Overweight and Obesity among School Children Aged 6 – 12 Years in Ilorin North Central Nigeria.

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Abstract
Background
Nutrition is a major determinant of a child's overall development and learning.[1] The new trend of malnutrition, described as double burden of malnutrition, is one in which under-nutrition is coexisting with over-nutrition and is a major problem facing the world today, especially developing countries.[2] The diminishing value towards healthy natural meals has led to over-nutrition.[3] Approximately 300 million people globally are obese.[4] There is an increase in the global prevalence of childhood obesity.[5] The prevalence of overweight and obesity were reported as 13.7% and 5.2% respectively, among Nigerian preschool children,[6] There are studies on the prevalence of overweight and obesity among adolescents[7,8] but little is known about these burden among school age children.
Objective: *To determine the prevalence of overweight and obesity among school aged children in Ilorin.*
Methods: *Cross sectional descriptive study of school aged children in Ilorin Kwara State using a multi-staged sampling techniques. A total of sixteen primary schools, eight public and eight private school pupils were recruited. The anthropometric measurements were taken to determine the anthropometric indices using the World Health Organization (WHO) reference 2007.*
Results: *A total number of 480 primary school children from Ilorin were recruited. Males were 221 (46.0%) with a M:F of 1:1.2. The prevalence of overweight and obesity were **7.3%** and **3.1%** respectively. Higher proportions of private school children were overweight and or obese.*
Conclusions: *The study affirms the increasing burden of over-nutrition among school children in Ilorin. Routine nutritional assessment of primary school children is advocated.*
Key words; *Burden, Malnutrition, Over-nutrition, School children.*

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I. Introduction

Malnutrition refers to both undernutrition and over-nutrition.[9] Under-nutrition is the predominant form frequently seen in developing countries.[10] In recent time, there is an increase in proportion of children with over-nutrition attributable to change in diets, economic improvement; reduce physical activity et cetera.[5] These can be assessed using the Body Mass Index (BMI), which refers to the weight in kilograms divided by height in meters squared. It was first devised in the 19th century by a Belgian statistician Adolphe Quetelet who referred to it as the Quetelet index of obesity.[11] It is the best anthropometric tool available in quantifying nutritional status for public health purposes.[12] It is a reliable indicator of body fat for children and gives valid information about an individual's health status.[13] It is age – and sex – specific and is often referred to as the BMI – for – age.[14]

BMI growth chart percentiles categorize healthy weight as BMI between 5th and 84th percentile (minus 2 to plus 1), overweight as BMI of 85th percentile to < 95th percentile (greater than plus 1 but less than plus 2) and obesity as BMI of ≥ 95th percentile (greater than plus 2).[15]

Over-nutrition (overweight / obesity) are occurring in this parts of the world despite the prevailing poor socioeconomic situations.[16,17] It influences the growth potential, cognitive ability as well as the overall well being of the child.[18,19] There is paucity of data on the burden of over-nutrition among school aged children in this part of the country.

Objective
To determine the prevalence of overweight and obesity among school aged children in Ilorin

II. Methodology

A descriptive cross – sectional, school – based study where subjects were public and private primary school children aged 6 – 12 years. The study was conducted in Ilorin, the capital of Kwara State which is situated in the North Central zone. Ilorin has 3 Local Government Areas (LGA); Ilorin East, Ilorin West and Ilorin South.[20]

The study was carried out among public and private primary school children aged between 6 – 12 years. The total population of pupils in both the private and public primary schools in the 3 LGA was 109,492.[21] The number of schools recruited per LGA was based on population size in a ratio 2:1:1 in Ilorin West, South and East respectively.

The minimum sample size calculated using the Yamane formula[22] was 480

A multi stage stratified sampling technique was used for the selection of subjects for the study as follows:

Using the school lists provided by the State Ministry of Education, the primary schools in each LGA were stratified into public and private schools. A total number of 16 primary schools were selected for the study. In each of the selected schools, 30 pupils were recruited to make a total of 480 pupils.

