A Community Based Study of the Antropometric Indices of Adolescent School Girls in Oshimili Local Government Area of Delta State, Nigeria.

M. U. Ibekwe* A. A. Okolo * R. C. Ibekwe*

SUMMARY

Background: Detecting malnutrition among adolescent girls is important because of its critical role in maternal and perinatal mortality. This study was done to asses the nutritional status of adolescent school girls in Oshimili Local Government Area of Delta State, Nigeria using anthropometric parameters.

Method: Anthropometric indices of one thousand and sixty eight girls (1068) aged 10 to 19 years from eight public secondary schools in Oshimili local government area of Delta State, Nigeria were assessed using height ,weight, skin fold thickness {Body fat % (BF%) and Body fat Kg (BF Kg) } and body mass index(BMI). Centile curves were estimated using Cole's LMS method. The mean height and weight of girls studied were compared to the National Center for Health Statistics (NCHS) international reference standard. The height and weight centile curves of the girls studied were matched with NCHS centile curves.

Results: There were no significant differences in the mean height ($p>0.05$), mean weight ($p>0.05$), BMI ($p>0.05$), BF% ($p>0.05$) and BF (kg) ($p>0.05$) between the urban and rural girls studied. The mean weight of rural girls ($p<0.05$) and urban girls ($p<0.05$) were significantly lower than the mean weight of NCHS standard. The height of the girls was not significantly different from the NCHS standard both among rural ($p> 0.05$) and urban ($p>0.05$) girls. Also the weight centile curves of the whole girls studied were consistently lower at each weight centile curve of NCHS when matched.

Conclusion: The adolescent schoolgirls in this study site weighed significantly lower than the NCHS international reference standard. There is need for improved nutrition targeted at adolescent girls in these Nigerian communities.

Niger Med J. Vol. 49, No. 4, Oct – Dec, 2008: 91 – 95.

Keywords: **Community based, anthropometric, adolescent, school girls, Delta State.**

INTRODUCTION:

Adolescence is characterized by dramatic growth and development physically, mentally emotionally and socially.[1] Malnutrition is an important part of a complex widespread problem of poverty and deprivation affecting millions of adolescents, especially in developing countries. [2,3]

Severe protein energy malnutrition affects mainly pre School children with result that only some of them survive to reach adolescent. At this stage the malnutrition tend to be mild and chronic, only being detectable by anthropometric measurement.[2,3] Malnutrition and poor growth in adolescent girls is critical because those who fail to attain their full growth potential are at increased risk of obstetric complications and having low birth weight babies with increased perinatal mortality. [4,5]

There are few Nigerian studies on nutritional assessment of adolescent girls, Cole[6] reported that 68.2% of adolescent school girls were under weight but this finding was limited by the small sample size (22) of his subjects and the fact that these subjects all reside in the hostel and may not reflect the conditions in the community. Brabin[7] working in south eastern Nigeria in 1993 reported height and weight values lower than the British 1990 reference values and postulated that this was a reflection of the influence of adverse socioeconomic conditions on health and nutrition. However, these values were not the American NCHS data which was the reference standard recommended by the World Health Organization expert committee for comparison in developing countries.[8] Brabin[7] also noted that the mean height of the girls were lower than values obtained in 1986 by Didia and Ogunranti[9] in a similar environment and attributed this to the worsened economic situation in the country. It will be interesting to observe the trend 13 years after.

This study aims to evaluate nutritional status of adolescent school girls in urban and rural areas in a Nigerian community using height, weight, skin fold thickness and body mass index, and to compare them to NCHS international reference standard.

SUBJECTS AND METHODS

Study area

The study was done in the communities of Oshimili North and South Local Government Areas of Delta State, South south Nigeria. Oshimili LGAs were chosen because they contain both urban and rural areas that were readily accessible. The definition of rural and urban was done using predetermined criteria.[10] Oshimili LGAs has a projected population of 143679 and is located on the West Bank of River Niger.[10] It shares borders with Ogwashiuku and Onitsha in Anambra State. The inhabitants are made up of both indigenous population who are Ibos and settlers from other parts of Nigeria. Their chief occupation is fishing, though farming is also common. The rural areas are underresourced with inaccessible roads, irregular supply of pipe borne water, while the urban areas enjoy good amenities.

