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Adolescent malnutrition: Prevalence and pattern in Abuja Municipal Area Council, Nigeria

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Abstract Objective: To determine the prevalence and pattern of malnutrition among adolescents in senior secondary schools in The Abuja Municipal area council
Methods: Study design: this is a cross-sectional study conducted among adolescents (10-19 years) in secondary schools. A multi-stage sampling technique was employed to select a total of 1700 students from classes in selected schools. All schools in the Abuja Municipal Area council (AMAC) were stratified into urban and rural schools. Eight schools were selected by balloting from a list of schools obtained from the Education centre. A school was selected from each of the four major districts of AMAC and four schools were selected from the rural making a total of 8 schools. Although the consent of the school authorities was obtained, individual subject also consented to the study before being enrolled. The study excluded those adolescents who were physically challenged thus limiting physical activity. Information was obtained via the use of questionnaires that were administered by trained personnel. Subject's height and weight was taken using the floor-type height (H) and weight (W) measuring scale model ZT-120 using Massachusetts department of public health protocol. The nutritional status was determined using the

formula: $BMI = W/H^2$, where W = weight (in kilograms) and H = height (in meters). The age and sex specific height and BMI percentile for each subject was determined using the 2007 WHO Height and BMI growth charts for age 5-19 years. The students were then classified into one of the following categories using previously used standards: normal, stunted, wasted, overweight or obese. Data was analyzed using SPSS version 17 statistical package.

Results: The mean age was 14.43 ± 1.94 years; male 688, female 862, M:F ratio 1.1.3. Mean BMI, weight and height were $20.31 \pm 3.07 \text{ kg/m}^2$, 51.07 ± 10.80 kg, and 157.88 ± 9.33 cm. The prevalence of wasting, stunting, overweight and obesity was documented as 1.7% (27/1550), 11.3% (175/1550), 13.2% (205/1550), and 2.6% (41/1550) respectively. Those in urban schools had higher mean BMI ($20.91 \pm 3.22 \text{ kg/m}^2$ versus $19.71 \pm 2.78 \text{ kg/m}^2$) and height (160.41 ± 9.14 cm versus 155.32 ± 8.81 cm) and p values < 0.05 .

Conclusion: There is a double burden of over-nutrition (overweight and obesity) and under-nutrition (stunting and wasting) among adolescents in Nigeria.

Key words: Adolescent, malnutrition, school population

Introduction

Globally there are about 1.2 billion adolescents and 85% of these adolescents live in the developing countries.^{1,2} According to the United Nations International Children Education Fund (UNICEF) estimates, 23% of the Nige-

rian population are adolescents (10-19 years).³ Malnutrition is a group of pathological disorders resulting from imbalance between intake of essential nutrients and the body's demand for them.⁴ Malnutrition is a global problem but the prevalence and pattern differ between nations and even within regions in the same

country.^{4,5} In the developed countries over-nutrition (obesity and overweight) is a major concern while in most developing nations under-nutrition predominates.⁶ Identified nutritional problems among adolescents include wasting, stunting, overweight, obesity and micronutrient deficiencies.^{6, 7}

Adolescence, characterised by rapid growth and development, is therefore accompanied by increase requirements for nutrients. When these increase needs are not met under-nutrition results.^{8,9} A previous (WHO) report showed that under-nutrition was widespread among Nigerian adolescents. Sixteen percent (16%) of adolescents in rural area were reported to be wasted compared to 8% in the urban area. Stunting was also reported to be more frequent in rural area.⁹ Significantly higher prevalence of under-nutrition was reported in many other developing countries, 23% in Benin, 36% in Nepal and 56% in India.⁹ Globally there are reports of increasing prevalence of obesity and overweight and the association with non-communicable disease especially cardiac deaths and morbidity.^{6,7}

Some determinants of malnutrition include area (rural versus urban), socioeconomic status, lifestyle including alcohol and tobacco use, eating habits and level of physical activity in an individual.⁶⁻¹¹ The association of malnutrition with increased mortality and morbidity in childhood is well understood.^{5,12} In adulthood, there is a higher burden of Type II Diabetes Mellitus (DM), hypertensive heart diseases, coronary heart diseases, colonic cancers and other disorders in obese and overweight individuals.⁶⁻⁹ Malnutrition in childhood through adolescence may progress to adult life. More importantly there may be factors that influence malnutrition e.g. eating habits and low physical activities that start in adolescence and persist into adulthood, thus increasing the burden of non-communicable diseases (NCDs) among the population.

There is a dearth of data on nutritional status in Nigerian adolescents. The global economic recession, adoption of sedentary lifestyle, the advancement in technological development and changing eating habits are some of the reasons to believe that there are changes in the nutritional status of Nigerian adolescents and their current status may be very different from the findings more than a decade ago.⁹ This cross-sectional study was therefore designed and conducted to determine the prevalence and pattern of malnutrition among Nigerian adolescents using in-school adolescents as the target population.