Children with features compatible with genetic syndrome, thyroid dysfunction and those with Neurological sequelae from suspected neurological infection were excluded from the study.

Anthropometric measurements

Weight**:** Was measured using the weighing scale with attached stadiometer (Seca Model 213, USA) with the patient lightly dressed. This was adjusted to zero reading before each measurement. The weighing scale was standardized using a known standard weight after every 10 users. The recordings were in kilogram, measured to the nearest 0.01kg.[46,48]

Height: Was measured using a standard stadiometer (Seca Model 213, USA). Each subject was asked to stand against the stadiometer on a flat wall, with the heel, buttock and occiput touching the wall, knees together, arms hanging loosely at the sides and the subject focusing horizontally on a distant object. The caliper was adjusted to make a right angle contact with the crown of the head and the height value was taken from the caliper, measured in centimeter to the nearest 0.1cm.[46,48]

From the above measurements, the anthropometric indices such as the weight-for-age and height-for-age were calculated and its appropriateness determined using the WHO AnthroPlus software.

Body mass index: This was calculated from weight and height in kg/m² as follows.

BMI = weight (kg) / height (m²). BMI was interpreted as healthy weight when BMI is between 5th and 84th percentile, overweight as BMI of 85th percentile to 95th percentile and obese as BMI of greater than 95th percentile. The Z scores for BMI – for – age was calculated for each child by comparing the BMI of the subjects to the standard reference values for the age and sex using the WHO Anthro Plus soft-ware. A child was adjudged over nourished when the value for BMI Z score is ≥+1.

III. Data analysis

The age in months, as well as the weight and the height of the subjects, are entered into SPSS version 20.0 from where it will be imported to the WHO Anthro Plus software for comparison with the reference population. This is used to derive the BMI – for – age Z scores. Tables were used to report descriptive statistics. Mean and standard deviation were provided as appropriate. The student's t-test was used to analyze continuous variables and to identify the significance between two means. Discrete variables were compared using the Chi-square test. The level of significance was established at P-value of < 0.05.

Ethical approval and consideration

Ethical approval was obtained from Kwara State Ministry of Education. Permission was also obtained from the school head teachers and class teachers during field work. In addition, written informed consent was obtained from the parents or guardians of the participants. Assent was also sought and obtained from participants aged 10 years and above.

IV. Results

Demographic characteristics of the study population

A total of 480 primary school pupils were recruited, 240 from the public and 240 from private schools. There were fewer proportion of children aged 11 and 12 years among the private school pupils 23 (9.6%) compared with the public school pupils 101 (42.1%). The public school pupils 18 (7.5%) on the other hand that has fewer children within the age brackets of 6 and 7 years when compared to the private school pupils 89

(37.1%). The gender distribution of children between the public and private schools is comparable. Of the total study population, 221 (46.0%) were males while 259 (54.0%) were females, with a male to female ratio of **1:1.2** (**Table I**).

Table I: Demographic characteristics of the study population

Parameters	Public schools n (%)	Private schools n (%)	Total n (%)
Age (years)	n=240	n=240	n = 480
6	5 (2.1)	41 (17.0)	46 (9.6)
7	13 (5.4)	48 (20.0)	61 (12.7)
8	34 (14.2)	38 (15.8)	72 (15.0)
9	38 (15.8)	45 (18.8)	83 (17.3)
10	49 (20.4)	45 (18.8)	94 (19.6)
11	43 (17.9)	18 (7.5)	61 (12.7)
12	58 (24.2)	5 (2.1)	63 (13.1)
Gender	n=240	n=240	n=480
Male	111 (46.3)	110 (45.8)	221 (46.0)
Female	129 (53.7)	130 (54.2)	259 (54.0)

Figures in parentheses (percentages) were added up across columns.
The mean age (±SD) of study population was 9.2 ± 1.8 years.
A higher proportion of private school pupils 23 (9.6%) were overweight compared to the public school pupils 12 (5.0%). Similarly, of the private school pupils, 10 (4.2%) were obese compared to the public school pupils 5 (2.0%). (**Table II**).

