Anthropometrically determined nutritional status of children in public and private primary schools in Lagos, Nigeria

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Abstract

Background: Under-nutrition remains high while overweight/obesity are on the rise in developing countries. Little is known about the differences in the prevalence of malnutrition among public and private primary school children in urban areas of Lagos, Nigeria. This study determined and compared the nutritional status of children in public and private primary schools in an urban area of Lagos, Nigeria.
Methods: A cross sectional study was conducted among public and private primary school children in an urban town in Lagos, Nigeria using multi-stage sampling technique to select 206 pupils. A structured interviewer administered questionnaire was used to obtain information on socio-demographic characteristics while anthropometric measures were obtained and compared to standards using WHO AnthroPlus, to determine the nutritional status.
Results: The prevalence of underweight (WAZ <-2SD) in the public primary schools, 6.8% (n=7) was higher than in the private schools, 1.9% (n=2) but the difference was not statistically significant. (p = 0.085). However, the higher prevalence of stunting (HAZ <-2SD) in public (20.4% (n=24) compared to private schools 3.9% (n=4) was statistically significant (P<0.000). The prevalence of overweight and obesity were significantly higher among respondents in private schools (8.7% and 4.9%) compared to those in public schools (0.0% and 1.0%) (p=0.0003).
Conclusions: Stunting was higher in the public schools, while obesity and overweight were higher in the private schools. Appropriate feeding from birth should be promoted to prevent under-nutrition among children in public schools and overweight/obesity among children in private schools.

Keywords: Anthropometry; Children; Nutrition; Stunting

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Introduction

Malnutrition continues to be a major health burden in developing countries. Despite the economic growth observed in some developing countries, more than 30% of children under 5 years of age in these countries suffer under-nutrition.[1] Concurrently, a growing prevalence of overweight/obesity and its related chronic diseases (resulting in 'Double Burden of Malnutrition' (DBM)) are being observed in these countries not only among adults but also among school children.[2]

About 6 million (4%) of the world's 149 million malnourished children are found in Nigeria.[3] The Nigerian food consumption and nutrition survey 2003 indicates that 42% of children are stunted and 25% are under weight. Recent statistics also show that 16% of children aged 6-11years are overweight and that an additional 14.3% are at high risk of becoming overweight.[4]

Malnutrition remains a significant determinant of mortality, short-term morbidity and reduction in intellectual capacity in societies which cannot afford such losses and costs. Overweight and obesity are also associated with an increased risk for many health conditions as well as reduced life expectancy.[5,6] Even though the increase burden of diseases such as cardiomyopathy, pancreatic disorders, respiratory disorder, cardiovascular diseases and diabetes mortality mainly affect the adult population and occur in later life, serious somatic co-morbidities increasingly appear during adolescence.[7,8]

Rural areas of developing countries are generally prioritized as regards nutrition intervention, because under-nutrition is more widespread in these rural areas than in urban areas:[9] however, a shift is occurring and children in the cities particularly in deprived, urban communities are at risk of both over-nutrition and under-nutrition.[10] Children in low-income, food-insecure households have significantly lower energy-intake, meat and fruit consumption compared with

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food-secure households; and are therefore more prone to under-nutrition.Such children are more likely to attend public schools. On the other hand, child overweight and obesity have been shown to be positively associated with indicators of higher socioeconomic status and children from families of higher socioeconomic status tend to attend private schools.[11]Meanwhile, attending private school has been shown to be associated with overweight.[12]In spite of these facts, little is known about the difference between the nutritional status of children attending public and private primary schools in urban areas of Nigeria.

This study was conducted to determine and compare the anthropometrically determined nutritional status of public and private primary school children in a urban town in Lagos, Nigeria. The information will be useful for health policy makers, educators and other stakeholders in planning appropriate nutrition intervention programs for school aged children and thereby improving their quality of life and productivity.

