Facing twofaces of malnutrition among schooling adolescents in North-Central Nigeria

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Abstract

Adolescence is a period of transition in which there are unique nutritional requirements. Our study determined the nutritional status of adolescents, schooling in north-central Nigeria. A cross-sectional study was conducted among 512 in-school adolescents. The sociodemographic and anthropometric data were analysed with the Statistical Package for Social Sciences version 22 and the WHO Anthro software (Version 3.1.0) respectively. Chi square statistics tested the association between categorical variables at 5% level of statistical significance. Binary logistic regression analysis determined the predictors of anthropometric indicators. From eight public schools, 512 students were interviewed, 53.5% of which were girls. While 21% were underweight, 20% were overweight, 12.1% were stunted and 0.1% was obese. Being from a polygamous family was predictive of stunting. The dietary pattern was starchy and meat consumption was rare. Meal skipping and snacking were common.

The two faces of malnutrition were common among the adolescent students. There is a need for nutrition education and effective school mental health policies in Nigeria and across Africa. Good nutrition among adolescents has an impact on mental health and education – two promising pillars to support the demographic dividend of Africa's youthful population.

Key words: Nutritional status, double burden of malnutrition, school health, adolescent health

Introduction

Africa has been described as the only continent where the incidence of undernutrition continues to rise despite a definite decline in poverty levels.[1] Underweight is a major public health issue[2] and overweight is also becoming a concern in Africa due to nutrition transition (Table 1).

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The stereotype of undernutrition associated with Africa[3] has long since given way for two faces of malnutrition, namely under- and overnutrition.[4] There is mounting evidence that African adolescents in the 21st Century are increasingly fitting into this new profile[1,5,6]

The end result of undernutrition and overnutrition are similar: shortened life expectancy, vulnerability to disease and reduced ability to contribute to society[7]

Many adolescents can be found in the educational system. Thus, the school environment provides a setting for assessing adolescent nutrition. Anthropometric indicators provide information about the nutritional status of adolescents[8] (Table 2). The aim of this study was to determine the nutritional status and dietary habits of school-going adolescents in Ilorin, Nigeria.

Methods

The study was conducted in Ilorin, which is the capital of Kwara State, Nigeria. Ilorin has many primary, secondary and tertiary educational institutions, including one of the aviation schools in Nigeria. Adolescents in Ilorin are typically in the secondary schools with a gross secondary school enrollment rate of 74%.[9]

This was a descriptive cross-sectional study. A three-stage sampling technique was used and subjects were selected by proportionate stratification[10]

The 2007 WHO reference values were used to categorise participants as stunted, underweight, overweight or obese. They have been used in Nigeria.[11,12]

Nutritional assessment was done using a 24-hour dietary recall. All the food and snacks consumed in the previous 24-hour period were recorded. A snack was defined as a light meal and/or a drink apart from the major diets of breakfast, lunch and dinner.[13]

Breakfast, lunch and dinner were defined as meals eaten from 06.00 am to 11.59 hours, 12.00 to 17.59 hours and 18.00 to 23.59 hours, respectively. Similar operational definitions have been used.[14,15]

Ethical clearance was obtained from the Ethical Review Board of University of Ilorin Teaching Hospital. Permission was obtained from the State Ministry of Education and Human Capital Development. A pretest test was conducted among 20 secondary school students in Ilorin South Local

Government Area.

The researcher team was introduced to students on the assembly ground in each school. The purpose of the study was explained. Anthropometric measurements were gotten from the measurement of weight and height. A flat weighing scale was standardised with metal weights from the Chemistry laboratory of the University of Ilorin. Before each measurement, the scale was crosschecked for zero error. Participants were instructed to remove shoes and jackets before weight measurement. The weight was estimated to the nearest 0.1kg.

A measuring tape was fixed to the wall and the participants stood with their backs against the wall. They stood upright, their feet apposed with their head facing forward in the Frankfurt horizontal plane.[11, 16]

In conducting the 24-hour recall, standard guidelines were followed in the consecutive steps of preparing respondents for the recall, recalling the food and drinks consumed and describing the food and drinks consumed.[17]

Data Analysis

Analysing the sociodemographic data was done using the Statistical Package for Social Sciences version 22.[18] The frequency distribution of variables was generated. The association between categorical variables was tested with Chi square statistics. The level of statistical significance was set at less than 0.05 (i.e. *p*< 0.05). Binary logistic regression analysis determined predictors of nutritional status.

