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Original Research Article

Anthropometry and Nutritional Status of Pre-School Children in a Rural Community in the Niger Delta Region of Nigeria

Chukwma B. Duru[1]*, Kelechi A. Uwakwe[1], Uche R. Oluoha[2], Chinomnso C. Nnebue[3], Kingsley I. Achigbu[4], Kelvin C. Diwe[1] and Chinedu A. Iwu[2]

[1]Department of Community Medicine Imo State University, Owerri, Imo State, Nigeria
[2]Department of Community Medicine, Imo State University Teaching Hospital Orlu, Imo State, Nigeria
[3]Department of HIV Care/Community Medicine, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria
[4]Department of Paediatrics and Child Health, Federal Medical Centre Owerri, Imo State, Nigeria

**Corresponding author.*

Abstract

Malnutrition is an important public health problem especially among children living in environments with poverty and high prevalence of infectious diseases such as found in developing countries. The study has been carried out to assess the nutritional status of under-five children attending Kindergarten and Nursery Schools in a rural community in Niger Delta, Nigeria. This was a school based descriptive cross-sectional study conducted among 300 Kindergarten and Nursery school pupils selected by multistage sampling technique. A semi-structured questionnaire was used to collect basic information about the pupils from their teachers, and their anthropometric indices were measured using, weighing scales, measuring tapes and shakirs' strip. The mean age of the pupils studied was 35±1.4 months. The prevalence of underweight, overweight, obesity, stunting and wasting among the pupils were, 8.0%, 16.0%, 7.3%, 21.0% and 7.7% respectively. Malnutrition is still prevalent in our environment thus there is need to institute appropriate strategies by the relevant authorities to combat this menace as this is still largely preventable.

Keywords

Anthropometry
Nutritional status
Preschool pupil
Rural community

Introduction

The major change in the nutritional profile of human populations (nutritional transition) resulting from a shift from a traditional diet to a western one, is determined by the interplay of economic, demographic, environmental and cultural changes occurring in a society and plays a role in the prediction and determinants of the nutritional status of the overall population (Frongillo et al., 1997; Monteiro et al., 2002; Bourne et al., 2003).

Children's physical growth patterns are among the tools used to assess the nutritional status ofa community. Physical growth itself is regulated by two major factors: genetics and the environmental (Adair and Guilkey, 1997; Saleemi et al., 2001). Although the quantity and

quality of food are the main environmental determinants of good nutritional status, children's physical and psychosocial surroundings also impact on their growth.

Malnutrition is an important public health problem for children living in environments with poverty and high prevalence of infectious diseases such as found in developing countries (Vella et al., 1994; Adair and Guilkey, 1997). Socio-economic status such as the mother's education and occupation, household income and health expenditure may influence malnutrition indirectly (Delpeuch et al., 2000; Zamilah et al., 2002; Ukwuani and Suchindran, 2003;), whilst a number of factors may be directly causative, including micronutrient deficiencies, inadequate protein intake, intrauterine malnutrition, maternal stature and infections (Hernandez – Diaz et al., 1999; Saleemi et al., 2001).

According to 2012 UNICEF, WHO and The World Bank child malnutrition database, 36% of African under-five-year olds were stunted, 29% were underweight, 28% were wasted while the global prevalence for overweight under-five year olds was highest in Southern Africa (37%). In Nigeria, the proportion of stunted (37%) and underweight (29%) children under-five year olds is very similar to the African picture while 18% of Nigerian children were considered wasted or too thin for their height (NDHS, 2013). A school based Nigerian study gave the proportion of overweight Nigerian under-fiveyear olds as 9.1% (Shalon et al., 2012).

Experience has shown that these malnourished children are susceptible to increased morbidity and mortality, and are the most vulnerable group in communities. Endemic poverty as evidenced by poor education, unemployment, increased household density and lack of basic resources for nutritional well-being form the basis for poor nutritional status in these children (Patel and Pettifor 1992; Dannhauser et al., 2000; Steyn et al., 2005). It is now also recognised that in addition to under-nutrition in children and pregnant mothers, the nutrition transition has led to an increase in overweight and obesity in the adult population resulting in an increase in the prevalence of chronic diseases (Fourie and Steyn, 1995). In recent years, however, this phenomenon has filtered down to the child population in developing countries undergoing transition (Faber et al., 2001; Yanovski and Yanovski, 2003; Steyn et al., 2005). The aim of this study was to assess the nutritional status of under-five pupils in nursery schools in Elele community, Rivers State, Nigeria.

