



Burden of Under-Nutrition amongst Adolescents in Uyo Urban Community, Akwa Ibom State, Nigeria

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ABSTRACT: This study investigates the burden of under-nutrition amongst adolescents in Uyo Urban community in Akwa Ibom state, using standard methods and conducted between June 2017 and May 2019 amongst adolescents aged 10-18 years in secondary schools in Uyo by measuring weight, height, as well as determination of BMI Z-scores and Z-scores of height of children. Data obtained revealed that 167(9.8%) of the total respondents were stunted while 219(12.9%) were wasted. 101(60.8%) of the males were stunted while 66(39.8%) of the females were wasted. There was a significant association between the age, sex and under-nutrition ($p=0.007$). This study showed a high prevalence of stunting and wasting amongst adolescent in Uyo.

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Adolescence is a transitional developmental period that begins with the onset of physiologically normal puberty and ends when adult behavior or identity has been attained. It typically spans between the ages of 10-19 years. (Dominic *et al*, 2003; Lempens *et al*, 1999). The World Health Organization estimates that there are about 1.3 billion adolescents worldwide (WHO, 2021) Adolescence is generally regarded as a healthy period, although some important health or social problem begins or peaks during this period. (Park *et al*, 2014) Nutritional and weight problems are part of these problems. (Spear *et al*, 2000). Nutrition is critical during adolescence for a plethora of reasons. (Spear *et al*, 2000) The growth during adolescence is faster than any other period of life. The rapid growth requires increased quantity as well as good quality of nutrients to meet the growth needs. (Spear, BA *et al*, 2000). In addition, there may be socio-cultural factors, lifestyle changes, and food preferences that can affect both nutrient intake and needs during adolescence. (Spear, BA *et al*, 2000) It is thus important that adolescence should have healthy eating habits to maintain optimal growth and intellectual development. (CDC, 1996). Poor dietary habits like skipping meals, increased consumption of fast-foods,

carbonated and sweetened beverages, and decreased consumption of food and vegetables have been noted amongst adolescents. (Onyiriuka *et al*, 2013; Adu *et al*, 2009, Otunaye *et al*, 2008) Various forms of under nutrition have been associated with these poor dietary habits, which in turn increase prevalence of chronic non-communicable diseases amongst adolescents. (Amon, *et al*, 2008) The association between malnutrition in childhood and increased prevalence of non-communicable diseases in adulthood is well documented. (WHO, 2021). Previous studies have reported increased prevalence of under-nutrition amongst Nigerian adolescents. (Owa, JA *et al*, 1997) In 2008, Olumakaiye in Osun state reported the prevalence of underweight malnutrition amongst adolescents to be as high as 20.1% (Olumakaiye *et al*, 2008) while Abdulkareem *et al* in 2014 reported the prevalence of wasting and stunting amongst adolescents in Abia to be 1.7% and 11.3% respectively. (Black *et al*, 2013). Similar findings of undernutrition have been reported in other developing countries. (Black *et al*, 2013; WHO, 2020). There is a dearth of information on adolescent undernutrition in Uyo, Akwa Ibom state, despite the burden of malnutrition in Nigeria. Thus, this study was

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conducted to determine the prevalence and patterns of under-nutrition amongst adolescents in secondary schools in Uyo.

MATERIALS AND METHODS

Study Area: This study was conducted between June 2017 and May 2019 amongst adolescents aged 10-18years attending public and private secondary schools in Uyo. Uyo is the capital of Akwa-Ibom state, and has an estimated population of about 847,500 and 11 political wards.(FGN,2017).At the time of sample collection, there were 145 secondary schools (14 public and 131 private) in Uyo. (FGN, 2017).

Sample Size Determination: Minimum Sample size was determined using the formula for calculating prevalence with a population prevalence set at 50% and degree of precision of 3 %.(Araoye, 2003; Nainget *al*, 2006). A total of 1701 students were enrolled for the study. Six wards were selected for the study by simple random sampling. Twelve schools (one public and one private) were selected from these six wards by simple random sampling.

Ethical Approval: Ethical approval was obtained from the institutional health review board of the university of Uyo teaching hospital. Permission was also obtained from the Akwa-Ibom state ministry of health and the respective school principals. Written informed consent were obtained from the parents of the students and assent from the students.

Data Collection: Height of the students was measured using a collapsible stadiometer, while weight was measured using a digital scale.