Analysis of anthropometric data was done with the WHO Anthro software (Version 3.1.0), using the WHO growth reference for adolescents.[19] The median values of anthropometric data by age and sex were calculated. Distribution graphs were computed for comparison of the adolescents' nutritional status with the WHO reference population.

Results

A total of 512 participants were interviewed from eight public schools, two of which were a boys-only and a girls-only school, respectively. Many

Table 1: Global Studies of Nutritional Status among In-school Adolescents

Country	Authors/Year	Sample Size	Age range (years)	Prevalence under-weight (%)	Prevalence overweight (%)	Prevalence obesity (%)
Nigeria, southeast	Ogechi, Akhakhia&Ugwunna (2007)	190	15 to 18	>20	Male: 4 Female: 2	-----
Nigeria, southwest	Omigbodun*et al.* (2010)	1799	10 to 19	18.9	2.3	-----
Nigeria, south-south	Onyiriuka, Umoru&Ibeawuchi (2013)	2,097 (all girls)	12 to 19	Meal skippers: 6.5 Non-skippers: 11.2	Meal skippers: 24.5 Non-meal skippers: 13.2	Meal skippers: 2.5 Non-meal skippers: 1.1
Nigeria, southern	Obong*et al.* (2012)	1,599	5 to 18	13.0	11.4	2.8
Nigeria, north-central	Jimoh (2016)	515	10 to 19	29.1	24.7	0.2
Nigeria, north-central	Ejike*et al.* (2010)	625	10 to 19	19.36	17.28 (overnutrition)	
Ghana	Adamu, Adjei &Kubuga (2012)	100	9 to 12	10	4	----
Ghana	Mogre*et al.* (2013)	218	5 to 14	Male: 38.5 Female: 23.6	Boys: 15.4 Girls: 18.9 (overweight/obese)	
Ghana and Uganda	Peltzer and Pengpid (2011)	5,613	13 to 15	-----	Boys: 3.2 Girls: 10.4	Male: 0.5 Female: 0.9
Kenya	Wachira (2014)	563	9 to 11	6.7	9.4	10.8
Kenya	Okoth (2013)		15 to 19	-----	Male: 10.3 Female: 18.7	Male: 0 Female: 2.1
South Africa	Monyeki*et al.* (2008)	1282 (primary pupils)	9.1 to 14.9	8 to 47.6	Boys: 0.3 to 4.9 Girls: 1.6 to 15.5	-----
Jamaica	Jackson, Vaughan & Ashley (2001)	1,698	11 to 12	Boys: 10.6 Girls: 7.1	19.3	-----
China	Shi (2005)	824	12 to 14	5.2	Boys: 17.9 Girls: 8.9 (obesity inclusive)	
USA	CDC	(National demographics)	10 to 19	-----	-----	17.1
Australia	Olds *et al.* (2010)	264 905	2 to 18	-----	21 to 25 (obesity inclusive)	5 to 6

Table 2: Anthropometric Indicators in Adolescence

Indicator	Definition	
	CHILDREN (> 10 YEARS)	ADOLESCENTS (10 TO 19 YEARS)
Stunting	Height-for-Age <-2SD	Height-for-Age <-2 SD
Wasting	Weight-for-Height <-2 SD	Not applicable
Underweight	Weight-for-Age <-2SD	BMI-for-Age <-2 SD
Overweight	Weight-for-Height > +1SD	BMI-for-Age > +1 SD
Obese	Weight-for-Height > +2 SD	BMI-for-Age > +2 SD

