Malnutrition among primary school aged children in Rivers State Nigeria.

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Abstract
Background: *Proper nutrition is a basic requirement for healthy physical, social and economic development of individuals. Access to food prevents nutritional disorders in childhood and poor health in adulthood. Social security however determines availability of and access to food. This study is aimed at assessing the nutritional status of primary school-aged children in Rivers State, Nigeria*
Method: *This is a cross-sectional study carried out among 393 primary school children aged 6 – 12 years in Rivers State Nigeria, recruited through a multistage sampling method. Pupils provided information on their anthropometry while their parents/guardians provided information on socio-demography. Univariate and bivariate analysis using IBM SPSS Statistics version 22 was done and results were presented on frequency tables. Level of statistical significance was set at $P < 0.05$*
Result: *Twenty-seven (6.9%) of the pupils were obese, 37 (9.4%) were overweight and 20 (5.1%) were underweight. Obesity among these pupils was associated with the type of school ($P < 0.0001$), residential area ($P = 0.01$), mother's level of education ($P = 0.02$) and father's occupation ($P = 0.012$). Logistic regression analysis showed that pupils who attend private schools were seven times more likely to be obese (OR = 7.384; 95% CI: 1.80 – 30.13). Furthermore, there was no statistically significant association between underweight and socio-demographic characteristic of the pupils.*
Conclusion: *Both over-nutrition and undernutrition exist among primary school-aged children in Rivers State Nigeria. School health services programs targeting proper nutrition should be carried out in primary schools.*
Keywords: *obesity, underweight, undernutrition, over-nutrition, malnutrition.*

I.   Introduction

Malnutrition is a spectrum of nutritional disorders characterized by deficiency or excess of either macronutrient or micronutrients or both. It includes undernutrition which manifest as underweight, stunting or wasting and overnutrition which presents as overweight and obesity. Proper nutrition is key to physical, mental and psychological development of individuals especially children in the community.[1] Undernutrition as a result of food insecurity has been associated with wasting, stunting, poor academic achievement among school going children, increased susceptibility to infections and anemia, while over nutrition has been found to be associated with dyslipidemia and diabetes mellitus and is also a risk factor for cardiovascular disorders like hypertension.[2,3] Malnutrition also affects the social and economic development of individuals in adulthood.[4,5] Thus, adequate nutrition enables individuals to achieve their maximum potentials leading to community and national development.[6] Individuals acquire dietary habits and lifestyles commonly during the mid-childhood period (ages 6 – 12 years). This period, which is also associated with intense physical growth and development, is therefore critical to the healthy development of the child in order to prevent nutritional disorders and its associated health challenges in later life.[7] School age children respectively contribute to about 24% and 15% of total population in developing and developed regions of the world.[8] Therefore, assessment of the nutritional statuses of children provides the indicator for the evaluation of the wellbeing and quality of life of children as well as the socio-economic status and development of populations.[9-11]

Studies have documented different degrees of co-existence of both undernutrition and overnutrition at the individual, community or population levels in countries of the world and especially the developing countries. For instance, among primary school children in a rural governorate in Egypt, 14.9% were obese and 3.4% underweight; in Argentina, 9.7% were obese, 12.1% overweight and 1.1% underweight while in Iran 5.8% were obese, 12.3% overweight and 13.5% underweight.[11-13] In others studies, Asiegbu et al (2017) reported that

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among school children aged 6 – 12 years in Abakiliki Metropolis Ebonyi State Nigeria, 5.6% were underweight, 6.2% overweight and 3.0% obese; Adegoke et al (2019) similarly found the prevalence of underweight, overweight and obesity among children 6 – 18 in Ile-Ife, Nigeria as 77.8%, 2.8% and 0.3% respectively.[7,14]

This 'double burden' of malnutrition will increase the disease burden in resource poor countries and cost of healthcare leading to a worsening of their already poor health indices. Also, the multi-dimensional nature of malnutrition poses a challenge to public health nutritional policies. [3,15,16]

Over the past few decades, the Niger Delta Area of Nigeria has witnessed several conflicts and militancy activities which have been attributed to social neglect by the Nigerian State and Multi-national Companies operating in the area.[17] This neglect has led to a widespread physical and economic underdevelopment in the area, succinctly described as the Niger Delta 'paradox of plenty', referring to a situation where petroleum exploitation creates abject poverty instead of wealth for the people.[7,18] The insurgencies created insecurity in the area and denied individuals access to their farms and businesses.[19] Consequently, this may have affected the supply of and access to food especially in the agrarian rural areas which produces food. Food insecurity affects the nutritional status of individuals particularly children.[6]

The aim of this study therefore was to describe the pattern of nutritional status of primary school aged children, in Rivers State following the emergence of social conflicts in the area. It is hoped that the findings would raise a flag among healthcare providers and policy makers on the impending health issues arising from these conflicts.

