

# Prevalence of overweight and obesity among secondary school adolescents in an urban area of Lagos, Nigeria

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## Abstract

Obesity is a major public health problem in the world with increasing prevalence among children and adolescents. The current study was a descriptive cross-sectional study involving 1100 students attending public and private secondary schools in Lagos. Calculations of body mass index (BMI) were performed, and 513 males and 587 females aged between 10 and 19 years were studied. Prevalence rates of overweight and obesity were 5.8% and 1.7% respectively; females had higher prevalence rates than males. Prevalence rates of overweight and obesity in private schools were higher than in public schools.

diovascular diseases, and certain cancers,<sup>11,12</sup> all of which reduce life expectancy.<sup>13</sup> Comparisons among various weight-for-height indices have led to the selection of body mass index (BMI) as a useful measure of obesity.<sup>14</sup> The aim of the present study was to determine the prevalence of overweight and obesity among adolescents attending secondary schools in a local council development area (LCDA) of Lagos State, Nigeria, using BMI centiles.

## Methods

The study was a descriptive, cross-sectional study, conducted in registered secondary schools located within Onigbongbo LCDA of Lagos State. Subjects were aged 10–19 years. Schools were grouped by stratified random sampling into private and public schools, and the sample size was distributed according to the ratio of adolescents in private and public schools. Four public and two private secondary schools were selected by random probability sampling. Students and parents gave consent, and ethical clearance was obtained from the Health Ethics and Research Committee of the Lagos State University Teaching Hospital.

Medical personnel who served as research assistants were trained in the measurement of weight and height, to reduce inter-observer and intra-observer errors. Height was measured to the nearest 0.1cm using a Prestige stadiometer. The subjects wore no shoes, and had their heels and backs against the height meter, with their heads in the Frankfurt plane.<sup>15</sup> Weight was measured to the nearest 0.1 kg with a Prestige spring scale tested and calibrated against a set of standard weights. BMI was computed as weight in kilogrammes divided by the square of height in metres. BMI percentiles were computed according to Centers for Disease Control (CDC) formulae.<sup>16</sup> Overweight was taken as a BMI equal to or greater than the 85<sup>th</sup> percentile for age and sex, and obesity was taken as a BMI equal to or greater than the 95<sup>th</sup> percentile for age and sex.<sup>17</sup>

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 20. Height, weight, and BMI values were expressed as means ( $\pm$ SD). Tests of association between categorical variables such as gender and type of school were carried out using Pearson's Chi square. Student's t-test was used for comparison of mean values, and  $p < 0.05$  was considered significant.

## Introduction

Obesity is a major public health problem in the world and a significant contributor to ill health.<sup>1</sup> It is a global problem that affects more than 300 million people worldwide.<sup>2</sup> Obesity results from an imbalance between food intake and energy output leading to excessive fat accumulation.<sup>3</sup>

Obesity hitherto seen predominantly in developed countries is now a potential health problem in developing countries.<sup>4,5</sup> Prevalence rates are as high as 21–24% for overweight and 16–18% for obesity among adolescents in the USA.<sup>6,7</sup> In India, prevalence rates of 14% and 11% for overweight and obesity respectively have been documented,<sup>8</sup> while values reported in Nigerian adolescents are in the range of 3.3% for overweight and 1.4–4.2% for obesity.<sup>9,10</sup>

Obesity is a risk factor for type 2 diabetes mellitus, hyperlipidaemia, renal disease, hypertension, other car-

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	Type of school		Total
	Private n=247	Public n=853	
<b>Gender</b>			
Male	112 (45.3%)	401 (47.0%)	513 (46.7%)
Female	135 (54.7%)	452 (53.0%)	587 (53.3%)
Total	247 (22.5%)	853 (77.5%)	1100 (100.0%)
<b>Age group (years)</b>			
Early adolescence (10–13)	112 (45.3%)	314 (36.8%)	426 (38.7%)
Mid adolescence (14–16)	126 (51.0%)	381 (44.7%)	507 (46.1%)
Late adolescence (17–19)	9 (3.6%)	158 (18.5%)	167 (15.2%)
<b>Mean weight (kg)</b>	50.4±12.2	47.4±11.3	48.04±11.57
<b>Mean height (cm)</b>	158.6±10.4	156.3±10.4	156.83±10.44
<b>Mean BMI (kg/m<sup>2</sup>)</b>	19.8±3.6	19.2±3.4	19.33±3.43
<b>BMI percentile</b>			
<85	215 (87.0%)	802 (94.0%)	1017 (92.5%)
85–94	23 (9.3%)	41 (4.8%)	64 (5.8%)
≥95	9 (3.6%)	10 (1.2%)	19 (1.7%)

Table 1. Demographic characteristics of adolescents studied

## Results

The study subjects numbered 1100, comprising 513 males and 587 females giving a male to female ratio of 0.9:1.0; 853 (78%) adolescents attended public schools while 247 (22%) attended private schools. Table 1 shows the demographic characteristics of the adolescents studied.

The prevalence of overweight was 5.8%, and obesity 1.7%, using age- and sex-related criteria specified by the Centers for Disease Control (CDC).<sup>17</sup> Among adolescents who attended public schools, prevalence rates of overweight and obesity were 4.8% and 1.2% respectively, while corresponding values among adolescents who attended private schools were 9.3% and 3.6% respectively ( $p < 0.01$ ).