From:* Department of Health Sciences Ebonyi State University Abakaliki Ebinyi State. +Department of Child Health University of Benin Teaching Hospital Benin, Edo State, Nigeria.

Correspondence: Mary-Ann U. Ibekwe
E-mail: - ugochiamadife@yahoo.com Telephone: - 2348033423291

Sample size and sampling technique:

There are 15 public secondary schools located in both LGAs, 8 are in the urban area while 7 are situated in the rural areas. Though 30% of the schools would have achieved a reasonable measure of accuracy, however, in order to increase the precision and predictive power of the study, 53% of the schools were used. Using a simple random sampling procedure, 8 schools were finally selected from the 15 schools in the LGAs. Since the population of girls aged between 10-19 years in the community was not known it was taken as 50% of the entire population to make room for the widest variance possible. The number of girls required for the study was calculated using the statistical formula for the calculation of sample size ($n = z^2 pq/d^2$).[11] A sample size of 1067 girls was obtained.

A stratified cluster sampling (multistage) technique was used in selecting girls for study from the schools selected and the sample frame was obtained by complete listing of the students' name, sex and age in all classes of the schools selected using the school register. With this sampling frame, the students were further arranged by the age cohorts in each schools as follows 10 -< 11, 11 - < 12, 12 - < 13,——— 19 - < 20. Applying the same formula for the calculation of sample size, each one-year segment was derived for the respective school.

Ethical approval:

Permission to carry out the research in schools was obtained from the state ministry of Health while the ethical committee of the University of Benin Teaching Hospital, gave ethical clearance for the study.

Subjects:

Apparently healthy school girls aged 10-19 years that gave written consent were randomly recruited into the study. Those with physical defects and/ or with proven chronic illness (diabetes mellitus, haemoglobinopathies, renal or cardiac defect) were excluded. The study was conducted in the school premises. Social class was determined on a scoring system based on mother's educational attainment and father's occupation.[12]

Anthropometry:

Height measurements without shoes as described in Jane's[13] work were done using a field wooden minimeter attached to a straight wall calibrated to the nearest 0.5cm. A head block is lowered in contact with the ruler to touch the head of the subject being measured who is standing erect with heels buttocks and head touching the wall. The heels were together and the feet at an angle 45°. The subject looked straight ahead with auditory meatus and lower border of the orbit in the same horizontal plane. The girls are asked to make them-selves as tall as possible; the heels are checked to see they are on the ground before measurements are taken.[13] Body weights without shoes, wearing only underwear were measured using a SECA standing scale calibrated to the nearest 100gm. All Height and Weight measurements were in triplicate and the mean was recorded on each occasion. Skin fold thickness were measured at two sites, left triceps and left sub scapular using harpenden calipers with the girls standing in relaxed position and the measurement expressed in mm is read directly on a dial with a 0.2mm precision. Skin fold thickness was used to calculate Body Fat % (BF%) using the equation developed by Johnson and Scholz. [14] The weight of the body fat (BF; kg) was estimated from BF% using the equation BF(kg) = {BF% x body weight(kg) } / 100. The BMIs were calculated by taking kg/m^2 for each individual.[7] The reference standards used were those of the National Centre for Health Statistics (NCHS).[8] Weight and height values were compared with NCHS standards. Each girl's parameters were plotted and compared to the NCHS centile curves by groups of urban and rural girls.

Data analysis:

The information was coded into a computer, using the soft ware, Epi-info 6.04(CDC/WHO). The frequencies of all responses, and the mean (x), standard deviations and range of continuous variables were determined. Means were compared using Student's-test while Chi square test was used to test for differences in proportions and centile curves were estimated using Cole's LMS method. Significance level was set at $p < 0.05$.