Materials and methods

Study area and population

Elele is a rural community in Ikwere local government area of Rivers state, which is located at the heart of the oil rich region of Nigeria, "The Niger Delta". It is geographically located along longitude 6' 48" and latitude 5' 6" and has a population of 20,620 people according to the 2006 National Population Census.Majority of its residents are of Ikwere and Igbo ethnic nationalities. Christianity of different denomination is the dominant religion though there are some Muslims and Traditional worshippers resident in the community. The major occupations of the people are petty trading, farming, and fishing. Also crude oil explorations occur in this region with its attendant problems. It has a privately owned University with a teaching hospital, an army barrack, several local markets, a fast food joint and a commercial bank. It is also home to 10 nursery and primary schools and five secondary schools. The study population comprised under-five-year olds from randomly selected nursery schools in Elele community.

Selection criteria

Only under-five children from the selected schools were studied.

Study design and sample size estimation

This was a cross-sectional descriptive survey of the nutritional status of under-five pre-school children in Elele community. Using the Cochrane formula for sample size estimation for cross-sectional studies and proportion of under-five-year olds in the rural areas who suffer from malnutrition (26.7%) according to Global Health Facts(UNICEF-WHO, 2012), the sample size that was used for this study was 300 children taking into consideration 10% attrition.

Sample size formula:

$$n = \frac{Z^2pq}{d^2}$$

Where n= Desired sample size; Z= Standard normal deviate at 95% confidence level = 1.96; p= Proportion of the target population estimated to have chronic malnutrition= 0.267; q= 1-p = 0.733; d= 5% sampling error = 0.05.

Sampling technique

The sampling technique used was the multi-stage sampling technique.

Stage I involved the stratification of the schools into public and privately owned. Thus six were privately owned while four were public schools

Stage II involved the selection of the schools that were studied. This was done using simple random sampling by balloting of which two nursery schools were selected from each arm.

Stage III involved the selection of pupils that were studied using stratified proportionate simple random sampling based on population size of the schools. Sixty pupils were studied from each of the selected two public schools while ninety were studied from each of the two selected private schools given that the proportion of private to public schools in the study area is 3: 2.

After stratifying them into the class levels in the selected schools and using the school register as the sampling frame, simple random sampling using a table of random numbers was used to select the pupils that were studied until the required sample size was gotten.

Data collection method and analysis

Data was collected by direct measurement of anthropometric parameters – weight, height and mid upper arm circumference (MUAC) – and percentages of these parameters among the participants were compared with the expected values for the child's age. Weight was recorded in kilograms to the nearest 0.1 kg using a standardised weighing scale.

The heights of the children were measured using a measuring board graduated to the nearest 0.1cm. The MUAC was measured using Shakir's strip. The following classification was used for this survey (Waterloo, 1972; Azubuike and Nkaginieme, 2007).

Mid Upper Arm Circumference (MUAC)

< 12.5 cm – Malnutrition

12.5 – 13.5 cm – At risk of malnutrition

≥ 14cm – Well Nourished

Modified Wellcome Working Party Classification:

S/N	Type	Observed weight as % of ideal weight for age
1	Obesity	> 120
2	Overweight	110 – 120
3	Normal range	90 – 110
4	Underweight	< 90

Height for age:

Anthropometric parameters	Normal	Mild-Moderate	Severe
Height for age (Stunting)	> 90%	80 – 90%	< 80%
Weight for height (Wasting)	> 80%	70 – 79%	<70%

Based on above parameters, the children were classified as well nourished (normal), underweight, overweight, stunted or wasted. Also participants' socio-demographic data were obtained using a structured questionnaire developed by the researchers.

The data obtained were cleaned, validated manually and analysed using computer software (Epi Info 7.1). Bivariate analysis was done with the chi-square test where appropriate to test for significant association. Results were considered significant when p-value was < 0.05. Frequency tables and percentages were also generated.

Ethical approval

Ethical approval for this study was obtained from Ethics Committee of the Department of Community Medicine, Madonna University, Elele, Rivers State, Nigeria. Approval was obtained from the appropriate authorities in the studied schools. Verbal consent was obtained from their teachers before commencement of study

Results

The mean, median and modal ages of the children studied were; 35.1±1.4, 36.0 and 38.0 months respectively with male to female of 1:1.3. Majority of the children attended private schools, 180, (60.0%) and were in Nursery classes, 215 (71.7%) (Table 1).

