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Prevalence of Stunting, Underweight and Obesity Among School-aged Children in Public Schools in Emekukwu, Upe and Umunan Towns in Imo State

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ABSTRACT

The relationship between nutritional status and academic achievement is complex. Developing countries have a higher dropout rate of primary school pupils than their counter parts in developed countries. This observation has kindled extensive research interest into this relationship. The objective of the study was to establish the factors associated with the nutritional status and academic achievement of pupils in 4public schools in semi-urban and rural communities in Imo State and to investigate the relationship, if any between their nutritional status and academic achievement. All the pupils in the four selected schools were enrolled in the study; they were 370 males and 316 females. Their personal characteristics, age, birth order, maternal occupation, height and weight were obtained. The results show that 26.7% were stunted (< - 2SD). Less than 50% were normal weight for age, and 4.3% were obese (> + 2SD). The differences in stunting, underweight and obesity were not statistically significant by gender (P > 0.05) in all cases. Factors associated with anthropometric parameters were mother's occupation, age and location of school. BMI for age z-score had a statistically significant relationship with mother's occupation, location of school and age of pupil (P < 0.05). This study provides evidence of the high levels of stunting and underweight among the school age children investigated. Also there is a low prevalence of obesity co-existing with stunting and underweight in the same population of school children in public schools.

Keywords: Stunting, Underweight, Children, Rural, Public Schools.

INTRODUCTION

Nutritional status has been referred to as the best global indicator of the wellbeing of children. Anthropometric indices reflect the health and welfare of individuals and communities and is predictive of health status, academic achievement and socio economic profiles of such communities.[1,2,3] Although the global levels of stunting in many developing countries is falling, Nigeria is one of the countries that presents little progress in this regard according to figures from the Food Consumption Survey of 2004 and Nigerian Health Nutrition and Population Country Status Report of 2005. [4,5] As such, child malnutrition, micronutrient deficiencies and attendant high levels of communicable diseases remains a major public health problem in developing countries, including Nigeria. [5,6,7,8,9,10]

Obesity and stunting can co-exist in the same nation, community or household[10]. In the case of a malnourished young child, there can be quick transition from wasting to obesity within a matter of weeks or a few months. Moreover in many cases these children remain stunted, making them more vulnerable as adults in an urban setting to obesity and diabetes. Rapid shifts in weight without concurrent gains in height is now recognized as particularly increasing the risk of later diabetes, central obesity and cardiovascular diseases The double burden of malnutrition exacerbates the nutritional problems in developing countries.[7,8,9,10]

There is strong association between increasing severity of anthropometric deficits and mortality. Empirical data points to the association of poor growth status with delayed mental development, poor school performance, reduced intellectual achievement, reduced work capacities and ultimately reduced economic productivity.[6,11,12,13] There is an increasingly powerful case to be made for securing the development of human capital through investments in the young and it has been argued that this is a precondition for sustained macro-economic growth.[13,14]

There is persistent call for surveillance of the trends of the major risk factors for the double burden of malnutrition, such as stunting, underweight, obesity, dietary patterns etc.[15,16,17] The main aim of this study was to investigate the nutritional status of school children in public schools in four towns, contiguous to Owerri,

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capital of Imo State, Nigeria. The objectives of the study were:
To determine the prevalence of stunting, underweight and obesity among surveyed school children, and;
To determine the characteristics of the pupils associated with stunting, underweight, and obesity.

MATERIALS AND METHODS

The Study Setting

The study was a cross sectional prevalence study carried out in 2014. The study sites were Emekukwu town in Owerri North LGA and Upe and Umunam are towns in Ngor-Okpalla LGAs. Emekukwu is a city with geographical coordinates; Latitude 5.47 and 7.1, longitude 5° 2758N and 7°5953E. it is about 7 kilometers from Owerri. Its inhabitants are mostly civil servants and business people. Upe and Umunam towns are located in Ngor-Okpalla local Government Area. Ngor-Okpalla has an area of 561 km^2 and a population of 159,932 (as at 2006 census). Upe has geographical coordinates; 5°240N and 7°60E. Umunam is an adjoining town to Upe. Both towns are inhabited by indigenous people. Farming is the predominant occupation of the people, some engage in petty trading, while very few commute from their homes to civil service jobs in the state capital Owerri. Due to economic hardship and systemic decay in the public school system, majority of parents who can, would send their children to fee paying private schools, rather than free public schools.

Sampling

There are 1274 public schools in Imo state, 29 of which are in Owerri municipal council, while the others are either in semi urban or rural communities. Four (4) schools were randomly selected for this study.

