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*Full Length Research Paper*

## **Overweight and Obesity among In-school Adolescents in Ondo State, Southwest Nigeria**

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### **ABSTRACT**

Over-weight and obesity are reported to be increasing worldwide and currently constituting a public health problem. The consequences of these include hypertension, diabetes mellitus, hyper-lipidaemia, coronary artery diseases and some cancers. The reports from several regions of the world concerning overweight/obesity among adolescents are not consistent. In Nigeria there is no current national figure on overweight/obesity in the adult or adolescents. The objective of this study was to assess the spread of overweight/obesity in Ondo state of Nigeria. This study was descriptive, cross-sectional in design. Six local government areas (LGA) were selected from the 18 LGA in the state. Twelve secondary schools were selected from the six LGA. Weight and height of each of the students were measured using standard techniques. Body mass index for age (BMI/A) was derived using the WHO-Anthro-Plus, data on age, sex, residence, family size, level of education and occupation of parents were obtained using a pre-tested, semi-structured questionnaire. Data were analysed using descriptive and inferential statistical data analysis at  $p=0.05$ . A total of 2031 (1126 males and 905 females), students participated in this study. Mean (SD) age was 14.28 (2.07) yr, height was 155.87 (10.63) cm, weight was 46.34 (9.65) kg. Using BMI/A, 332 (16.3%) were underweight, 117 (5.8%) were overweight, 23 (1.1%) were obese and 1559 (76.8%) were in the normal range. Underweight was 224 (16.47%) in the urban and 108 (16.09%) in the rural. Overweight was 64 (4.70%) in the urban and 53 (7.90%) in the rural while obesity was 0.96% in the urban and 1.49% in the rural. Underweight was more (18.65%) in the males than females (13.48%), so also obesity (1.24% males, 1.0% females), however overweight was 7.40% in females and 4.44% in males ( $p<0.05$ ). In conclusion, whereas overweight/obesity prevalence is low, and of no public health importance in this study, underweight prevalence is significant, therefore merits intervention as this represents the last phase of growth. While underweight is equally distributed in both urban and rural, overweight is more in the rural sector. Underweight and obese were more in the males; overweight was more among the females. This pattern suggests a need for health and nutrition education among the adolescents.

**Keywords:** Adolescents, overweight, obesity, rural/urban

### **INTRODUCTION**

Obesity is the accumulation of excess body-fat and it can be assessed clinically as body mass index (BMI) of  $\geq 30$  with BMI ranging from 25 to 29.9 as overweight (Apia

and Mato 2008, Okoro and Adeyemi, 1999). As a result of improvement in living standard and changing lifestyles, the problem of obesity appears to be evolving in the developing part of the world (Shebang, 2011). The prevalence has been described as a global epidemic and it has even replaced under-nutrition as the most common

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public health concern for infants and children (WHO, 1998).

Childhood obesity is a serious public health problem. Studies have shown evidences that moderate number of obese children will grow up as obese adults with the related adverse health consequences, such as heart disease, hyperlipidemia, hyperinsulinaemia, hypertension, hypercholesterolemia, angina pectoris, non-insulin dependent diabetes mellitus (NIDDM) and early atherosclerosis and even increased mortality in adulthood (Amole *et al*, 2011, Ojofetimi *et al*, 2011, Sebanjo, 2011, Rehor and Brownsey 2002 and Sothern *et al*, 2000).

Obesity in childhood is not limited to the developed countries alone. The literature indicates a rising prevalence of childhood obesity in both developed and developing countries (Akinpelu, 2008, Matsushita *et al*, 2004 and Rasmussen *et al*, 1999). de Onis and Blössner (2000) have also reported a rapid increase in the prevalence of overweight and **obesity** among pre-school children in developing countries.

Adolescent obesity is thought to be associated with some psychological problems like low self esteem, feeling of inadequacy, anxiety, social dysfunction, depression and moodiness; all of which affect the personality of the adolescents (Ojofetimi *et al*, 2011). It was reported that girls who are overweight or obese are prone to developing high-risk behaviours such as smoking and drinking alcohol, and are also less likely to engage in physical activities and exercise programmes that promote energy expenditure (Wadden and Stunkard, 1995).