The mean weight, height, and BMI of males were 46.3±11.3 kg, 158.0±2 cm, and 18.3±2.5 kg/m<sup>2</sup> respectively; while corresponding female values were 49.5±11.6 kg, 155.8±8.5 cm, and 20.2±3.8 kg/m<sup>2</sup> respectively. Females were significantly heavier than males ( $p < 0.001$ ), while males were significantly taller than females ( $p = 0.001$ ).

In males, the prevalence of overweight and obesity was 2.1% and 0.4% respectively, and in females 9.1% and 2.9% respectively ( $p < 0.001$ ). Prevalence rates of overweight in early, mid and late adolescence were 6.4%, 6.1% and 2.5% respectively, while prevalence rates of obesity were 1.6%, 1.9% and 1.9% respectively ( $p = 0.504$ ).

## Discussion

The overall prevalence rates of overweight and obesity in the present study are similar to those reported in previous

studies in Nigeria,<sup>9,10</sup> but lower than results reported in the USA and other developed countries.<sup>6,7</sup> The present findings also differ from an Indian report.<sup>8</sup> This disparity may be attributed to different factors, including socio-demographic and economic variables.

Higher BMI values in females could be explained by higher levels of oestrogen which encourage fat deposition, and the higher probability of males being more involved in physical exercise.<sup>18</sup> Higher prevalence rates of overweight in lower adolescent ages may be due to increase in gonadotropin secretion which occurs at this time, stimulating oestrogen production and resulting in fat deposition.<sup>18</sup>

Overweight was twice as prevalent and obesity was three times as prevalent in private schools compared with public schools. This supports the general belief that privileged adolescents with greater access to wider food choices are more likely to attend private schools. Health education is needed to encourage lifestyle changes among those affected.<sup>19</sup>

Further research is needed to consider the socio-cultural, behavioural factors, and sexual maturity rating that may be predictors of overweight and obesity. Prevention of obesity should begin in childhood as the prevalence is highest in early adolescence.

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## Author declaration

Competing interests: none.

Any ethical issues involving humans or animals: none.

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## References

1. Kopelman PG. Obesity as a medical problem. *Nature* 2000; 404: 635–43.
2. Vazquez G, Duval S, Jacobs D, et al. Comparison of body mass index, waist circumference, and waist/hip ratio in predicting incident diabetes: a meta-analysis. *Epidemiol Rev* 2007; 29: 115–28.
3. Agarwal R, Bills J, Light R. Diagnosing obesity by body mass index in chronic kidney disease: an explanation for the 'obesity paradox'? *Hypertension* 2010; 56: 893–900.
4. Ford ES, Mokdad AH. Epidemiology of obesity in the western hemisphere. *J Clin Endocrinol Metab* 2008; 93: S1–8.
5. Malecka-Tendera E, Mazur A. Childhood obesity: a pandemic of the twenty-first century. *Int J Obes* 2006; 30: S1–3.
6. National Center for Health Statistics, United States 2011; with special features on socioeconomic status and health. Hyattsville, MD: US Department of Health and Human Services, 2012.
7. Ogden CL, Carroll MD, Kit BK, et al. Prevalence of childhood and adult obesity in United States 2011–2012. *J Amer Med Ass* 2014; 311: 806–11.
8. Chhatwal J, Verma M, Riar SK. Obesity among pre-adolescents

- and adolescents of a developing country (India). *Asia Pac J Clin Nutri* 2004; 13: 231–35.
9. Ahmad M, Ahmed H, Airede K. Body mass index among school adolescents in Sokoto, north-western Nigeria. *Sahel Med J* 2013; 16: 5–9.
  10. Sabageh A, Ojofeitimi E. Prevalence of obesity amongst adolescents in Ile-Ife, Osun State, Nigeria using body mass index and waist hip ratio: a comparative study. *Niger Med J* 2013; 54: 153–6.
  11. World Health Organization. *Obesity and overweight*. Fact Sheet No. 311.2012. Geneva, Switzerland: World Health Organization.
  12. Novac O, Matasaru S, Tataru S, et al. The assessment of weight excess complications for children and school teenagers. *Rev Med Chir Soc Med Nat Lasi* 2009; 113: 740–4.
  13. Poirier P, Thomas D, Bray G, et al. Obesity and cardiovascular disease: pathophysiology, evaluation and effect of weight loss. *Circulation* 2006; 113: 898–918.
  14. Cole TJ. Weight-stature indices to measure underweight, over-weight and obesity. In: Himes JH (Ed), *Anthropometric Assessment of Nutritional Status*. New York: Wiley-Liss 1991: 83–111.
  15. Martorell R, Malina RM, Castillo RO, et al. Body proportions in three ethnic groups: children and youths 2–17 years in NHANES II and HHANES. *Human Biol* 1988; 60: 205–222.
  16. Centers for Disease Control (CDC). Child body mass calculator [Internet]. [cited 2013 Sep 1]. Available from: [http://allnutritionals.com/calculator/body\\_mass\\_calculator](http://allnutritionals.com/calculator/body_mass_calculator).
  17. Centers for Disease Control (CDC). Clinical growth charts [Internet]. [cited 2013 August 2]. Available from: [http://www.cdc.gov/growthcharts/clinical\\_chart20](http://www.cdc.gov/growthcharts/clinical_chart20).
  18. Burt-Solorzano CM, McCartney CR. Obesity and the pubertal transition in girls and boys. *Reproduction* 2010; 140: 399–410.
  19. Macwana JJ, Mehta KG, Baxi RK. Predictors of overweight and obesity among school-going adolescents of Vadodara City in western India. *Int J Adolesc Med Health* 2016 (epub ahead of print). DOI: 10.1515/ijamh-2015-0078.

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