RESULTS

There were a total of 4,484 girls in all the schools studied, out of which 1068 were recruited for the study. Six hundred and eighty five (65.5%) of the girls were from urban schools while 383(36.1%) were recruited from rural schools. In Table I the distribution of the subjects according to age and location is shown. There were fewer girls in the 10 years and 19 years age groups studied because the two extremes of ages were low in number in the school population. The mean age of the study population was 15.12years. In Table II the social class distribution of the subjects is highlighted, girls from the rural schools were predominantly from lower social classes, the difference in social class distribution is statistically significant ($x^2 = 248.5$, df = 4, $p < 0.05$).

Table III highlights the comparison between the mean height of the urban (155.53cm±11.28) and rural girls (155.29cm±10.2), and also with mean NCHS height (155.80cm±11.68). The differences were not statistically significant. In Table IV, the mean weight of rural girls (45.19kg ±14.8) was not significantly different from that of urban girls (46.08kg ±11.33) ($t = 1.29$, $p > 0.05$). However the mean weight of NCHS reference standard (50.24 kg ± 14.8) was significantly higher than the values obtained for rural girls ($t = 10.04$, $p < 0.05$) and urban girls ($t = 9.61$, $p < 0.05$).

Table V shows the comparison of the Body Mass Index (BMI), Body fat percentage (BF %) and Body fat in kilogram (BF (kg)) of rural and urban girls. Though the mean BMI of the total population was $18.93 kg/m^2$, only 57.15% of the girls studied attained the cut off value of $18.5 kg/m^2$. The mean BMI of urban girls ($19.024 kg/m^2$) was higher than that of rural girls ($18.84 kg/m^2$), while the mean BF% (17.80%) and BF (kg) (8.89kg) of urban girls were lower than those of rural girls (18.30%) and (8.91kg) respectively. However, there was no statistically significant difference observed between urban and rural girls in relation to BMI ($p = 0.05$), BF% ($p > 0.05$) and BF (kg) ($p > 0.05$).

The height and weight centile curves of both urban and rural girls studied were comparable with each other except that the weight centile curves of the urban girls are slightly higher than that of the rural girls at each centile curve. (Fig.1 and fig.2).

Figure 3 shows that the weight centile curves of the girls studied were consistently lower at each weight centile curves of NCHS when matched.

Table 1: Location and age distribution of subjects

Age in years	Rural Schools Ugbo	Illah	Okpa	Oko	Sub Total	Urban Schools Ibusa	Aggs	Niger	St. Brigids	Sub Total	Total
10	0	1	0	0	1	3	5	1	3	12	13*
11	2	3	1	2	8	4	27	4	12	47	55*
12	7	4	3	1	24	15	25	5	17	62	86*
13	11	13	10	6	31	27	33	16	17	93	124*
14	17	12	14	4	47	21	23	26	15	85	132*
15	25	26	14	15	80	6	28	19	40	93	173*
16	32	7	13	15	67	12	23	19	48	102	169*
17	12	12	11	22	57	14	16	13	40	83	140*
18	6	6	9	17	38	13	25	12	30	80	118*
19	3	5	4	18	30	6	8	6	8	28	58*
	115	89	79	100	383	121	213	121	130	685	1068
	(10.8)	(8.3)	(7.4)	(9.4)	(36.1)	(11.3)	(19.3)	(11.3)	(21.5)	(63.5)	(100)

Figures in bracket ( ) represent percentage of total studied
***Represent total studied per age group**

Table 2: Distribution of the study population according to social class

Social class	Rural (%)	Urban (%)	Total (%)
I	6(0.56)	22 (2.0)	28(2.56)
II	17(1.59)	83(7.77)	100(9.36)
III	42 (3.93)	302 (28.22)	344 (32.15)
IV	131 (12.27)	204 (19.10)	335 (31.37)
V	187 (12.51)	74 (6.93)	261 (19.44)

$X^2 = 248.52$, df = 4, $p < 0.001$
Social Class: I and II = Upper Class
III = Middle Class
IV and V = Lower Class

Table 3: Comparison of mean Height of study subjects and NCHS standard

Heigh	Urban [1]	Rural [2]	NCHS [3]
Mean(cm)	155.53	155.29	155.80
SD	11.28	10.2	11.68
95%CI	152.69-158.37	152.72-157.86	152.86-158.74

[1,2] t=0.35 (p> 0.05) ;
[1,3] t =0.63 (p > 0.05)
[2,3] t =0.98 (p > 0.05).