In Tunisia, 9.1% of adolescent girls are at risk for being overweight (BMI/age  $\geq$  85th percentile). The annual rates of increase in the prevalence of overweight are 0.5% in Brazil and 0.2% in China. Iranian prevalence of 15% for overweight and 5% for obesity was also reported. Overall prevalence of overweight and obesity were 11.1% and 14.2% respectively among adolescent in India (Akinpelu *et al*, 2008). The incidence of obesity in adolescents rose from 11% in 1984 to 25% in 1998, with African-American girls having a 50% greater prevalence than White girls (Ojofetimi *et al*, 2011). Malik and Bakir (2007) reported the prevalence of 22.5% and 13.7% among children in the United Arab Emirate.

In Nigeria, there are no data to back up the prevalence of obesity among members of the entire population (Ogunjimi *et al*, 2009). Data on the prevalence of overweight and obesity are few (Ojofetimi *et al*, 2011). Little is also known about prevalence of obesity in Nigerian adolescents' population (Akinpelu *et al*, 2007). A prevalence of 18% among school age

children has been reported in Nigeria (Sebanjo *et al*, 2011). Ben-Bassey *et al* (2007) reported overall prevalence rates of overweight and obesity in the urban and rural areas respectively, as 3.7% and 0.4%, and 3.0% and 0.0% among children 10-19 in Eti-Osa Local Government Area (LGA) of Lagos State. A prevalence rate of obesity and overweight of 1.7% and 6.8% respectively was also reported by Ansaa *et al* (2007) among students 10-20 years in Cross-River state. This study was therefore carried out to assess the prevalence of overweight and obesity among adolescents in Ondo state Nigeria.

## MATERIALS AND METHODS

**Location:** The study was carried out in six local government areas (LGAs) of Ondo state stratified by sector into rural and urban. It was a cross-sectional survey. From the list of schools in these LGAs, two schools each were selected using a table of random numbers. A total of twelve schools were selected.

**Subjects:** Students aged between 10-19 years were recruited for the study. A total of two thousand and thirty one apparently healthy students were recruited (1126 males and 905 females).

**Anthropometric Measurement:** This was done using calibrated equipments by trained personnel adhering to the WHO guidelines (WHO 1995). Height was taken to the nearest 0.1 cm, as the maximum distance to the uppermost position on the head from heels, with the individual standing barefoot using stadiometers (locally constructed). Body weight was measured to the nearest 0.1 kg using a digital weighing scale (seca 803/seca uk). BMI was calculated as weight in kilograms divided by height squared in meters ( $\text{kg m}^{-2}$ ). In addition, data on age, area of residence, family size, and level of education and occupation of parents were collected with the aid of a questionnaire.

**Data Analysis:** The data were analyzed using Statistical Packages for Social Sciences (SPSS) version 15. Both descriptive and inferential statistics were used to examine the relationship between obesity and the socio-economic variables and to describe the prevalence of obesity among adolescents in Ondo state. The gender-specific prevalence was obtained. Means, standard deviations and proportions were determined. Also anthro-plus was used to calculate BMI for age percentiles.

## RESULTS

Table 1 shows the socio demographic characteristics of the household. About 60% of the respondents were from urban areas with 40% from the rural areas. Fifty-six percent of the respondent's mothers had secondary school education with 2.1% having informal education.

**Table 1.**  
Socio-demographic characteristic of the study students

Demography feature	Number	Percentage
<b>Sector</b>		
Urban	1223	60.2
Rural	808	39.8
<b>Total</b>	2031	100.0
<b>Educational level of mother</b>		
Tertiary	528	31.5
Secondary	938	56.0
Primary	166	9.9
Informal	43	2.1
<b>Total</b>	1675	100.0
<b>Father's occupation</b>		
Civil servant	776	39.2
Private company worker	68	3.4
Farming	474	23.9
Trading	431	21.8
Artisan	231	11.7
<b>Total</b>	1980	100.0

