attributed to dietary preferences, with a tendency towards urbanized and western lifestyles among the high social class and consequently higher risk of over-nutrition as noted by Van der sande, Ceesay, Miligan., *et al.* [18] and Nwizu, Njokanma, Okoroma., *et al* [19]. Higher socio-economic status was identified as an independent risk factor for obesity in a study done among Israeli school children by Huerta, Haviv, Bibi., *et al.* [20] in 2005.

In general, increased burden of overweight and obesity in children and adolescent has been identified in our setting, there is the need to put in place clear cost effective evidence based policies, such as reduction in high calorie diet marketing to children, which will retard or perhaps reverse the trend of a rising obesity in our setting. Furthermore, in view of its public health significance, it is also important to periodically evaluate the prevalence of weight disorders in children and adolescents so that additional appropriate preventative strategies can be instituted.

The main strength of our study is that we established increased prevalence of overweight and obesity in a representative sample of children and adolescents in our environment over relatively short period of time, using similar anthropometric measurements used in earlier study in Kano. Therefore there is urgent need to take appropriate preventive strategies to retard or even reverse the trend in our setting and generally in Nigeria.

## Conclusion

The prevalence of overweight and obesity is on the increase and the finding is in keeping with studies done elsewhere in the country. The study showed that female gender as well as high social class is associated with a higher prevalence of overweight and obesity.

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**Volume 7 Issue 4 April 2018**

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