BMI was calculated using the formula (Hall, *et al*, 2006);

$$BMI = \frac{wt (kg)}{(height)^2 m^2}$$

Information about socio-demographics, lifestyle (feeding/exercise involvement) were obtained from the students using a pretested questionnaire. Socioeconomic class of parents was determined using Oyedeji's classification. (Oyedeji, *et al*, 1985)

Data Analysis: All data obtained were grouped and arranged into tables, and analyzed using the statistical package for social sciences (SPSS version 20) Stunting was defined as height for age Z-score \leq -2SD from the median for age and sex, while wasting was defined as BMI Z-score \leq -2SD for the median for age and sex.(WHO,2021). Chi-square was used to determine the relationship between qualitative

variables. Statistical significance was set at p values less than 0.05

RESULTS AND DISCUSSION

The socio-demographic characteristics of 1701 students that participated in the study are presented in table 1. Five hundred and eighty (34.1%) of the respondents were aged 10 – 12 years' old and 981 (57.7%) were females. Most, 1692 (99.5%) were Christians while 9 (0.5%) Muslims participated in the study. Majority, 1385 (81.4%) were Ibibio by tribe while smaller proportions of Igbo, Efik and Enang respondents participated (117 (6.9%), 65 (3.8%), 59 (3.5%) respectively). Nine hundred and ninety-six (58.6%) of the respondents were of the upper socioeconomic class and 253 (14.9%) were classified as lower socioeconomic class. Theanthropometric measurements are presented in table 2.The mean height of the respondents was 1.57 ± 0.1 metre, mean weight of 48.9 ± 10.1 kg and BMI of 19.5 ± 3.1 kg/m².Factors associated with stunting are presented in table 3

Table 1: sociodemographic characteristics of respondents

Variable	Frequency	Percentage
Age group		
10-12 years	580	34.1
13-15 years	577	33.9
16-18 years	544	32.0
Sex		
Male	720	42.3
Female	981	57.7
Religion		
Christianity	1692	99.5
Islam	9	0.5
Tribe		
Ibibio	1385	81.4
Igbo	117	6.9
Efik	65	3.8
Enang	59	3.5
Oro	45	2.6
Yoruba	20	1.2
Hausa	10	0.6
Socioeconomic class		
Upper class	996	58.6
Middle class	452	26.5
Lower class	253	14.9

Table 2: Anthropometric characteristics of respondents

Variable	Mean \pm SD	Range
Height	1.6 \pm 0.1	1.9-1.3
Weight	48.9 \pm 10.1	68.5 - 36.9
BMI	19.5 \pm 3.1	28.3 - 16.6

One hundred and forty-eight (67.6%) of the respondents aged 10 – 12 years were wasted compared to 22 (10.0%) of those aged 16 – 18 years.

Table 3: Factors associated with stunting among the respondents

Variable	Height		χ^2 (p value)
	Normal	Stunting	
Age group			
10-12	467 (30.5)	113(67.7)	99.88(0.001) *
13-15	536(34.9)	41 (24.5)	
16-18	531(34.6)	13(7.8)	
Sex			
Male	619(40.4)	101(60.5)	24.17(0.001) *
Female	915(59.6)	66(39.5)	
Socioeconomic status			
Upper class	908(59.2)	88(52.7)	3.93(0.14)
Middle class	397(25.9)	55(32.9)	
Lower class	229(14.9)	24(14.4)	
Frequency of feeding			
Less than 3	769(50.1)	80(47.9)	3.34(0.19)
3-5 times	659(43.0)	69(41.3)	
Greater than 5 times	106(6.9)	18(10.8)	
Family setting			
Married	1300 (84.7)	150(89.9)	3.78(0.29)
Divorced	85 (5.6)	5(3.0)	
Single	46(3.0)	5(3.0)	
Widowed	103(6.7)	7 (4.1)	
Hours on TV/Games (screen time)			
Less than 2 hours	742(48.4)	81(48.5)	2.51(0.47)
2-4 hours	481(31.4)	53(31.7)	
4-8 hours	186(12.1)	15(9.0)	
Greater than 8 hours	125 (8.1)	18(10.8)	
Exercise Involvement			
Daily	639(41.7)	77(46.1)	1.27(0.52)
3 times a week	568(37.0)	56(33.5)	
Less than 2 times a week	327(21.3)	34(20.4)	