**Table 3.**  
Sector, sex and age differences in BMI/A

	Underweight	Normal	Overweight	Obese	Total
SECTOR	%	%	%	%	N
Urban	16.47	77.87	4.70	0.96	1360
Rural	16.09	74.52	7.90	1.49	671
Total	16.35	76.76	5.76	1.13	2031
<b>SEX</b>					
Male	10.3	41.9	2.5	0.7	1126
Female	6.0	34.8	3.3	0.4	905
Total	16.3	76.8	5.8	1.1	2031
	%	%	%	%	N (%)
<b>AGE</b>					
10.0	0.2	2.7	0.5	0.0	68(3.4)
11	0.4	3.2	0.5	0.0	84(4.1)
12	1.6	10.8	1.2	0.1	279(13.7)
13	2.9	13.6	0.7	0.2	353(17.4)
14	2.6	11.1	0.8	0.2	299(14.8)
15	2.4	16.0	1.2	0.2	403(19.8)
16	2.7	8.8	0.4	0.2	248(12.2)
17	2.1	4.3	0.2	0.1	138(6.8)
18	1.1	5.0	0.2	0.0	128(6.3)
19	0.2	1.4	0.0	0.0	33(1.6)
Total	16.3	76.8	5.8	1.1	2031(100.0)

**Table 2.**

Mean age, height, weight and body mass index category of the respondents

Parameter	Mean	S.D
Age (years)	14.28	2.07
Height (cm)	155.87	10.62
Weight (Kg)	46.34	9.65
<b>BMI category</b>		
Underweight	332	16.35
Normal	1559	76.76
Overweight	117	5.76
Obese	23	1.13
<b>Total</b>	2031	100.0

### BMI – Body mass index

The mean age of the student was  $14.28 \pm 2.1$ . The mean height and weight were  $155.87 \pm 10.6$  and  $46.34 \pm 9.65$  respectively. A total of 140 respondents had a BMI greater than 25 with 5.8% 1.1% being overweight and obese respectively. Overall 117 (5.76%) of the students were overweight and 23 (1.13%) were obese. The prevalence of overweight was significantly higher in girls than in boys ( $p < 0.05$ ). However, obesity was higher in boys than in girls (1.24% and 1.0% respectively). The age difference in BMI/A shows that students aged 10 and 15 had the highest prevalence of overweight (1.2%) while no prevalence of overweight and obesity was recorded for adolescent aged 19 years.

**Table 4.**

Socio economic status of parents' difference in BMI

	Underweight	Normal	Overweight	Obese	Total
<b>Mother's educational level</b>					
Tertiary	95(5.7%)	391(23.3%)	35(2.1%)	7(0.4%)	528(31.5%)
Secondary	151(9.0%)	720(43.0%)	57(3.4%)	10(0.6%)	938(56.0%)
Primary	19(1.1%)	137(8.2%)	9(0.5%)	1(0.1%)	166(9.9%)
Informal	5(0.3%)	36(2.1%)	1(0.1%)	1(0.1%)	43(2.6%)
Total	270(16.1%)	1284(76.7%)	102(6.1%)	19(1.1%)	1675(100.0%)
<b>Father's Occupation</b>					
Civil servant	129(6.3%)	593(29.9%)	47(2.4%)	7(0.4%)	776(39.2%)
Private	10(0.5%)	58(2.9%)	0(0.0%)	0(0.0%)	68(3.4%)
Farming	64(3.2%)	369(18.6%)	36(1.8%)	5(0.3%)	474(23.9%)
Trading	80(4.0%)	321(16.2%)	23(1.2%)	7(0.4%)	431(21.8%)
Artisan	42(2.1%)	176(8.9%)	9(0.5%)	4(0.2%)	231(11.7%)
Total	325(16.4%)	1517(76.6%)	115(5.8%)	23(1.2%)	1980(100%)
<b>Family Size</b>					
1-5	110	484	44	6	644
6-10	193	926	63	17	1199
Total	303	1410	107	23	1843 (100%)

Adolescents from the urban areas had lower prevalence of overweight and obesity compared with those from the rural areas (4.7% to 7.9% and 0.96% to 1.49%) and the difference was statistically significant.

In the study population, students whose mothers had secondary school education as the highest level of education had the highest prevalence of overweight and obesity. It was however not statistically different from other students. Adolescents whose fathers were farmers had an overweight prevalence of 1.8% and those whose father's occupation was trading had 1.2% prevalence of overweight and 0.4% prevalence of obesity (Table 4).