Table 4: Comparison of mean weights of study subjects and NCHS standard

Weigh	Urban [1]	Rural [2]	NCHS [3]
Mean(cm)	46.08	45.19	50.24
SD	11.33	9.84	14.8
95%CI	43.23-48.94	42.72-47.04	46.51-54.0

[1,2] t =1.28 (p> 0. 05) [1,3] t =9.61 (p <0.05)
[2,3] t =10.04 (p< 0.05)

Table 5: Comparison of the mean values of BMI, BF%, and BF(kg) of girls from rural and urban areas

Parameters	Urban	Rural	T	P
BMI (Kg/m²)				
Mean	18.84	19.02		
Sd	2.26	2.91	1.12	>0.05
Range	12.95-28.16	10.98-34.74		
95%CI	18.76-19.20	18.76-19.29		
Body fat (%)				
Mean	18.30	17.80		
Sd	7.09	8.28	1.04	>0.05
Range	1.53-35.10	2.79-34.18		
95%CI	17.83-19.26	16.8-18.27		
Body fat(kg)				
Mean	8.91	8.89		
Sd	4.29	5.36	0.07	>0.05
Range	0.63-25.80	0.66-32.64		
95%CI	8.71-9.59	8.28-9.24		

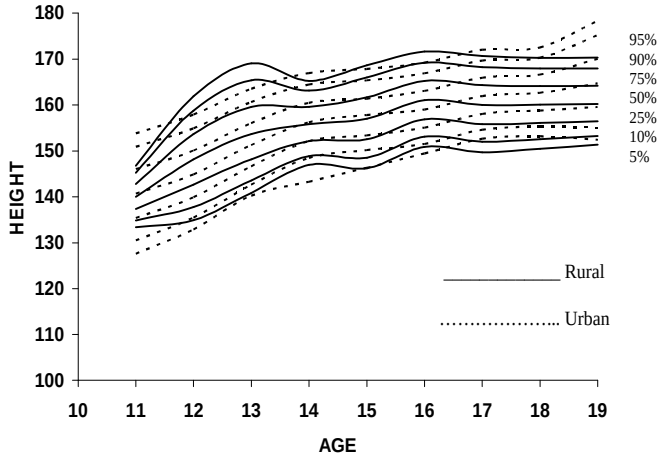

Fig 1. Height curves of urban girls compared with rural girls

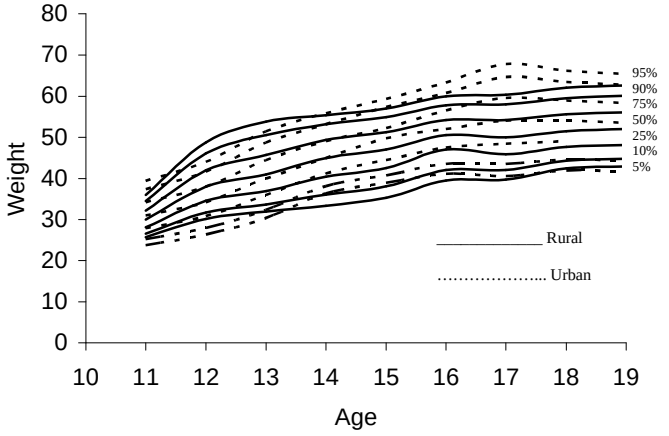

Fig 2. Weight curves of urban girls compared with rural girls.