*Significant

Table 4: Factors associated with wasting among the respondents

Variable	Weight		χ^2 (p value)
	Normal	Wasting	
Age group			
10-12	432(29.1)	148(67.6)	130.34(0.001) *
13-15	528 (35.7)	49 (22.4)	
16-18	522(35.2)	22(10.0)	
Sex			
Male	591(39.9)	129(58.9)	27.52(0.001) *
Female	891(60.1)	90(41.1)	
Socioeconomic status			
Upper class	878(59.2)	118 (53.8)	3.77(0.15)
Middle class	382(25.8)	70(32.0)	
Lower class	222(15.0)	31 (14.2)	
Frequency of feeding			
Less than 3	741(50.0)	108 (49.3)	3.98(0.14)
3-5 times	640(43.2)	88(40.2)	
Greater than 5 times	101(6.8)	23(10.5)	
Family setting			
Married	1257(84.8)	193(88.1)	2.06(0.56)
Divorced	82(5.5)	8(3.7)	
Single	46(3.1)	5(2.3)	
Widowed	97(6.5)	13(5.9)	
Hours on TV/Games (Screen time)			
Less than 2 hours	715(48.2)	108(49.3)	2.02(0.57)
2-4 hours	464 (31.4)	70(32.0)	
4-8 hours	181(12.2)	20(9.1)	
Greater than 8 hours	122(8.2)	21(9.6)	
Exercise indulgent			
Daily	611(41.2)	105(47.9)	3.66(0.16)
3 times a week	550(37.1)	74(33.8)	
Less than 2 times a week	321(21.7)	40(18.3)	

*Significant

The association between the respondents age and their weight was statistically significant ($p = 0.001$). One hundred and twenty-nine (58.9%) of the males were stunted compared to 90 (41.1%) of their female counterparts.

This finding was also statistically significant ($p = 0.001$). There were no statistically significant relationships between the respondents' socioeconomic status, feeding frequency, family setting, screen times, and exercise with their weight. One hundred and thirteen (67.7%) of the respondents aged 10 – 12 years were stunted compared to 13 (7.8%) of those aged 16 – 18 years. The association between the respondents age and their height was statistically significant ($p = 0.001$). Factors associated with wasting among the respondents are presented in table 4. One hundred and one (60.5%) of the males were stunted compared to 66 (39.5%) of their female counterparts. This finding was also statistically significant ($p = 0.001$). There were no statistically significant relationships between the respondents' socioeconomic status, feeding frequency, family setting, screen times, and exercise with their height. This study assessed the prevalence of malnutrition and the predisposing factors among adolescents. Malnutrition has proven to be a persistent problem which has been on the increase despite millions of funds invested in nutrition even in Nigeria. According to the 2016-2017 Multiple Indicator Cluster Survey (MICS) report, marginally more Nigerian children under the ages of five are suffering from acute malnutrition (increasing from 10.2% to 10.8% from 2016 to 2017, respectively) (NDHS, 2018). Chronic malnutrition (stunting) on the other hand has been on the decrease worldwide with 1 in 3 children stunted in a 2017 study (NDHS 2018)

Based on this problem, our study was done in Nigeria and showed a prevalence of acute malnutrition (wasting) as 12.8% i.e. 1 in 8 adolescents is wasted. Chronic malnutrition prevalence was 9.8% among the adolescents i.e. 1 in 10 of them is stunted. This improvement is not in isolation and could be the outcome of relentless efforts by government and well-meaning organizations at combating malnutrition, however there is still more to be done. Multiple studies have been done in different parts of Nigeria at different time frames showing varying but higher prevalence of wasting and stunting. (Abdulkarim *et al*, 2019; Odiong *et al*, 2021).

The NDHS 2018 gave a very high prevalence of malnutrition in Nigeria at 41% with 6.9% prevalence in South-South each for stunting and wasting which is comparable but lower than the finding of our study. This high National prevalence was gotten by pooling the proportions from other regions where the North West alone had a prevalence of 38.4% and 33.9% for stunting and wasting respectively. The NDHS 2018 low prevalence of 6.9% was gotten from the whole south-south region and in comparison with our study, may be because of the significantly higher standard of living in the nearby metropolitan cities of Benin, Port Harcourt, Warri, and Asaba. This higher proportion suffering from acute malnutrition in our study from Uyo would mean higher incidence of complications of malnutrition such as reduced immunity and increased infection rates and also increased severity of otherwise mild diseases thus continuing the infection-malnutrition cycle. (Introduction to malnutrition, 2021) This may not translate to increased hospital visits or admissions as many people use alternative treatment methods such as traditional medicine attendants, self-medication and local chemists. Chronic malnutrition is likely to result due to poor treatment of the acute malnutrition and poor awareness besides other researched causes of inappropriate dietary choices, a low income, difficulty obtaining food etc. (WHO, 2021) Chronic malnutrition can lead to more long-term problems of impaired intellectual development and heart failure. (Introduction to malnutrition, 2021) More targeted efforts such as public education exercises and training of traditional attendants and community stakeholders would need to be employed. Traditional birth attendants are an indispensable resource of information for new mothers, especially those who cannot make it to the nearest health facility. Another potential action against malnutrition is the mother-to-mother support groups to spread the message about breastfeeding and also child nutrition. This was adopted by Action against Hunger in Somalia and can be used also here in the battle against malnutrition. (Action against hunger, 2021) Similar