II. Materials and Methods

Study area.

This study was carried out in Rivers State, situated on the coastal plain of the Eastern Niger Delta of Nigeria. It is an oil mineral producing state in the South-South geopolitical zone of Nigeria, with its capital in Port Harcourt. It is comprised of three urban and twenty rural Local Government Areas (LGAs) with a projected population of about 6.2 million people. [20] The major occupations of the people are petty trading, traditional farming and fishing in the rural areas with commercial and industrial activities in the urban areas. Oil exploratory activities also take place in remote rural areas of the State. These oil activities provide employment for migrants and also an enabling business environment for the development of other secondary commercial activities. Currently the State operates the Universal Basic Education program in line with the educational policy in Nigeria. There are 935 public primary schools and 258 government approved private primary schools in the State, supervised by the Rivers State Ministry of Education.

Study design and sampling

This is a cross-sectional descriptive study among primary school pupils aged 6 – 12 years enrolled for school in the primary schools in the State. Sample size was determined with the formula [21] $n = Z^2pq/d^2$; where n = minimum sample size; Z = level of statistical significance = 95% (1.96); P = prevalence of underweight among primary school children in Ile-Ife (14) = 77.8% = 0.778; q = $1-p$ = 0.222; d = Precision/error tolerated (5%) = 0.05. The calculated minimum sample size is 265, however this was increased to 500 in order to accommodate for non-response. Pupils were recruited through a multistage simple random sampling as follows; three LGAs (one urban and two rural) were first selected by simple random sampling followed by two schools in each LGA (one public and one private) and finally pupils in each class in the school using the class registers as sampling frame. Consequently, six primary schools and 500 pupils were selected respectively from 213 primary school and 1343 pupils in the three LGAs selected for this study. Five hundred parents and guardians of recruited pupils were invited to participate in the study. However, 393 gave informed consent and provided information on family's socio-economic status as proxies to the recruited pupils. Anthropometric information was obtained directly from the pupils. Excluded from the study were pupils who were ill or have limb deformities. Obesity has been associated with sexual maturation among adolescent boys and girls consequently pupils who have attained sexual maturity were excluded.[22] Weight of pupils were measured with a weighing scale (Model ZT-120) graduated from zero to 120kg.[23] Pupils were weighed before their lunch break, wearing light clothing (school uniform) but without footwears and pullover. Weight were measured to the nearest 0.1kg. The accuracy of this scale was assessed using a standard 5kg weight before measurement of each pupil. Height of pupils were measured with a standiometer on the weighing scale (Model ZT-120). Measurement was done with the pupil standing barefooted on the footplate of the weighing scale. The arms hung freely on both sides with palms facing the thighs and the buttocks, heels and back of the head making direct contact with the standiometer. Where necessary, the hair on top of the head was flatten. Height was recorded to the nearest millimeter (0.1 cm) during maximal inspiration by lowering the headboard to the apex of the pupil's head in Frankfort's plane (a line perpendicular to the metric rule on the wall, passing through the participant's cheek and opening of the external ear.[2,24] BMI was calculated from the formula, weight of pupil in kilograms divided by the square of height in meters.[25] This was adjusted for age and sex using the CDC growth

chart for boys and girls 5 – 19 years to derive the BMI for age-sex percentiles. Pupils whose BMI for age-sex percentile lie below the 5th percentile were classified as underweight; those at the 5th percentile or more but below the 85th percentile were classified as normal; those at 85th or more but below 95th percentile were classified as overweight and those at the 95th percentile or more as obese.[26]

Data was analyzed using IBM SPSS Statistics version 22. Results are presented in frequency tables. Pearson Chi square (X^2) test of statistical significance and logistic regression analysis for predictors of obesity were done at $P = 0.05$.

Ethical approval

The Research Ethics Review Committee of the University of Port Harcourt Teaching Hospital, Port Harcourt gave approval for this study while the Rivers State Ministry of Education, Education Secretaries in the LGAs, and Headmasters or Headmistresses to the selected schools granted permissions for data collection. All proxies to the pupils (parents or guardian) gave informed consent after receiving detailed information on the purpose and safety of the study and assurance of the confidentiality of the information obtained from them.

III.   Results

Table 1 shows that approximately half of the pupils were male (n =224, 57%) attending public primary schools (n =201, 51.1%). Majority of these were first born (n = 108; 28.1%) and 8 years of age (n = 82; 20.9%).