Sample Size Determination

Using simple random sampling, four public schools were selected for the study. Sample size was determined by the method of Snedecor and Cochran[18]

$n=pqz/d^2$

where z=1.96 ,corresponding to 95% confidence interval, d at 5% acceptable margin of error, p = .383, corresponding to 38.3% prevalence of stunting in Nigerian children[19], while q= 1-.383.
n=185 in each school

Two hundred (200) children were chosen from each school to make up for attrition.
Exclusion criteria included children whose dates of birth were not found in the school register, as the schools are required to sight the birth certificates of children before school enrolment. Also excluded were children with limb deformity, those who were sick at the time of the study and those girls who had observable breast development or boys who had their voices cracked. Using stratified random sampling (based on age and sex distribution in each school and class). In the end, 686 pupils participated in the study; they were 370 boys and 316 girls.

Ethical Considerations

Ethical approval was obtained for the study from the ethical committee of the Imo State Universal Basic Education Board (SUBEB). Written consent was obtained from the head teachers in all the schools, who then appointed two senior teachers (including the assistant head teachers in each schools) to work with the researchers.

Measurement

The main variables studied were pupils age, sex, weight, height, location of school, birth order and maternal occupation. The weight of the children was taken with the children wearing minimal clothing using an electronic scale (Health-0-Meter model HDM 691 D-01-95), while observing standard precautions[20].

The height of the children was measured using a mobile stadiometer (harpenden model), to the nearest 0.1cm. The age of each child was deduced from the date of birth and recorded in months (The schools insist on sighting birth certificates before admission of pupils). The height for age Z- score, weight for height Z-score and BMI for age Z-score were calculated using WHO Anthro Plus software. Each child was then categorized into the following categories of height for age, weight for height and BMI for age.

CONCLUSION

We make the conclusion that the levels of stunting and underweight in public schools are very high and unacceptable, giving the linkage of under nutrition to both to poor academic achievement and poor health outcomes. More efforts should be made by relevant stake holders to better the lot of children in the rural areas studied.

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DISCUSSION

Prevalence of stunting and underweight

The study has shown that there was a very high prevalence of stunting; 10.1% severe, <-3sd of HAZ score, 16.6% moderate (<-2sd) and 31.7% mild stunting (<-1sd of HAZ score). That means less than 50% of surveyed school-aged children had normal or above normal standards for height for age. This is very disturbing, given that stunted children have poorer educational outcomes[5,22,23,24]. It had been observed that for every 10% increase in stunting, the proportion of children reaching final grade of primary school dropped by 7.9%[25]. The level of stunting found in this study is higher than 25.3% reported among school aged children in public schools in Uyo[26].

Similar high levels were reported in Enugu, south east of Nigeria, where only 26% of 285 pupils had normal height for age[27]. In Northern Nigeria, Aliyu et al reported 44.9% stunting among public school children[24]. However lower levels of stunting have been reported in several rural locations in Nigeria[28,29]. It is also worrisome that the youngest children (2-5 years) were among the worst affected. It has been suggested that early childhood malnutrition may have irreversible consequences[23]. Childhood stunting has also been linked to adult obesity and diet related chronic diseases[30,31]. Lian et al reported that 69% of 295 children 5 years or younger in Malaysia had stunting[32].

The finding that boys were more stunted than girls in this study is in agreement with the finding among school age children in Uyo, Nigeria[26]. Further study will reveal if these seemingly high levels of stunting are a reflection of economic hardship and or poor child feeding and caring practices.

The prevalence of underweight found in this study is lower than that reported in school-aged children in Uyo[26] but similar to levels reported elsewhere in Nigeria[4] in a study of poor nutritional status of school children in urban and per-urban areas of Quadadougo, Darbone et al[33] reported that underweight was higher in males as found in the present study similar findings had been reported by other authors[34,35]. This may partly be explained by differentials in physical activity pattern and maturation rates of both sexes[21,34].

They high prevalence of underweight found in this study may be contributed to poor social an health services in developing countries such as Nigeria, which other authors have alluded to[16,35,36,37]. It has been stated that nutritional status is the best global indicator of well being of children, as child malnutrition has been linked to increased morbidity and mortality[4,5,38].

Prevalence of Obesity

The emerging increasing prevalence of childhood obesity has led to concerns because of the links between it and chronic diseases in adulthood. In this regard, the finding of 4.3% obesity in this study is of concern, and may be associated with consumption of highly processed foods which had been reported elsewhere[26,39]. It may also be an indication of cultural preference of weightier children and the perception that weightier children were healthier. Further research in these aspects is called for.

Childhood obesity especially in a population with high prevalence of stunting is not desirable given the links to adult obesity and related diseases[30,31].