Table II: Body mass index profile of study population by school type

Parameters	Public n (%)	Private n (%)	Total n (%)
BMI class	n=240	n=240	n=480
Normal	178 (74.2)	178 (74.2)	356 (74.2)
Underweight	45 (18.8)	29 (12.0)	74 (15.4)
Overweight	12 (5.0)	23 (9.6)	35 (7.3)
Obesity	5 (2.0)	10 (4.2)	15 (3.1)

Figures in parentheses (percentages) were added up across columns.

Body mass index profile of pupils by gender
There was a total of 124 (25.8%) malnourished children, 7.3% overweight and 3.1% were obese **Table III.**

Table III: Body mass index profile of pupils by gender

Parameters	Male n (%)	Female n (%)	Total n (%)
BMI class	n=221	n=259	n=480
Normal	160 (72.4)	196 (75.7)	356 (74.2)
Underweight	40 (18.1)	34 (13.1)	74 (15.4)
Overweight	15 (6.8)	20 (7.7)	35 (7.3)
Obese	6 (2.7)	9 (3.5)	15 (3.1)

Figures in parentheses (percentages) were added up across columns.

V. Discussion

The overweight status from this study was 7.3%, which is comparable to the 7.5% reported in Enugu.[8] The similarity in these studies may be due to the urban nature of the study sites with change in diets and sedentary lifestyles as seen in the Enugu study. A study in Lagos reported a higher prevalence (10%) of overweight,[23] the difference may stem from the overall higher level of socio-economic status (47.6%) reported in the Lagos subjects compared to 31% in the current study as higher socio-economic status tend to produce a population with the tendency to being overweight.

The proportion of pupils who were overweight in this study was higher among private than public school pupils, a finding similar to that from Osogbo.[24] The higher proportion (>2/3rd) of the private school pupils from the upper socio-economic class reported in these studies may explain the similarity. A significantly higher proportion of females compared to males were overweight in this study, consistent with earlier reports

from Enugu[25] and Abuja.[7] The reason for this finding could be due to the fact that females are more likely to engage less in out-door physical activities in this environment. They also have more accessibility to food through their involvement in food preparation as well as the effect of estrogen.[7,23] A higher overweight among males than females was however reported in Ebonyi,[26] this difference may be attributed to the gender disparity and male preference in the region.[27]

The prevalence of obesity in this study was 3.1% which is similar to the 2.8% earlier reported in Gombe.[28] The reason for this similarity is not clear but may be due to the similarity in sample size used in both studies. It may also be explained by the effect of genetics.[29] This finding (3.1%) was higher than the 1.7% and 1.4% reported in Enugu[25] and Sokoto[30] respectively, but lower than the 5.2% and 8.6% reported in Ile-Ife[6] and Port-Harcourt[31] respectively. The International Obesity Task Force (IOTF) which was the tool employed in both the Enugu and Sokoto studies compared to the WHO Anthroplus software with a different cut-off used in this study may be responsible for the identified difference. The Ile-Ife and the Port-Harcourt studies on the other hands were done in the preschool aged children among whom an earlier study had reported that the prevalence of obesity decreases with advancing age.[32] Obesity in this study was higher among private than public school pupils, similar to a report in Lagos.[23] This may be due to the higher SEC with reduced physical activity occasioned by the use of motorized form of transportation which is predominant among private school pupils.[23] A higher proportion of females than the males had obesity in this study buttressing an earlier report in Abuja.[7] This may be due to a higher sedentary life-style, increased Television viewing time, accessibility to food and the effect of estrogen on fat accumulation among the females.[33,34]

VI. Conclusion;
Overweight and obesity were higher in private compared to the public school pupils.
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