Materials and Methods

Study design

This comparative cross-sectional study was conducted among pupils not older than 10 years in primary 3-6 in private and public-owned primary schools Ojodu Local Government Area of Lagos State. The formula for the comparison of proportions of two independent groups was used to obtain a minimum sample size of 48 for each group (having taken prevalence of underweight, P_1 to be 47% and prevalence of underweight in private school, $P_2$to be 21% and the critical value corresponding to power of the study at 80% to be 0.84).[13]

This study used a multi-stage sampling technique with purposive sampling of first-order clusters at the last stage. At the first stage, all 20 primary schools in the Ojodu local Government Area were divided into two strata: 15 private and five public primary schools. One out of the five public and two out of the 15 private primary schools were chosen using simple random sampling(balloting method). At the second stage of sampling, all pupils in primary three to six were selected for inclusion in the study in the private schools. The total number was one hundred and three (103). In the public school, systematic random sampling (with interval of 2) was used to select equal number of pupils (103) from the four arms of each class of primary three to six.

A pre-test was carried out among forty (40) school children in the study age-group, (20 from Flora private primary school and 20 from Oke-ira public primary school in a similar town in Lagos). This pilot informed adjustments to the questionnaire and design of the study before commencement of the study reported here. A structured interviewer-administered questionnaire was used to obtain information on socio-demographic status. Weight was measured using a digital weighing scale (Model 880, Seca, Hamburg, Germany) calibrated to the nearest 0.1 kg. Height was measured using a portable measuring unit (Seca Bodymeter Model 208, Seca, Hamburg, Germany) calibrated to the nearest 0.1 cm. While measuring height, the children were asked to stand straight, looking ahead, with shoulder blade, buttocks and heels touching the measuring board, arms at side, legs straight, with the knees together and feet flat without shoe.

The BMI for age Z-score, height for age Z- score and weight for age Z- score were calculated using standardized program software developed by WHO (AnthroPlus version 1.0 4, 2007). This software is limited to height and weight for age Z-score and BMI for age z scores calculations alone and does not calculate for other anthropometric variables. Children were considered underweight and stunted if their weight-for-age and height-for-age Z-scores were below -2.0SD of the World Health Organization standard respectively. Overweight was defined as between +1 and +2SD of BMI for age Z-score and Obesity as >+2 SD of BMI for age Z score for age and sex of the World Health Organization standard.[14]The study was carried out between June and September 2012.

Data analysis

Data was processed and analyzed with Statistical Software Package for Social Sciences (SPSS 17.0 Software) and Programme for epidemiologists (PEPI) was used for analysis where the values in some cells were less than five (5) making Chi-square not valid. Proportions (and 95% Confidence Intervals) were used to describe discrete variables while means±SD was used to describe continuous variables. The Chi-square test (or Fisher's exact test where appropriate) was used to compare proportions and Student's t-test to compare means. All statistical tests were considered significant at $P<0.05$.

Ethical approval

Ethical approval was sought and obtained from the Research and Ethics committee of Lagos University Teaching Hospital. Permission was taken from the school authorities with responsibility for the pupils. Informed consent was obtained from the parents and children. Information about participants was treated confidential.

Results

The mean age of the children in private schools was 8±0.8 years, while that of the children in public schools was 9.2±0.7 years (p=0.04). They were predominantly Yoruba tribe (71% and 75.7% from private and public respectively). The mean height in private and public schools were 138.7±8.9 cm and

138.1±7.9 respectively (p=0.0001) while the corresponding values of weight of children for the private and public schools were 31.3±6.5 cm and 26.1±3.7 cm respectively (p=0.03)

Only seven (6.8%) of respondents in private and two (1.9%) of respondents in public were underweight. None of the children in both strata of schools was severely underweight (i.e. WAZ ≤3). More than half (53.4% and 59.2%) of respondents in public and private schools respectively had normal weight for age. The differences in the distribution of weight for age Z scores was statistically significant; p=0.0005 (Table 1).