Table 3: BMI and Characteristics of the Respondents

Characteristics	Normal BMI and Overweight		χ^2	p	Normal BMI and Underweight	χ^2	p
	Normal (%) n_1=301	Overweight (%) n_2=103			Underweight (%) n_2= 107		
Age							
Early adolescence	78(25.9)	74(71.8)			38(35.5)		
Late adolescence	223(74.1)	29(28.2)	68.723	.000*y	69(64.5)	68.723	.000*y
Gender							
Male	148(49)	45(43.7)			45(42)		
Female	153(51)	58(56.3)	2.908	.405	62(58)	2.908	.405
Religion							
Christianity	168(55.8)	45(43.7)			71(66.4)		
Islam	133(44.2)	58(56.3)	11.739	.008*y	36(33.6)	11.739	.008*y
Position in family							
First	90(30)	27(26.2)			30(28)		
Others	211(70)	76(73.8)	0.948	.814	77(72)	0.948	.814
Doing extra work							
Yes	84(28)	37(36)			21(19.6)		
No	217(72)	66(64)	7.343	.062	86(80.4)	7.343	.062
Class							
Junior	58(19.3)	86(83.5)			36(33.6)		
Senior	243(80.7)	17(16.5)	139.550	.000*y	71(66.4)	139.550	.000*y
Place of living							
Home	272(90.4)	103(100)			107(100)		
Hostel	29(9.6)	-	21.549	.000*y	-	21.549	.000*y
Difficulties with teachers							
Yes	60(20)	12(11.7)			18(16.8)		
No	241(80)	91(88.3)	3.906	.272	89(83.2)	3.906	.272
Prior visit to G. C							
Yes	126(42)	68(63.6)			40(37.4)		
No	175(58)	35(36.4)	22.749	.000*y	67(62.6)	22.749	.000*y

χ^2: Chi square; *: Statistically significant (i.e. p value < 0.05), Y: Yates Test.

participants (62.7%) were late adolescents between 15 and 19 years. Some students (n=37, 7.2%) had no awareness of the presence of guidance counsellors in their school, and 127 students (28.4%) were not willing to see one.

Nutritional status using anthropometric indicators
Underweight and overweight were observed

among 21% and 20% of the respondents respectively and obesity was found among 0.1% of the sample. Underweight and overweight had similar prevalence among boys and girls (Figure 1). The median height-by-age of both genders was comparable (Figure 2).

Factors associated with anthropometric indices
Overweight was associated with early

Table 4 Association of Stunting with Sociodemographic Variables

Variables		Stunting			p-Value
		No Stunting in Growth	**Stunting in Growth**	**Total**	χ^2 df
Class	Junior	176 (97.8%)	4 (2.2%)	180 (100%)	< 0.0001
	Senior	274 (82.5%)	58 (17.5%)	332 (100%)	25.497 df=1
Place of living	Home	439 (90.9%)	44 (9.1%)	483 (100%)	< 0.0001
	Hostel	11 (37.9%)	18 (62.1%)	29 (100%)	72.093 df=1
Age	Early Adolescence	191 (100.0%)	0 (0%)	191 (100.0%)	< 0.0001
	Late Adolescence	259 (80.7%)	62 (19.3%)	321 (100.0%)	45.592 df=1
Gender	Female	274 (100.0%)	0 (00.0%)	274 (100.0%)	< 0.0001 81.212
	Male	176 (73.9%)	62 (26.1%)	238 (100.0%)	df=1
Religion	Christianity	250 (87.7%)	35 (12.3%)	285 (100.0%)	0.894 0.018
	Islam	200 (88.1%)	27 (11.9%)	227 (100.0%)	df=1
Family Type	Monogamous	386 (89.8%)	44 (10.2%)	430 (100%)	0.003
	Polygamous	64 (78.0%)	18 (22.0%)	82 (100%)	8.886 df=1
Marital Status of parent	Married	398 (90.9%)	40 (9.1%)	438 (100%)	
	Not Married	10 (43.5%)	13 (56.5%)	23 (100%)	< 0.0001
	Others	42 (82.4)	9 (17.6)	51 (100%)	47.748 df=1
Father's Education	Educated	417 (87.2%)	58 (12.2%)	475 (100%)	0.802
	Not educated	33 (89.2%)	4 (10.8%)	37 (100%)	0.063 df=1
Mother's Education	Educated	408 (88.1%)	55 (11.9%)	463 (100%)	0.623
	Not educated	42 (85.7%)	7 (14.3%)	49 (100%)	0.241 df=1
Father's Employment Status	Employed	423 (87.6%)	60 (12.4%)	483 (100%)	0.376
	Unemployed	27 (93.1%)	2 (6.9%)	29 (100%)	0.785 df=1
Mother's Employment Status	Employed	422 (87.9%)	58 (12.1%)	480 (100%)	0.944
	Unemployed	28 (87.5%)	4 (12.5%)	32 (100%)	0.005 df=1

Table 5: Predictors of Stunting

Predictors	Adjusted odds ratio	95% C.I	P-value
Age (Early vs. Late adolescence)	19.81	0.00-[b]	0.99
Class (Junior vs. Senior)	-2.23	0.38-0.301	0.00*
Place of living (Home vs. Hostel)	-2.79	0.27-0.14	0.19
Gender (Male or Female)	20.16	0.00-[b]	0.99
Family type (Monogamous vs Polygamous)	-0.90	0.22-0.75	0.04*

adolescence (χ^2=68.054, p=0.000[y]) and residence at home (χ^2=21.549, p=0.000*[y]) (Table 3). Underweight was associated with older adolescence (χ^2=68.723, p=0.000[y]). Similarly, stunting was prevalent in late adolescence (p < 0.0001, χ^2 = 45.592) (Table 4).