The mean weight, height and MUAC of the pupils were; 15.1±1.9kg, 98.7±5.9cm and 15.7±1.1cm respectively (Table 2).

Table 3 shows that the prevalence of underweight, overweight, obesity, stunting, and wasting among the studied pupils were 8.0%, 16.0%, 7.3%, 21.0%, and 7.7% respectively.

Table 1. Socio demographic characteristics of pupils.

Socio demographic characteristics	Frequency (n=300)	Percentage
Age group (months)		
0-24	69	23.0
25-59	231	77.0
Total	300	100.0
Mean age: 35.1±1.4 months, median age: 36.0 months, modal age: 38.0 months		
Sex		
Male	130	43.5
Female	170	56.7
Total	300	100.0
Type of school		
Private	180	60.0
Public	120	40.0
Total	300	100.0
Class		
Pre-Nursery	85	28.3
Nursery I	107	35.7
Nursery II	108	36.0
Total	300	100.0

Table 2. Anthropometric measurement of the children.

Variable	Frequency	Percentage
Weight (kg)		
≥ 12	57	19.0
13-16	172	59.3
17-20	61	20.3
>20	4	1.3
Total	300	100.0
Mean weight= 15.1±1.9kg, median weight=15.2kg, Modal weight=14.8kg		
Height (cm)		
75-84	2	0.7
85-94	68	22.7
95-104	183	61.0
105-114	47	15.6
Total	300	100.0
Mean Height = 98.7± 5.9 cm, Median Height= 98.1cm, Modal Height=100.3cm		
MUAC (cm)		
12.5-13.5	11	3.7
>13.5	289	96.3
Total	300	100.0
Mean MUAC = 15.7± 1.1 cm, Median MUAC = 55.5cm, Modal MUAC=15.5cm		

Table 3. Nutritional status of pupils using anthropometric indices.

Nutritional status	Frequency	Percentage
Weight for Age		
Underweight	24	8.0
Normal	206	68.7
Overweight	48	16.0
Obesity	22	7.3
Total	300	100
Height for Age		
Normal	237	79.0
Stunted	63	21.0
Total	300	100.0
Weight for Height		
Normal	277	92.3
Wasting	23	7.7
Total	300	100.0

Underweight (8.7%) was commoner among children within the ages of 25-59 months, while overweight, (30.2%) and obesity, (15.9%) were commoner in children within the 0-24 months age bracket. These variations were statistically significant, (χ^2=17.06, df=3, p=0.000). The pattern of stunting was similar in all age brackets, 0-24 months (81.2%) and 25-59 months, (78.4%), p>0.05.The prevalence of underweight was higher among females (9.4%) than males (6.2%) while obesity was higher in males, (9.2%) than females, (5.9%). This difference was not statistically significant, p>0.05. Also the prevalence of stunting was similar in males, (20.0%) and female (21.8%), p>0.05.

Prevalence of underweight was slightly higher among pupils in public schools, (10.8%) than their counterpart in private schools, (6.1%) while obesity was higher among pupils in private schools, (10.0%), than their counterparts in public schools, (3.3%). This difference was not statistically significant, p>0.05. More pupils from public schools (38.3%) were stunted than their counterparts from private schools (9.4%). This difference was statistically significant, χ^2=36.21, df=1, p=0.000 (Table 4).

Discussion

A major finding in this study was that stunting (21%) was the commonest nutritional abnormality observed among the children studied. Significantly, 16% of the children were overweight, 7.3% obese, 7.7% wasted, whereas only 8% were underweight. The frequency of stunting, underweight, and wasting reported herein is

considerably lower than the national figure which stood at 37%, 29% and 14% respectively among under five children, just as the proportion of overweight children in our study is more than ten times (16.0% vs 1.2%) the national figure (NDHS, 2013). The reason for this could be attributed to the high level of economic activities in this region of the country which is largely due to crude oil exploration and drilling activities and its attendant indirect positive effect on the nutritional well-being of the children due to increased income for caregivers when compared to compared to children from the other regions of Nigeria.