## DISCUSSION

The objective of this study was to find the prevalence of overweight and obesity among adolescents in Ondo state Nigeria. The prevalence of overweight and obesity was 5.76% and 1.13% respectively. This figure is higher than the prevalence reported by Ben-Bassey *et al*, (2007) of 3.7% and 0.4% among adolescent in Lagos, Nigeria and higher than the prevalence reported by Tang *et al* (2007) among adolescent in Ho Chi Minh City of 4.9% and 0.6%. However, this observed prevalence is lower than the prevalence reported among Bolivian adolescent of 14% overweight and 5% obesity (Perez-Cueto *et al*, 2009). The result was close to the prevalence reported by Ansa *et al* (2007) of 1.7% obesity and 6.8% overweight among Nigerian adolescents. No published

overweight and obesity prevalence study in Ondo state was found, therefore changes in the prevalence of obesity and overweight, over time, cannot be ascertained.

Sex difference in the prevalence of underweight was significant ( $p=0.001$ ) from this study. Girls had a lower prevalence (13.48%) than boys (18.65%). This agrees with the study by Ansa *et al* (2001), Francis *et al* (2009), Reddy *et al*, (2009), Al-Sendi *et al* (2003), Bader *et al* (2008) and Wang *et al* (2009) who all reported a higher prevalence of overweight in female than male adolescents. However, Kautianinen *et al* (2002) and Hong *et al* (2007) reported a higher prevalence of obesity in boys than in girls among Finnish adolescents and Ho Chi Minh City respectively. Prevalence of obesity from this study was significantly higher in boys than in girls. Francis *et al* (2009) attributed the higher prevalence of overweight among female adolescent with high consumption of sweetened beverage. Ansa *et al* (2008) did not find a significant association between overweight/ obesity and the consumption soft drinks in Nigerian adolescents.

Differences on the prevalence of overweight and obesity based on sector was significantly different ( $p=0.001$ ). There was significant difference in the prevalence of obesity among the adolescents from the rural and urban areas. Adolescents from the urban areas had higher prevalence of overweight (3.2%) and obesity (0.6%). This agrees with study in United Arab Emirates where the lowest prevalence of overweight and obesity

among adolescent was reported among boys from the rural area (Malik and Bakir, 2007). Ben-Bassey *et al* (2008) and Perez-Cueto *et al* (2009) also reported that overweight and obesity are mainly found in the urban areas. This result also agrees with the report from Australia that the age and gender-specific prevalence of overweight and obesity is significantly higher in urban Australian Aboriginal people than in the general Australian population, particularly in women (Thompson *et al*, 2003). In a Botswana study, higher prevalence of obesity in the urban area has been linked to more snacks servings consumption and fewer servings consumption of traditional foods (Maruapula *et al*, 2011). A statistically significant difference in the prevalence of overweight and obesity was also observed in sector in Vietnam. High socio- economic status was linked with higher prevalence. Higher prevalence of overweight and obesity were observed in students from wealthy urban district schools in comparison to students from schools in the rural or semi-rural districts (Tang *et al*, 2007).

Prevalence of overweight and obesity was also significantly different with age in this study. Adolescents aged 13-16 years had higher prevalence ( $p=0.000$ ) of overweight and obesity than others. Ansa *et al* (2008) reported a prevalence of 4% in adolescents 13-15years and 3% in 16-18years. It was observed from this study that the prevalence of overweight and obesity seems to decrease with age for both sexes. From a study in Tuscany in Italy, it was also reported that the trend of prevalence of overweight (including obesity) tended to decrease with age and more markedly in girls from 34% at 9years to 12.2% at 15years (Lazzeri *et al*, 2008). Bader *et al*, 2008 observed that highest proportion of normal weights was at age 15years in both male and female adolescents (66%).

There was no significant association between overweight and obese adolescents and their family size and the parent's level of education and occupation. However respondents from households where the father is working as a civil servant had the highest proportion of obese and overweight adolescents. In a study in Italy, there was a contrary observation (Gnavi *et al*, 2000), this finding could be perhaps because of little or no physical exercises, watching television, use of computers and playing electronic games for hours.

**Conclusions:** In this study, underweight and not overweight and obesity among adolescents remains of public health significance. Furthermore, adolescent girls tend to have higher BMI for age than the boys. Intervention program to educate parents and the adolescents themselves are needed to prevent the increase in prevalence of overweight and obesity

especially in a country like Nigeria where under-nutrition already exists. There is also a need for survey of national prevalence in this age-group.

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