Predictors of anthropometric indices

Logistic regression revealed that senior class and a polygamous background were predictive of stunting (Table 5). No variable was predictive of over- or underweight.
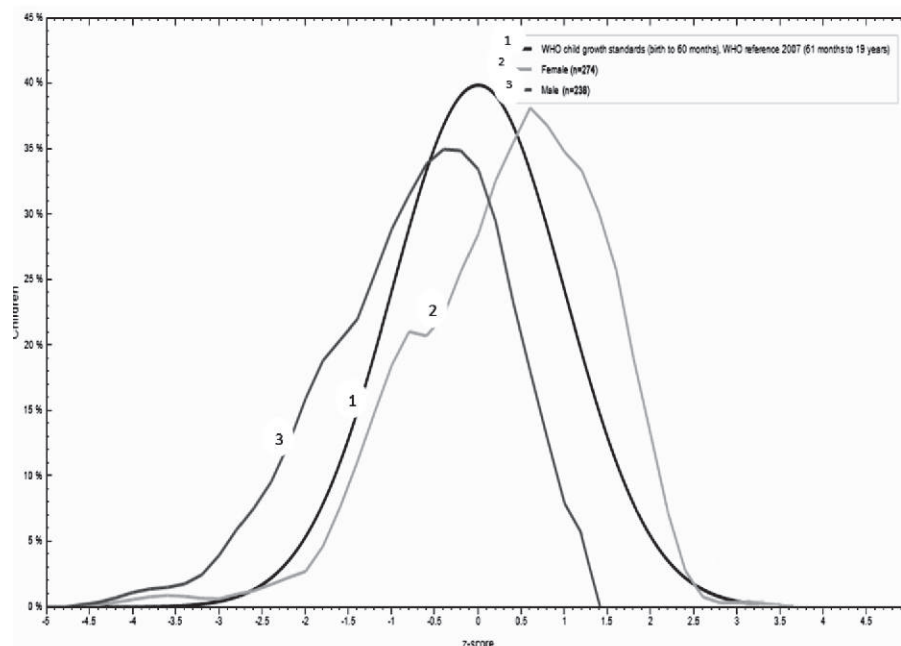
Figure 1: Participants (BMI) for age by sex compared with WHO (2007) standard
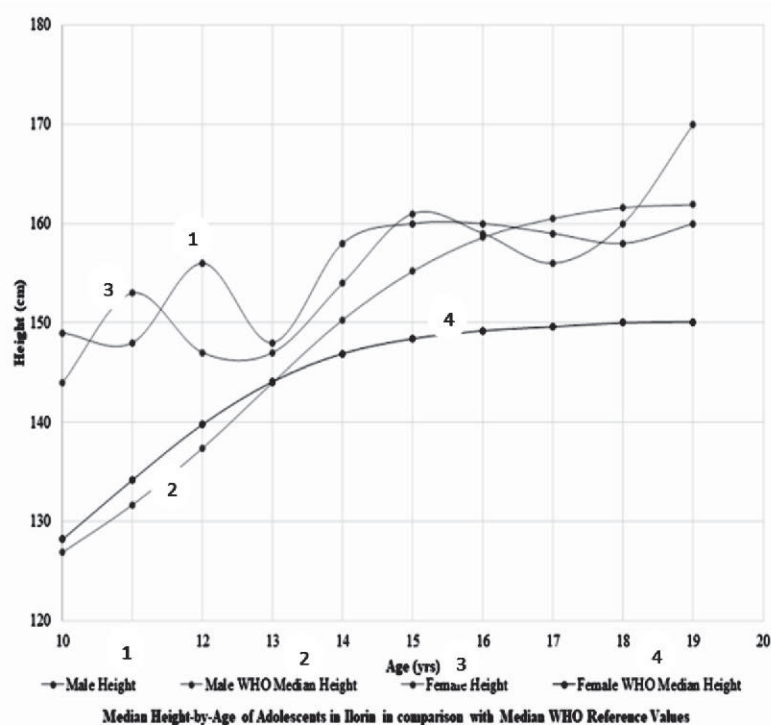