Table 1: Frequency distribution of children in primary schools in Lagos by Weight-For-Age Z-Score (WAZ)

Nutritional Indicator (WAZ)	Proportion (%)	
	Public (n =103)	Private (n =103)
≤-3.00	0 (0.0)	0 (0.0)
-2.00 to -2.99	7 (6.8)	2 (1.9)
-1.00 to -1.99	40 (38.8)	26 (25.3)
0.99 to -0.99	55(53.4)	61 (59.2)
1 to 1.99	0 (0.0)	9 (8.7)
2 to 2.99	1 (1.0)	5 (4.9)
>3.00	0(0.0)	0(0.0)

Fisher's exact = 0.0005

Overall, the proportion of children who were stunted (defined as HAZ <-2.0) was 12.1% (n=25). Almost one quarter of pupils in public, 21 (20.4%) and only 4 (3.9%) of pupils in private schools were stunted and the difference was statistically significant (p=0.0001). The proportion of pupils with normal height for age (HAZ >1) was 79.6 % (n=79) in public and 96.1% (n=96) in private schools (Table 2).Males were more stunted (66.7%) than females in public schools (33.3%).

Table 2: Frequency distribution of children in primary schools in Lagos by Height-For-Age Z-Score (HAZ)

Nutritional Indicator(WAZ)	Proportion (%)	
	Public (n =103)	Private (n =103)
≤ -3.00	0(0)	0(0)
-2.00 to -2.99	21(20.4)	4(3.9)
-1.00 to -1.99	8 (7.8)	3 (2.9)
0.99 to -0.99	47(45.6)	49 (47.6)
1 to 1.99	16(15.5)	28 (27.2)
2.00 to 2.99	11(10.7)	18(17.4)
≥3.00	0 (0)	1(1.0)

Fisher's exact = 0.0006

The difference in the proportions of pupils who were underweight in public and private schools was not statistically significant (p = 0.085). The prevalence of overweight among respondents in private school was higher (8.7%; n=9) compared to public school (0%; n=0) Moreover, 4.9% (n=5) of the pupils in private schools were obese while 1.0% (n=1) of those in public schools were obese(p=0.0003) as shown in Table 3.

Table 3: Comparison of underweight, overweight and stunting in the public and private primary schools in Lagos, Nigeria

School type	Nutritional status [n (%)]						
	Underweight	Normal	Overweight	Obesity	Normal	Stunting	Normal
Public	7(6.8)	96(93.2)	0 (0)	1(1.0)	102(99.0)	21(20.4)	82(79.6)
Private	2(1.9)	101(98.1)	9(8.7)	5(4.9)	89(86.4)	4(3.9)	99(96.1)
Total	103(100.0)	103(100.0)	103(100.0)	103(100)	103(100)	103(103)	103(100)

Underweight: p = 0.085
Overweight/Obesity: Fisher's exact = 0.0003
Stunting: P = 0.0001

Discussion

This study showed the co-existence of under nutrition and over nutrition among the pupils. The frequency of normal Weight-for-Age (WAZ= -1 to +1 SD) was 95.1% among pupils in public and 98.1% among private school pupils. Underweight was more prevalent in public compared to private school pupils but this difference did not reach statistical significance (6.8% vs. 1.9%; p=0.08) The prevalence for underweight we report here for public school pupils is similar to those reported by investigators in a study on school age children in Pemba Island, Zanzibar (prevalence of underweight in the public schools 6.7%)[15] but incongruous with findings from Bangladesh where prevalence of underweight was 67%.[16] The reasons for this substantial difference with the Bangladesh figure are unclear but important differences are noteworthy, including primarily the fact that the Bangladesh study was set in a rural, and ours in an urban, community. The total prevalence of underweight (WAZ < -2) among the children in this study was also much lower compared to results obtained among school children in Makurdi, Nigeria (52.7%)[17] and Uyo, Nigeria (39.2%).[18] The prevalence of underweight in the private school (1.9%) was also much lower than that obtained in private schools in Uyo (27.3%)[18]and Burkina Faso (14%).[19] Reports from rural and urban primary schools in Ile-Ife Nigeria also revealed much higher prevalence rates of underweight: 61.2%, 70.5%, respectively. The prevalence of under-weight among children in both public and private schools in this Lagos study are much lower than in some other parts of Nigeria and India. This could be because Lagos is an urban metropolis and the children have access to good nutrition compared to other parts of Nigeria. The rates being lower than obtained in India is not surprising given that India is thought to have the highest prevalence rates of childhood malnutrition in the world.[20]