Table no 1: Socio-demographic characteristics of Primary
School children in Rivers State Nigeria

Variables (n = 393)	*Freq*	*(%)*
Sex of pupils		
Male	224	57.0
Female	169	43.0
Type of school of pupils		
Public	201	51.1
Private	192	48.9
Age of pupils		
6	74	18.8
7	61	15.5
8	82	20.9
9	71	18.1
10	54	13.7
11	32	8.1
12	19	4.8
Mean age (SD)	8.36 (1.73)	
Position of pupil in the family*		
1st	108	28.1
2nd	91	23.6
3rd	88	22.9
4th	40	10.4
$\geq 5^{th}$	58	15.1

missing values (n = 385)

Pupils whose mothers have secondary level education and above were 308 (78.5%) while 85 (21.6%) of them had fathers who were professionals (Table 2).

Table 2: Socio-demographic characteristics of parents/guardians of primary school children in Rivers State Nigeria

Variables (n = 393)	Freq	%
*Level of education of mother**		
None	28	7.1
Primary	56	14.3
Secondary	155	39.5
Tertiary	153	39.0
*Occupation of mother**		
Professional	40	10.2
Non-professional	353	89.8
*Level of education of father**		
None	36	9.2
Primary	35	9.0
Secondary	154	39.5
Tertiary	165	42.3
*Occupation of father**		
Professional	85	21.6
Non-professional	308	78.4

*n < 393 (missing value)

Although majority (n = 309; 78.6%) of the pupils had normal weight, 27 (6.9%) were obese while 20 (5.1%) were underweight (Table 3).

Table No 3: Nutritional status of Primary School Pupils in Rivers State, Nigeria

Nutritional status	Frequency (n = 393)	Percent
Obesity	27	6.9
Overweight	37	9.4
Normal	309	78.6
Underweight	20	5.1

Table 4 shows that there is a statistically significant association between obesity among pupils in Rivers State Nigeria and type of school ($P < 0.0001$), place of residence ($P = 0.01$), mother's level of education ($P = 0.02$) and the occupation of their fathers ($P = 0.012$).

Table 4: Socio-demographic characteristics of primary school pupils with obesity or underweight

Variables	Total Freq (%)	Obesity (n = 27) Freq (%)	P value	Underweight (n = 20) Freq (%)	P value
Type of school					
Public school	201 (51.1)	3 (11.1)	<0.0001	13 (65.0)	0.203
Private school	192 (48.9)	24 (88.9)		7 (35.0)	
Sex					
Male	224 (57.0)	16 (59.3)	0.81	11 (55.0)	0.853
Female	169 (43.0)	11 (40.7)		9 (45.0)	
Age					
6	74 (18.8)	6 (22.2)	0.61	2 (10.0)	0.159
7	61 (15.5)	7 (25.9)		2 (10.0)	
8	82 (20.9)	6 (22.2)		7 (35.0)	
9	71 (18.1)	3(11.1)		1 (5.0)	
10	54 (13.7)	4 (14.8)		4 (20.0)	
11	32 (8.1)	1 (3.7)		1 (5.0)	
12	19 (4.8)	0		3 (15.0)	

Position of child						
1	108 (28.1)	8 (29.6)	0.926	10 (50.0)	0.244*	
2	91 (23.6)	8 (29.6)		5 (25.0)		
3	88 (22.9)	5 (18.5)		2 (10.0)		
4	40 (10.4)	3 (11.1)		2 (10.0)		
≥ 5	58 (15.1)	3 (11.1)		1 (5.0)		
Place of residence						
Urban	183 (46.6)	19 (70.4)	0.010	10 (50.0)	0.752	
Rural	210 (53.4)	8 (29.6)		10 (50.0)		
Highest level of education of mother						
None	28 (7.1)	0	0.02*	2 (10.0)	0.484*	
Primary	56 (14.3)	2 (7.4)		4 (20.0)		
Secondary	155 (39.5)	6 (22.2)		9 (45.0)		
Tertiary	153 (39.0)	19 (70.4)		5 (25.0)		
Occupation of mother						
Professionals	40 (10.2)	5 (18.5)	0.137	1 (5.0)	0.432	
Non-professional	353 (89.8)	22 (81.5)		19 (95.0)		
Highest level of education of father						
None	36 (9.2)	0 (0)	0.145*	4 (20.0)	0.19*	
Primary	35 (9.0)	2 (7.4)		3 (15.0)		
Secondary	154 (39.5)	8 (29.6)		5 (25.0)		
Tertiary	165 (42.3)	17 (63.0)		8 (40.0)		
Occupation of father						
Professionals	85 (21.6)	11 (40.7)	0.012	3 (15.0)	0.55	
Non-professional	308 (78.4)	16 (59.3)		17 (85.0)		

*Fisher's exact test

Table 5 shows that the type of school is the only predictor of obesity among pupils in Rivers State. Pupils attending private schools were seven times more likely to be obese compared to those attending public schools (OR = 7.384; 95% CI: 1.80 – 30.13).