Figure 2: Median Height-by-Age of Adolescents in Ilorin in comparison with Median WHO Reference Values

24-Hour Dietary Recall

The food groups recalled were starchy food, legumes, meat/milk, vegetables, beverages, fats & oil and snacks. Rice was the staple meal, constituting 41.2% of starchy meals ingested; meat and eggs were the least consumed proteins, accounting for 9.3% and 10.7% respectively. Snacking was common, as reported by 89.5% of respondents. Lunch (56.8%) and breakfast (33.4%) were the more commonly skipped meals.

Discussion

The sample size was comparable with other studies from Nigeria[20] and Ghana.[21] The study setting mirrored other studies conducted in public schools.[22] Single-sex Nigerian schools have been surveyed previously.[20]

Undernutrition (underweight, stunting) and overnutrition (overweight) were observed with similar prevalence, reflecting "two faces of malnutrition".[23] It is a concern, as this pattern has been described as the

trend in developing countries since a nutrition transition began.[24,25]

One in five respondents was overweight and one respondent was obese. Overweight was more prevalent in south-south Nigeria. [13]The southern fattening diet was suggested as a cultural explanation[26]. Another plausible consideration is that these weight differences may have genetic underpinnings. Anthropometric measurements among Nigerian samples are known to vary with tribal and ethnic differences.[12,27]

Underweight was prevalent in this study. This confirmed previous findings from north-central Nigeria.[28,29] In northeast Nigeria, the prevalence was much higher.[30] The authors contextualized underweight in light of physical activity levels of the adolescents who were reportedly more active than their counterparts with normal weight or obesity. However, genetic influences may have been contributory. Broader considerations are poverty and the political unrest brought about by terrorist actions in that region, both of which may affect nutrition.

Factors associated with Overweight/ Underweight

Being overweight had no association with gender. This was surprising because it contrasted studies which have shown overweight to be prevalent among girls elsewhere in West Africa,[31] East Africa, [32] South Africa [33] and around the world.[34,35]

Our study did not replicate the association of mother's educational level with adolescents' nutritional status.[11,36]Nonetheless, the observed association with the family type and rearing environment emphasize the role of parents in encouraging good dietary habits among adolescents.

Stunting

Stunting was prevalent among boys.The nutritional status of boys in developing countries tends to be poorer than that of girls. [37] Stunting was prevalent in late adolescence and this agrees findings from an Ibadan study.[11]

Respondents whose parents were unmarried and those in polygamous family settings had a higher prevalence of stunting. This is congruent with the previous Ibadan study. [11] These family characteristics may represent disadvantaged situations in which adolescents' nutrition is compromised.

Dietary Habits

Very few adolescents had eaten meat the day before they were seen. This was congruent with the meal pattern in an earlier study where 40.2% of adolescents in Kwara had not taken fish or meat in the week before the interview and most of them ate eggs (boiled/fried) only 1 to 2 times in the week.[28]Similar findings were described among adolescents in

Cameroon, more than half of whom had less than the daily protein requirements.[38]This eating pattern may be a contributing factor to undernutrition.

Lunch was the most commonly skipped meal, followed by breakfast. Onyiriuka found breakfast as the most commonly skipped meal. [13]Some students skipped lunch because they were busy with extracurricular academic activities. Some skipped breakfast because they did not want to be late for school. Finance may have been a reason for some skipping meals.

Snacking was common among all adolescents, with buns being the commonest snack taken. Similar findings were described previously.[39,40]Previous studies have linked snacking and meal skipping with obesity. [13,41.] Further studies are required to confirm this connection in Ilorin.

Limitations

Micronutrient analysis may have provided additional information on the nutritional status. Findings from a 24-hour dietary recall should be interpreted with caution because the short duration provides limited information about dietary behaviour. Nonetheless, our study provides recent information about the nutritional status and dietary patterns of in-school adolescents in north central Nigeria.

Conclusion

Adolescents are in a crucial phase of physical and mental development. School feeding programs should be implemented to address improve protein consumption, discourage snacking and meal skipping, and reduce the prevalence of stunting, especially among boys. Nutrition is an integral part of school mental health and all stakeholders need to collaborate to secure the future of Nigerian adolescents.

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