Overall, 12.1% of all the pupils were stunted. This is similar to the prevalence of stunting reported among children in South Sinai, Egypt (11%)[21]but much lower

than the prevalence of stunting reported among children in Makurdi, Nigeria (52.7%).[17]The prevalence of stunting (HAZ < -2SD) in public schools was 20.4% and this is similar to the 30% prevalence of stunting observed in another Lagos study.[22]

Males were more stunted (66.7%) than females in public schools (33.3%) and this is consistent with findings from a study of the Mapuche in South America, which found that boys were more likely to be stunted than girls. [23] Other studies carried out in Makurdi, and Ondo-State in Nigeria also revealed that the proportion of stunted male children was significantly higher than the proportions in their female counterparts.[17,24] This disparity between the male and female child is a typical observation in many developing country settings[25] but it is difficult to attribute public health significance to it given the potential role of the higher prevalence of stunting in the male children in comparison with the female children at about this period in the lives of the children –(i.e the early beginnings of the pubertal growth spurt in girls being the key factor).

The prevalence of stunting was higher in public (20.4%) than in private school(3.9%) children (p=0.0001). When comparing nutritional status according to school type, stunting and underweight were more frequent in public school than in private school children, the difference reaching statistical significance (p<0.05).This higher prevalence of under-nutrition in public schools has been reported in previous studies.[26]

The overall prevalence of overweight and obesity among children in private schools were 8.7% and 4.9% respectively (p=0.001). The prevalence of overweight in Kerala (17.73%) and Norway (18.5%) is much higher than the value obtained in this Lagos study but the prevalence of obesity is similar (4.99% and 3.6%, respectively).[27,28]However, the prevalence of obesity among children in Uyo, Nigeria (11.5%) was much higher than the levels we found in our study.[18]

The prevalence of overweight and obesity were higher in private schools (8.7% and.4.9%) than public schools (0% and 1%) and this difference was statistically significant (p=0.001). Only one child was obese (1%) in the public school and none of the other children was overweight. This is similar to results of another study in Burkina Faso where overweight/obesity was more prevalent in private (4.7%) than in public (1.3%).[29] The near absence of obesity among children in the public school could be because of the low socio-economic status of their families, since public schools are usually patronized by people with less favourable economic circumstances. They have limited access to energy-dense snacks and fast food because of their cost. Moreover, children enrolled in public school probably engage in more physically demanding activities (more play, fewer sedentary activities) compared to their contemporaries in the private schools. Majority of these public school children walk to school daily regardless of the distance, enhancing their physical activity levels thereby.

In conclusion, under-nutrition existed alongside overweight /obesity in the private schools even if it was lower than in other parts of the country and some international comparator countries such as India. The prevalence of under-nutrition was higher among pupils in public schools while that of over-nutrition (overweight/obesity) was higher in private schools. The nutrition transition, characterized by a shift in dietary habit and lifestyles with resulting increases in the prevalence of overweight/obesity and co-morbidity, is still in its early stages in the study area and this upsurge can be contained if remedies are put in place.There is an urgent need to address nutrition problems among school age children through community based nutrition education, the primary school curriculum and a sustainable school meals programme for all primary school pupils, particularly those in public schools.

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