Table 5: Predictor factors for obesity among primary school pupils in Rivers State

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	OccuFath2(1)	-.167	.467	.128	1	.721	.846	.339	2.114
	Residence(1)	-.852	.454	3.524	1	.060	.427	.175	1.038
	SchType(1)	1.999	.721	7.697	1	.006	7.384	1.798	30.317
	EduMoth			.324	3	.955			
	EduMoth(1)	17.214	7277.685	.000	1	.998	29915130.488	.000	.
	EduMoth(2)	-.362	.896	.163	1	.687	.697	.120	4.033
	EduMoth(3)	.134	.559	.058	1	.810	1.144	.383	3.419
	Constant	2.530	.480	27.738	1	.000	12.558		

a. Variable(s) entered on step 1: OccuFath2, Residence, SchType, EduMoth.

IV.   Discussion

This study showed that both overnutrition and undernutrition co-exist among primary school aged children in communities in Rivers State Nigeria despite the social insecurity that exist in the area. Among primary school aged pupils, the prevalence of obesity was found to be 6.9% while overweight and underweight were 9.4% and 5.1% respectively. Other studies have reported similar dual burden of malnutrition among children in different parts of Nigeria. For instance, the prevalence of obesity, overweight and thinness were respectively reported as 2.8%,11.4% and 13.0% among urban school-aged children in Southern Nigeria; 0.3%, 2.8% and 77.8% in Ile-Ife South-West Nigeria and 3.0%, 6.2% and 5.6% in Abakiliki South Eastern Nigeria.

[7,14,27] This finding shows a worsening of the epidemic of obesity and an improvement in the burden of undernutrition among pupils in Rivers State compared to other parts of Nigeria. Furthermore, the burden of obesity in this study is comparable to that reported among Iranian children, but much better than is reported among primary school aged children in Egypt and Argentina.[11-13] On the other hand, the prevalence of underweight found in this study is higher than those reported among children in Egypt and Argentina but lower when compared to the finding among Iranian children.[11,12]

This study also shows that obesity was more among children attending private school ($P < 0.0001$), reside in urban area ($P = 0.01$) and have fathers whose occupation are classified as professional ($P = 0.012$) or mothers who attained tertiary level of education ($P = 0.02$). Other studies have similarly reported that obesity is commoner in private schools, urban residence and among children from rich parents, who may have money to spend at school.[7,13,27,28] However, the association between obesity and sex is conflicting. While some studies found obesity to be more among females in Southern Nigeria, Dar es Salaam and in Egypt, similar studies among Iranian and Malay children reported more among males.[8,12,13,27,28] These conflicting finding may be due to differences in gender roles and privileges enjoyed by children in the different societies. It has been reported in less developed countries that in societies which attach more cultural values on male children, gender differentials in nutritional status tends to favour males who are more obese because they enjoy longer duration of breast-feeding and child care time, greater access to nutritious food in terms of quality and quantity and also better health treatment.[8] In other societies where male preference is not a norm and males are more physically active, females are more sedentary and are more likely to be obese than males. The type of school pupils attends predicted development of obesity. Pupils who attended private school were seven times more likely to develop obesity. Hajian et al (2008) also reported that school aged children attending private schools were two times more likely to become obese.[13]

This study found low level of underweight among primary school aged children in Rivers State (5.1%). Some studies have similarly reported low level of underweight in their populations while others have reported very high degree of underweight ranging from 13.5% - 77.8% among rural primary school aged children.[7,8,11-14,29,30] This study did not assess food habits and access to food of the pupils however, it is generally believed that undernutrition is common in rural population due to food insecurity arising from cultural practices and beliefs and the commercialization of food produce by rural dwellers.[29]

Although this study found no statistically significant association between underweight and the socio-demographic characteristics of the pupils, its burden was more among those attending public school as were similarly reported among school age children in Abakiliki, Nigeria and Iran. This study also did not show any statistically significant difference in underweight between pupils in urban and rural areas. This finding is in contrast with the notion that undernutrition is less likely in urban areas as a result of urbanization which ensures better access to food and conditions that enhance sedentary lifestyle.

The children's food intake (nutritional history), physical activity and medical histories as well as household income, which possibly reflect socio-economic and nutritional deprivations, were not measured. These may pose limitation to the study.

V. Conclusion

Both overnutrition and undernutrition thrive among primary school aged children in Rivers State, Nigeria. Obesity was found to be more among children who attend private schools, reside in urban area, have mothers who attained tertiary level education and fathers who are professionals. Pupils who attend private schools were seven times more likely to be obese. Although no association was found between underweight and sociodemographic characteristics of the children, underweight pupils were more among those attending public schools. It is therefore recommended that School Health service programs emphasizing proper nutrition, should be carried out in primary schools.

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