Table 4. Distribution of Nutritional Status by Age, Sex, and Type of School of the Pupils

Nutritional status	Age of pupils			
	0-24 months n (%)	25-59 months n (%)	Total n (%)	Statistics/ *p*-value
Weight for age				
Underweight	4(5.8)	20(8.7)	24(8.0)	χ^2=17.06
Normal	33(47.8)	173(74.9)	206(68.7)	df=3
Overweight	21(30.4)	27(11.7)	48(16.0)	*p*=0.000*
Obesity	11(15.9)	11(4.7)	22(7.3)	
Total	69(100.0)	231(100.0)	300(100.0)	
Height for Age				
Normal	56(81.2)	181(78.4)	237(79.0)	χ^2=0.25
Stunted	13(18.8)	50(21.6)	63(21.0)	df=1
Total	69(100.0)	231(100.0)	300(100)	*p*=0.616
Nutritional Status	**Sex of pupils**			
	Male n (%)	**Female n (%)**	**Total n (%)**	**Statistics/ *p*-value**
Weight for age				
Underweight	8(6.2)	16(9.4)	24(8.0)	χ^2=0.02
Normal	90(69.2)	116(68.2)	206(68.7)	df=3
Overweight	20(15.4)	28(16.5)	48(16.0)	*p*=0.873
Obesity	12(9.2)	10(5.9)	22(7.3)	
Total	130(100.0)	170(100.0)	300(100.0)	
Height for Age				
Normal	104(80.0)	133(78.2)	237(79.0)	χ^2=0.74
Stunted	26(20.0)	37(21.8)	63(21.0)	df=1
Total	130(100.0)	170(100.0)	300(100.0)	*p*=0.710
Nutritional Status	**Type of school attended**			
	Private n (%)	**Public n (%)**	**Total n (%)**	**Statistics/ p-value**
Weight for age				
Underweight	11(6.1)	13(10.8)	24(8.0)	χ^2=0.31
Normal	120(66.7)	86(71.7)	206(68.7)	df=2
Overweight	31(17.2)	17(14.2)	48(16.0)	*p*=0.571
Obesity	18(10.0)	4(3.3)	22(7.3)	
Total	180(100.0)	120(100.0)	300(100.0)	
Height for Age				
Normal	163(90.6)	74(61.7)	237(79.0)	χ^2=36.21
Stunted	17(9.4)	46(38.3)	63(21.0)	df=1
Total	180(100.0)	120(100.0)	300(100.0)	*p*=0.000*

* = Significant

It has also been observed that the proportion of underweight children is more in the 25 – 59 months compared to the 0 – 24 months old (8.7% vs 5.8%) and the proportion of stunted children was 18.8% in the 0-24

months old and 21.6% in the 25 – 59 months old . Likewise, the younger children have higher proportion of overweight (30.4% vs 11.7%) and obesity (15.9% vs 4.7%) compared to the older children. This result is plausible considering that many of the younger children are still being breastfed and chronic malnutrition sets in only after weaning (Babatunde and Qaim, 2010). Other researchers have also found that age of child is positively related to the probability of stunting and that other things being equal, other children are more likely to be stunted (Babatunde et al., 2011; Kabubo – Mariara et al., 2006).

We found that there was no significance difference in the nutritional status of the children with respect to their sex. This finding contrasts with a meta-analysis data from 16 demographic and health surveys conducted in 10 sub-Saharan African countries which revealed that boys were more stunted than girls (Wameni et al., 2007) but concurs with other African studies (Madondo et al., 2012; Mahgoub et al., 2012) that also found no significant difference. Given the five year interval between these studies and the findings in our study, it could be that the effect of sex on the nutritional status of children is becoming abridged as parents now give equal attention to their children irrespective of their sex.

It was clearly apparent in our study that private school children had better nutritional status than their public school counterpart, with under-nutrition (6.1% vs 10.8%) and stunting (9.4% vs 38.3%) being significantly higher in the later. However, it is of note that overweight/obesity was also significantly higher in private than public schools. This is in accordance with findings from previous studies in other developing countries' school children (Dabone et al., 2011; Groenvelf et al., 2008). Socio-economic disparities likely underline these differences. We did not examine the socio-economic conditions of the individual children because it was a school based study and house-hold information were not available but it is a common knowledge in our environment that rich parents who can afford higher bills would rather send their children to private schools due to the poor state of most public schools in the country.

Conclusion

Based on our findings, it is apparent that malnutrition is still prevalent in our rural communities. It is also obvious that overweight/obesity is becoming a cause for concern in our children. It may be concluded that the nutrition transition characterized by shifts in dietary habits and lifestyle with resulting increases in the prevalence of obesity and its co-morbidity is beginning to take root in our communities. There is need to institute appropriate strategies by the relevant authorities to combat this menace given that it is largely preventable.

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