Materials and Methods

Study design: this study is a cross-sectional study conducted among adolescents in secondary schools
Study area: the study was conducted in the Abuja Municipal area council in the Federal capital territory of Nigeria.

Sampling technique: a multistage sampling was employed in this study. All schools in the Abuja Municipal Area council (AMAC) were stratified into urban and rural schools. Eight schools were selected by balloting from a list of schools obtained from the Education centre. A school was selected from each of the four major districts of AMAC and four schools were selected from the rural making a total of eight schools.

Study population: only students who were verified (using school records and/or birth certificate) to be between the ages of 10 and 19 years were selected. Although the consent of the school authorities was obtained, individual subject also consented to the study before being enrolled. The study excluded those adolescents who were physically challenged thus limiting physical activity.

Sample size determination was done using the approach described by Araoye et al.¹³ The study assumed a prevalence of 50% among adolescents in the population. Eight hundred and fifty students were selected from the four urban schools and an equal number were selected from the rural schools. The total number of study subjects was 1,700.

Multistage random sampling was employed for the selection of students from the classes in each school. Information was obtained via the use of questionnaires that were administered by trained personnel. Subject's height and weight were taken in the presence of a chaperon assigned by the school. The floor-type height (H) and weight (W) measuring scale model ZT-120 was used for measurement using Massachusetts department of public health protocol. The nutritional status was determined using the formula: $BMI = W/H^2$, where W = weight (in kilograms) and H = height (in meters). The age and sex specific height and BMI percentile for each subject was determined using the 2007 WHO Height and BMI growth charts for age 5-19 years. The students were then classified into one of the following categories using previously used standards: normal, stunted, wasted, overweight or obese. The socioeconomic status of the students was determined by a method described by Olusanya et al based on the educational attainment of the mother and father's occupation.¹⁴ Data was analyzed using SPSS version 17 statistical package.

Results

Sociodemographic parameters

The overall sample size was 1,700 but 1550 (91.2%) questionnaires were analyzed because of withdrawal of consent in 150 (8.8%). There were 688 (44.4%) males and 862 (55.6%) females and the Male: Female of 1:1.3. The mean age of the study population was 14.43 ± 1.94 years. The students in middle adolescence (14-16 years) were 818 (52.7%) of the sample; early adolescence (10-13 years), 500 (32.3%) and 232 (15.0%) late adolescence. Seven hundred and eighty (50.3%) were from

urban schools while the rest were selected from rural schools. The ethnic groups represented in the sample were Igbo (29.7%), Yoruba (19.7%), Hausa (6.6%) and others (Gbagyis, Fulanis, Nupes, Ebiras) 44%. The upper social class represented 708 (45.7%) of the study population; 542 (35.0%) were in the middle class and 300 (19.3%) in the lower class. In the urban area, 502 (64.4%) belong in the upper class and 68 (8.7%) in the lower class. In the rural area 206 (26.8%) and 232 (30.1%) belong in upper and lower class respectively. These differences were statistically significant $p < .05$.

Nutritional status of the adolescents

The mean weight, height and BMI of the adolescents are 51.07 ± 10.80 kg, 157.88 ± 9.33 cm, 20.30 ± 3.07 kg/m².

Table 1 below shows the distribution of the anthropometry among the study population.

Table 1: Distribution of mean weight, height and BMI for the study population

Age (years)	No	Mean weight (kg)	Mean Height (cm)	Mean BMI (kg/m ²)
10	23	34.87±5.05	143.00±7.72	16.97±1.36
11	83	40.35±8.31	147±7.78	18.34±2.74
12	170	42.82±8.22	150.64±7.15	18.70±2.64
13	224	47.55±9.56	155.10±7.93	19.62±2.84
14	290	50.26±10.23	156.94±7.98	20.30±3.12
15	287	53.76±9.21	160.56±7.45	20.81±2.90
16	241	56.18±9.53	163.00±8.37	21.09±2.87
17	138	57.65±7.89	163.05±8.22	21.71±2.97
18	84	59.52±8.81	164.29±7.82	21.95±2.86
19	10	57.60±6.42	163.70±5.24	21.73±1.87
Total	1550	51.07±10.80	157.88±9.33	20.31±3.07

The mean BMI, weight and height for males were 19.60 ± 2.71 kg/m², 50.81 ± 11.85 kg and 160 ± 11.14 cm respectively. The mean BMI, weight and height in females were 20.89 ± 3.22 kg/m², 51.28 ± 9.87 kg, 156.19 ± 7.16 cm respectively ($p < 0.000$). The parameters show statistically significant differences $p < 0.05$ and also statistically significant differences when disaggregated for the urban and rural schools as shown in Tables 2 below.

Table 2: Mean BMI, weight and height for male and female adolescents by school setting

Mean	Males		Females	
	Urban	Rural	Urban	Rural
BMI (kg/m ²)	20.20±2.90	19.10±2.40	21.30±3.30	20.30±3.00
Weight (Kg)	50.60±12.0	47.10±10.3	53.20±9.90	48.90±9.30
Height (cm)	165.10±10.40	156.10±10.00	157.50±6.80	154.60±7.30

The overall prevalence of any type of malnutrition in the sample population was 28.8% i.e. 448 adolescents. The type of malnutrition and prevalence in the population is shown in table 3 below.