studies in Nigeria show varying prevalence. A study done in 2021 gave an overall prevalence of stunting and wasting was 5.4% and 9.6% respectively (Odiong *et al*, 2021). This study, though it was done in the same study area, employed 5 – 10 year old participants compared to our study that involved respondents aged 10 – 18 years. The lower proportions are encouraging and signals a bright future for the youths in the state. This could be the result of the long fight against malnutrition by government and well-meaning non-governmental organizations. It could translate into lower incidences of malnutrition at older ages and its attendant benefits.

Many studies done on the age group of 10 – 18 years note a double burden of malnutrition (over nutrition and undernutrition) which was not observed in our study. A similar study done in Gombe and Uyo between 2015 and 2017 noted 6.8% were under nourished and 12.4% were overweight/ obese. (Wariri, *et al*, 2020) This finding is also lower than the undernutrition prevalence in our study which may be an indication of worsening nutritional profile in the state. None of the participants in our study were overweight/obese in this study compared to earlier reports. (Wariri *et al*, 2020; Yusuf *et al*, 2021) This is however in keeping with the trend of malnutrition in the developing countries. This finding may not be entirely related to the level of poverty but perhaps, the genetic make-up of the members of the community. Multiple other previous studies done in Southern Nigeria show lower prevalence of undernutrition. (Abdulkaram *et al*, 2019; KolaRaji *et al*, 2017; Uwakwe *et al*, 2019). The number one cause of malnutrition worldwide is poverty; however multiple other factors have been implicated. This study showed that malnutrition was highest at younger age groups (10 – 12 years). This is usually the early stages of puberty. Puberty triggers a growth spurt, which increases nutritional needs which have to be provided during this critical period of rapid growth otherwise there would be an imbalance in the energy demand and supply mechanism. (Soliman *et al*, 2014) It could manifest as undernutrition at this age group. This finding is corroborated in recent literature. (WHO, 2021) Armed with the knowledge of the implicated age group, community interventions can be channeled to curb this menace of malnutrition in schools and in the community as a whole. A school policy employing a targeted approach may be required by providing supplemental rations only for malnourished children meeting program cut-off criteria. Education of parents of these malnourished children may help to improve the intake of adequate nutrients (locally made therapeutic foods) among these children. This education would include dietary advice, health care

and social services. Males were more likely to be malnourished compared to their female counterparts in Uyo. This is corroborated by the Odiong's study in 2021 and other literature.(Abdulkaram *et al*,2019; Odiong, *et al*, 2021) This is expected as during puberty, males on the average grow taller and gain more weight compared to females and thus the expected weights and heights for age are usually higher. (Loomba-Albrecht *et al* 2009)This does not imply that females should be left out of malnutrition interventions but rather more efforts should be in place in identifying malnutrition cases early and treatment started. Social class has been implicated by multiple studies as predicting malnutrition, (Abdulkaram *et al*, 2019; Ismail *et al*, 2020; Adeomi *et al*, 2021) this is not the case in our study. Food is known to be cheap in our study area and the multiple decade long interventions against malnutrition has improved knowledge of dietary patterns that reduce the incidence of malnutrition. Thus it is not surprising that even in poverty, the children are not malnourished. Malnutrition is a worldwide problem but its management has to model based on the peculiarities of the place where these adolescents are, which schools they attend, the costs of feeding, religious and cultural practices. Although money is important, it shouldn't replace health and dietary education as there is a saying "You give a poor man a fish and you feed him for a day. You teach him to fish and you give him an occupation that will feed him for a lifetime".

Conclusion: This study shows a high prevalence of wasting and stunting amongst adolescents in secondary schools in Uyo.

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