Age was the most important variable affecting to the nutritional status of the children in the present study. The youngest children being most affected. Nigeria in one of the countries with high infant and under give mortality rate[4,5]. The links between undernutrition and ill health has been well documented[39]. The finding of this study us that children of business women were most likely to be underweight followed by those of housewives. Under normal economic conditions, children of housewives might have been expected to have better care, while the children of business women may lack. However, the findings may suggest poor economic and environmental conditions as well as some level of ignorance. These may also indicate areas of nutrition and social intervention.

It has been reported elsewhere that age, gender and mothers education were major determinants of nutritional status of children[28].

Definitions of stunting, underweight and obesity

Stunting was defined as < -2sd of height for age Z-score of WHO, 2003 reference standard.Underweight/thinness was defined as < -2sd BMI for age Z-score of WHO, 2003 reference standard. Overweight was defined as > +2SD weight for height/ BMI for age Z-score of WHO, 2003 reference standard[21]

Statistical Analysis

This was done using SPSS version 20. Data processing included significance was set at 95% (P<0.05).

RESULT

Description of pupils

There were 686 children 370 (53.9%) males and 316 (46.1%) females. Majority were aged 10 – 13 years, 6-9 years old were 258 (37.8%), 2-5 years 129 (18.8%) while only 31 (4.5%) were 14 years or more.

Most of the pupils were 3rd – 4th birth order, 41.1% 1st – 2nd birth order made up about 39% of the pupils, 19% were 5th – 6th birth order, while almost 9% were 7th or more in birth order. With respect to their mother's occupation 88 (13.3%) were housewives, 185 (27.9%) were traders, 164 (24.7%) were farmers, 96 (14.5%) were civil servants, 5.4% and 5.3% were health workers and businesswomen respectively.

Prevalence of stunting

The overall prevalence of severe stunting (<-3sd of height for age z score) was 10.1%, while moderate stunting (<-2sd) was 16.6%. A higher proportion (11.8%) of all the girls were severely stunted, while 16.3% of all girls were moderately stunted. Among all boys, 8.6% were severely stunted, while 16.8% of boys were moderately stunted. The differences in prevalence between boys and girls was not statistically significant (p<0.05).Table 2. The oldest children age 14 years and above had the highest prevalence of severe stunting (33.3%), followed by 23.3% of the youngest children aged 2-5years. The oldest age group also had the highest prevalence of moderate stunting (28.6%), followed by the youngest age group with 14.7% prevalence of moderate and 22.5% prevalence of mild stunting (<-1sd). Of those aged 9 to 13years, 18 (6.7%) and 55 (20.5%), were severely and moderately stunted respectively. The age group least affected by severe and moderate stunting were those aged 6 to 9 years. The differences in prevalence by age was statistically significant (p<0.05 Table 3)

Results on table 4 show that of the characteristics of the children associated with stunting, location of school and age were statistically significant (p<0.05), while that with gender, mother's occupation and birth order were not.

Prevalence of Underweight

More than 2% of the surveyed children were severely underweight (<-3sd of BMI for age z score), 77(11.4%) were moderately (<-2sd), while 35% were mildly underweight (<-1sd of weight for age z score). Of these, slightly more boys were either severely(3.3%) or moderately (12.2%) underweight than girls (2.7% and 10.5% respectively).Table 2.The prevalence of underweight in the different age groups is shown on table 3; of those aged 10- 14 years, 11 (4.1%) and 30 (11.2%) were either severely or moderately under weight, while in those aged 6-9years, 6(2.3%) and 34 (13.2%) were severally and moderately underweight respectively. The differences in prevalence of underweight by age was statistically significant (p<0.05). Only 29 (4.3%) of surveyed school children were obese. The youngest age bracket were more likely to be obese followed by those aged 6-9years. No child in the other age brackets was obese.

Characteristics of children associated with stunting, underweight and obesity

Mother's occupation and location of school had a statistically significant relationship with stunting, while birth order and gender did not (p>0.05) Table 4. A higher proportion of the children of business women were underweight (8.3%), followed by 5.7% of children of housewives, while the proportion of the children of teachers and traders who were underweight were low (1.1% each).

The relationship of obesity to age was statistically significant (p<0.05) table 3. Mother's occupation, location of school, gender and age had a statistically significant relationship with obesity (p<0.05), while gender did not have (p<0.05). The children of farmers were most likely to be obese.