Table 3: Pattern of malnutrition among adolescents studied

Malnutrition type	Total No (%)	Male No (%)	Female No (%)	Odds ratio	X ²	Df	p-value
Stunting	175 (11.3)	127 (18.5)	48 (5.6)	3.839	63.4	1	0.000
Wasting	27 (1.7)	18 (2.6)	9 (1.0)	2.545	5.52	1	0.019
Over-weight	205 (13.2)	52 (7.6)	153 (17.7)	0.379	34.6	1	0.000
Obesity	41 (2.6)	16 (2.3)	25 (2.9)	0.797	0.49	1	0.484
Total	448 (28.8%)	213 (31.0)	235 (27.2)		1		

Discussion

Adolescent malnutrition has been reported from several parts of the world.^{1-6,15,16} An earlier report by WHO from this country documented essentially under-nutrition which was more frequent among adolescents in rural areas than those in urban area. In that report 10% of rural adolescents girls were stunted and 5% in urban areas were stunted. The prevalence of wasting was 8% and 16% in urban and rural areas respectively in the same report.¹ The current findings are different from the earlier reports in that it documented a double burden of malnutrition: a high prevalence of overweight (13.2%) and stunting of 11.3%. Indeed, overweight is the most prevalent form of malnutrition among the adolescents studied. The mean BMI and weight for adolescent females is higher than those for males while the height of adolescent males is higher than that of females. These differences were statistically significant. The observed higher BMI in females may be because of the effect of oestrogen which leads to more accumulation of adipose tissue. Furthermore, females are less likely to engage in outdoor physical activities compared to their female counterparts in this part of the world. With respect to the males, they have a longer duration of growth spurt than the females hence likelihood to have a higher final height as observed in this study.

The prevalence of overweight and obesity found in this study was higher compared with previous reports from Nigeria.¹⁷ This may be related to the higher socioeconomic class of the adolescents in this study because half to two-third of the adolescents were in the upper social class. The study by Owa *et al* documented a higher prevalence of obesity and overweight among children 5-15 years in an essentially affluent population.¹⁸ These findings of rising obesity and overweight among adolescents and children are in keeping with findings from other developing countries as well as what has been documented for developed countries.^{6,15,16} The higher prevalence of overweight and obesity among the females in this study is in agreement with previous studies from Nigeria.^{17,18} This may be because female adolescents are less likely to engage in outdoor physical activities in our setting compared to the males. They may also have more access to food and snacks as they are more likely to be involved in the preparation and serving of food in the household in our setting. Female adolescents may also skip meals and therefore end up snacking and

consuming high calorie drinks more than their male counterparts. Overall overweight and obesity were more prevalent among adolescents in urban schools from upper social class. This translates to probability of higher access to food and snacks and likely due to less physical activities including household chores. The fast food revolution (as both parents work leaving little room for home cooking), easy access to cheap sweetened drinks, and sedentary activities like watching television, playing video games may have all contributed to the increasing levels of over-nutrition. These factors more likely affect adolescents in urban areas compared to those in rural areas where there is limited access to fast food and even internet.

Stunting was commoner among those from rural schools and among males. This may be due to lower socio-economic status of the students in the rural schools compared to those in the urban schools. Poor nutritional knowledge, low maternal education, and higher physical burden like hawking may all contribute to the higher levels of stunting in rural areas though were not investigated in this study.

When factors that affect nutrition are persistent, the effects are best seen in the final height of individuals. Male adolescents, who have a longer period of growth spurt, compared to the females are more likely to manifest stunting more frequently compared to females in the event of chronic malnutrition, hence the current observation.

The association between malnutrition in childhood and increased mortality and morbidity is well documented.^{12,19} The association between over-nutrition and metabolic syndromes and increased mortality and morbidity from non-communicable diseases (NCDs) in adulthood is also well documented.^{6,20} The effect of malnutrition among adolescents is less well studied. It is plausible to assume that over-nutrition in adolescents may progress into adulthood with similar health conse-

quences. These effects are likely to add on to the increasing burden of NCDs in developing countries if efforts are not made to control malnutrition among adolescents. There is a need for more broad-based research into adolescent malnutrition including associated factors - causal and related- and consequences both short and long term. This information will help in the design of preventive and interventional programmes on individual, family and community levels.

Conclusion

The double burden of under-nutrition and over-nutrition exists in an epidemic proportion among the adolescent population. Overweight among females is the most prevalent form of malnutrition documented.

Authors' contributions

AAA and OAT: Developed the conceptual frame work for the study, prepared the study questionnaire, and participated in data analysis and preparation of final draft.

OAT: Data collection from the schools.

AP and SDR : Reviewed the questionnaire, data collection and data analysis.

Conflict of interest: None

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