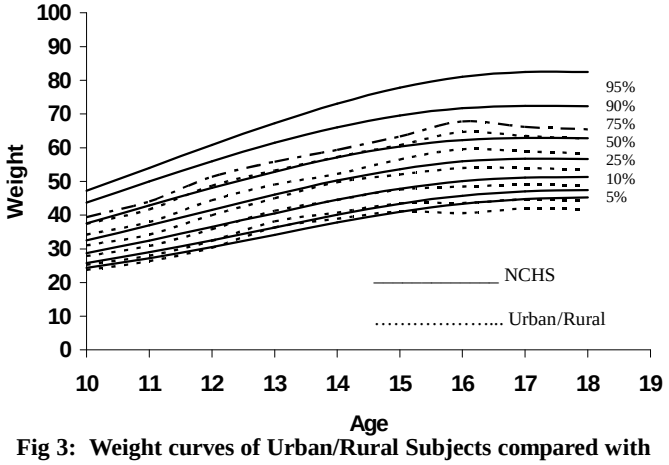

Fig 3: Weight curves of Urban/Rural Subjects compared with NCHS Standards.

DISCUSSION

There were no significant differences in the mean height and weight of rural and urban girls. It is possible that the dietary pattern of these groups were similar despite the differences in socio-economic status of the groups. Walker et al [15] had reported similar pattern among Kingston girls living in rural area and concluded that under-nutrition was not a problem among low income girls. Brabin et al [7] on the other hand observed a clear difference in nutritional status between rural and urban adolescent girls in south eastern Nigeria. They found that the mean height and weight were consistently lower for rural girls and were around –1Z score from the British reference median and that 10.4% of the rural and 4.7% of the girls in urban areas were classified as stunted. The difference between our finding and Brabin et al's[7] finding could be due to the difference in subject selection while our subjects were students in both rural and urban areas, in their study the rural adolescent girls were villagers who were mostly farmers while the urban girls were students.

The weights attained by both groups failed to match the gold standard recommended by WHO as international reference standard.[8] It was discovered that the weight centile curve of the girls studied were consistently lower at each weight centile curve of the NCHS reference curves. This is similar to previous reports in Nigeria.[6,7,9] It has been postulated that adolescents in Nigeria whether in urban and rural communities consumed less than the recommended energy intake for their age as recommended by FAO/WHO/UNU[16]. This could account for the differences in weight observed in the study group and NCHS standard.

There were however, no differences in the mean height of the studied population compared with the NCHS population. This shows that although these girls were as tall as the reference standard they were not quite as heavy. They are underweight but not stunted. The reason for this is not quite clear. It is however, postulated that the net effect of consumption of low energy diet in these adolescents girls may have led to their faltering in weight. Indeed stunting is usually an indication of long standing nutritional inadequacies. In this instance, these adolescents were underweight, an indication of the recent nature of their nutritional inadequacies. These findings are in keeping with the observation of other authors. Cole and Taiwo et al[6] in their study on Nigerian adolescent girls reported that 68.2% of the girls studied were underweight after comparing the data to international standard. They also observed that the energy in-take values of these girls were low as compared with recommended values. This they further explained by the fact that the low energy in-take might be due to the lower energy density of the Nigerian diet when compared with diet typical of Europe. It is therefore possible that the girls of this study consumed lower energy density diet at a period when their nutritional needs were heightened to account for their lower weight. Brabin et al[7] in 1994 compared the height of their subjects to the 1986 study by Didia and Oguanranti[9], of girls from similar environment and found that they were apparently shorter than earlier girls. They felt that it supports the fear that the dwindling economic climate in Nigeria was taking its toll and was evident in decreased height and weight values across rural and urban areas. The findings of this study did not confirm their observation since our subjects' heights were comparable to international standard.

Nutritional assessment of adolescents should not stop at only the height and weight, it should also include BMI because a girl may be in normal range for height and weight but still be under weight.[17] There was no significant difference in the BMI

of both rural (18.84kg/m^2) and urban girls(19.02kg/m^2). Though there is no standardized cut off point for low BMI for adolescents but using the NHANES value of < 18.5kg/m^2, 42.9% of the subjects were below this threshold and therefore thin. Like in other developing countries underweight and thinness is the major problem.[18] In developed countries BMI is an important measure of obesity, this was not noted to be a problem in this study as none of the girls exceeded the cut off limit of > 30kg/m^2.