Table 1: Characteristics of pupils by age, gender, birth order, location of school and mother's occupation, Owerri, 2014

	Male	Female	Total %	
Age (years)				
2 – 5	65	64	129 (18.8)	$X^2 = 0.399$
6 – 9	138	120	258 (37.6)	
10 – 13	153	115	268 (39.1)	P > 0.05
14 – 17	14	17	31 (4.5)	
	370 (53.9%)	**316 (46.1)**	**686**	
Birth order				
1 – 2	55	46	101 (39.1)	$X^2 = 4.02$
3 – 4	50	56	106 (41.1)	P > 0.05
5 – 6	31	24	55 (19.2)	
7 – 10	17	8	25 (8.7)	
			287	
Mother's occupation				
Housewife	41	47	88 (13.3)	
Farmer	83	81	164 (24.7)	
Teacher	31	24	60 (9.0)	$X^2 = 52.2$
Trader	97	88	185 (27.9)	P < 0.05
Civil servant	41	55	96 (14.5)	
Health worker	34	2	36 (5.6)	
Businesswomen	33	2	35 (5.3)	

NB: Significant at p<0.05

Table 2: Prevalence of stunting, underweight, and overweight in surveyed school aged children by sex

	Male n (%)	Female n (%)	Total (%)	Statistic
Height for age Z score				
<-3sd	32 (8.6)	36 (11.8)	68 (10.1)	
<-2Sd	62 (16.8)	50 (16.3)	112 (16.6)	
<-1Sd	119 (32.2)	95 (31.0)	214 (31.7)	$X^2 = 4.2$
-1sd to median	96 (25.9)	84 (27.5)	180 (26.6)	P >0.05
+ 1sd	42 (11.4)	30 (9.8)	72 (10.7)	
+ 2sd	12 (3.2)	9 (2.9)	21 (3.1)	
+ 3sd	7 (1.9)	2 (0.7)	9 (1.3)	
	370 (100.0)	306 (100)	676 (100)	
BMI for age Z score				
<-3sd	12 (3.3)	6 (2.7)	18 (2.7)	
<-2sd	45 (12.2)	32 (10.5)	77 (11.4)	$X^2 = 12.4$
<-1sd	123 (33.3)	113 (36.9)	236 (35.0)	P >0.05
-1sd to Median	148 (40.1)	101 (33.0)	249 (36.9)	
+ 1sd	25 (6.8)	32 (10.5)	57 (8.4)	
+ 2sd	6 (1.6)	3 (1.0)	9 (1.3)	
+ 3sd	10 (2.7)	19 (6.2)	29 (4.3)	
	369(100.0)	306(100.0)	675(100)	

NB: Significant at p<0.05

Table 3: Prevalence of Underweight, Obesity and Stunting in Surveyed School Aged Children in Public Schools in Imo State by their Age

	<-3sd	<-2sd	<-1sd	-1sd to median	+1sd	+2sd	+3sd	Total	Statistics
BMI by age									
2-5yrs	1 (0.8)	4 (3.1)	24 (19.4)	49(38.0)	18 (14.0)	6 (4.7)	26 (20.2)	129 (19.1)	X^2 =134.0
6-9yrs	6 (2.3)	34 (13.2)	92 (35.7)	104(40.3)	17 (6.6)	2 (0.8)	3 (1.2)	258 (38.2)	P < 0.05
10-14yrs	11 (4.1)	30 (11.2)	112(41.9)	91 (34.1)	22 (8.2)	1 (0.4)	0 (0.0)	267 (39.6)	
14-17yrs	0 (0.0)	9 (42.9)	7(33.3)	5(23.8)	0(0)	0 (0)	0 (0.0)	21 (3.1)	
Height for age									
2-5yrs	30 (23.3)	19 (14.7)	29 (22.5)	31 (24.0)	9 (7.0)	8 (6.2)	3 (2.3)	129(19.1)	X^2 =93.0
6-9yrs	13 (5.0)	32 (12.4)	78 (30.2)	73 (28.3)	46 (17.8)	10 (3.9)	6 (2.3)	258 (38.2)	P<0.05
10-13yrs	18 (6.7)	55 (20.5)	102 (38.1)	73 (27.2)	17 (6.3)	3 (1.1)	0 (0)	268 (39.6)	
14-17yrs	7 (33.3)	6 (28.6)	5 (23.8)	3 (14.3)	0 (0)	0 (0)	0 (0)	21 (3.1)	

NB: Significant at p<0.05

Table 4: Characteristics of Pupils Associated with Stunting, Underweight and Overweight

Variables	X^2	*P < 0.05	
Stunting			
Mother's occupation	50.2	0.058	NS
Birth order	21.8	0.242	NS
Location of school	82.8	0.000	Significant
Gender	4.2	0.650	NS
Age	95.9	0.000	Significant
Underweight			
Mother's occupation	76.3	0.000	Significant
Birth order	26.1	0.009	Significant
Location of school	82.8	0.000	Significant
Gender	12.4	0.054	NS
Age	161.0	0.000	Significant
Obesity			
Mother's occupation	43.9	0.000	Significant
Birth order	6.8	0.009	Significant
Location of school	69.5	0.000	Significant
Gender	14.9	0.020	NS
Age	3.7	0.000	Significant

NB: Significant at p<0.05: NS means not significant