Body fat measurement by triceps and sub scapular skin fold provides an important adjunct in the estimation of obesity. There were no differences in body fat measures using either body fat (%) or (kg) between rural and urban girls. This finding supports previous reports that despite limitations there is a close association between BMI and adiposity.[17]

In conclusion this paper provides useful information on the anthropometric indices of adolescent girls in Oshimili LGA in Delta State, Nigeria. It has shown that the weight of the girls studied were significantly lower than the international reference standard. The authors therefore advice for nutritional support targeted at adolescent school girls.

REFERENCES

1. Needlman R. D. Growth and Development: Adolescence In: Behrman R. E., Kliegman R. M., Jenson H. B. eds, Nelson's Texbook of Pediatrics, 16th edition. *W.B Saunders Co*. 2000; 52 -57.
2. Nwokocha A. R. C. Adolescence and associated problems. In: Azubuike J. C., Nkanginieme K. E. O. eds, Paediatics and Child Health in a tropical region, 2nd edition. *African Educational Services*. 2007; 84 – 99
3. Lewis I. A., Yakubu A. M. Status of Adolescent and young adults in Nigeria, Ibadan: *CSS Bookshop Limited* 1998; 329 – 336.
4. Harrison K. A. Child bearing health and social priorities: A survey of 22774 consecutive hospital births in Zaria Northern Nigeria. *British journal of obstetrics and Gynaecology* 1985; **5:** 32 – 48.
5. Umeora O. U. J., Esike C. O. U., Egwuatu V E. Maternal mortality in rural Nigeria. *Int J Gynecol Obstet* 2005; **88:** 321-322.
6. Cole A H, Taiwo O O, Nwagbara N I, Cole C E. Energy intake, anthropometry and body composition of Nigerian adolescent girls: a case study of institutionalized secondary school in Ibadan. *British Journal of Nutrition* 1997; **77:** 497 – 509.
7. Brabin L, Ikimalo J, Dollimore N, Kemp J et al. How do they grow? A study of South – Eastern Nigerian adolescent girls. *Acta Pediatr* 1997; **86:** 1114 – 20.
8. NCHS growth charts. United States department of health education and welfare: public health service. *Rockville md*. HRA 76 – 11120,233, 1976.
9. Didia B. C., Ogunranti J. O. Height and puberty in contemporary healthy Eastern Nigerian growing children: a clinical anthropological study. *J Trop Padiatr* 1986; **32:** 36 – 40.
10. Nigerian Human Development Report 2001/2001. Millennium edition. United Nations Development Programme, Lagos, Nigeria; 2001.
11. Lwang S. K., Type C-Y (eds). Teaching Health Statistics. Twenty lessons and seminar on line. WHO, Geneva, 1986; 67-74.
12. Okpere E., Olusanya O. The importance of social class in voluntary fertility control in a developing country. *West Afr J Med* 1985; **4:** 205 – 212.
13. Janes M. D. Physical growth of Nigerian Yoruba children. Tropical geogr Med 1974; **26:** 389 -398.
14. Johsen D., Scholz C. Anthropometric methods for the assessment and estimation of nutritional status of man. Wissennc haftlich:2 eitsc hriftder Humboldt universitat zur Berlin. *R medizin* 1981; 38: 218 – 226.
15. Walker S. P., Grantham-McGregor S. M., Himes J. H., William S. Anthropometry in adolescent girls in Kingston, Jamaica. *Annals of Human Biology* 1996; **23:** 23-29
16. Cooper R., Rotimi C. et al. Nutritional status in rural Nigeria. *Lancet* 1996 ; **347:** 331.
17. Lynch J., Wang X. I., Wikken O. E. Body mass index in Australian children: recent changes and relevance of ethnicity. *Arch Dis Child* 2000; **82:** 16 – 20.
18. Datta Banik N. D., Nayar S., Krishna R., Bakshi S. Taskar A. D. Growth pattern of Indian school children in relation to nutrition and adolescence. *Indian Journal of Pediatrics* 1973; **40:**173 – 179.