Bio Core
Exploring Scientific Community

International Journal of Biotechnology and Bioengineering

ISSN 2475-3432

Research Article Open Access

Anthropometric studies on some primary school children of Ajaokuta local Government area of Kogi State, Nigeria

Ekpa Emmanuel[1*], Okpanachi Patience[1], Mohammed Asmau[1], and Iyayi Augustine[1]
Department of Biosciences, College of Natural and Applied Sciences, Salem University Lokoja-Nigeria

*Corresponding Author: Ekpa Emmanuel, Department of Biosciences, College of Natural and Applied Sciences, Salem University Lokoja-Nigeria, Tel: +2347036135834 E-mail: emmeks@yahoo.co.uk

Citation: Ekpa Emmanuel et al.(2017) Anthropometric studies on some primary school children of jimgbe community, ajaokuta local government area of kogi state-Nigeria. Int J Biotech & Bioeng 3:1, 1-7

Received February 3, 2017; Accepted February 14, 2017; Published February 28, 2017.

Abstract

Anthropometric studies were carried out on 136 randomly selected primary school children in Jimgbe (Salem University host community) located in Ajaokuta Local Government Council of Kogi State-Nigeria. Data relating to body development and general growth in that population are not yet available. Therefore, this current work was purposely done to assess the nutritional status of the pupils who are between the ages of 5 and 12 years inorder generate a baseline for subsequent studies. The children were selected at random from classes 1-6 and different anthropometric parameters like height for age, weight for height and body mass index (BMI) were measured. Distribution by sex shows 68 boys and an equal number for girls within study group. Severe stunting and low weight was seen in 75% of the children with 25% been normal. Significant difference (<0.02) was not observed in malnourished boys and girls, while normal weight for age and height for age occurred in 25% and 35% in boys and girls respectively. Children within the age bracket of 11-12 were more stunted than other age groups both within the sexes. On the whole, the population was found to be severely malnourished based on World Health Organization Standards. The implication of this studies is hereby discussed as a panacea for improving the nutritional level of this population for a better life.

Keywords: Anthropometry, nutritional status, Stunnting, malnourishment, body mass index

Introduction

Malnutrition remains a widespread problem in developing countries, in particular among the poorest and most vulnerable segments of the population. Malnutrition is typically caused by a combination of inadequate food intake and infection which impairs the body's ability to absorb or assimilate food. It is an important cause of low birth weight, brain damage and other birth defects, and contributes to developmental (physical and cognitive) retardation, increased risk of infection and death, and other problems in infants and children (Flegal et al; 2005). One approach to studying nutrition is to assess nutritional status on the basis of anthropometric indicators. These are based on physical body measurements such as height or weight (relates the age and sex of the individual), and have the benefit of being both inexpensive and non-intrusive (Jeffrey, 2006). Anthropometric indicators are useful both at individual and population levels. At an individual level, anthropometric indicators can be used to investigate cases of compromised health or nutritional wellbeing. This information can be valuable for screening children for interventions and for assessing the response to interventions. At the population level, anthropometry can be used to study the nutritional status within a country, region, community, or socioeconomic group, and to study both the determinants and consequences of malnutrition. This form of monitoring is valuable both for the design and targeting of health and nutrition interventions (Goonefilleke et al; 1997).

In 1981, some nutritionists conducted a study on the Body composition and nutritional status of urban Guatemalan children of high and low socioeconomic class. To achieve the purpose of their study, 981 school students were selected randomly from Guatemala City. Their average ages were 7.00 to 13.99 years old from high

and low socioeconomic status (SES). High SES children have larger median values for triceps skinfold, subscapular skinfold, arm circumference, and estimated mid-arm muscle and fat areas than low SES children. Compared with children of a US reference sample, the high SES children generally have larger values for all variables and the low SES children have smaller values. However, the differences between the low SES children and the children of the other two samples are greater for arm fat area than for arm muscle area. The analysis suggests that low SES Guatemalan children suffer to a greater extent from chronic energy, rather than protein, under nutrition. A similar pattern of energy malnutrition has been observed for rural Guatemalan children. These combined data suggest that estimates of fat reserves of the arm provide a useful indication of nutritional status for Third-World children. Results from rural Costa Rican and Honduran studies have been taken to mean that muscle reserves are better than fat reserves as indicators of nutritional status in developing countries. But, those studies did not estimate cross-sectional muscle and fat areas and only considered the extremes of the population distribution for muscle and fat.

Also, another study done in 2009 employed the comparison of anthropometrical parameters of the four-year-old children in urban and rural Slavonia, Croatia, 1985 and 2005.The aim of the study was to identify the secular trends in the anthropometrical parameters of the 4-year-old children in SlavonskiBrod, Slavonia, Croatia, and the nearby rural area by comparing data of Height, Weight, and mid-arm circumferences from 2005 with the historical control data published in 1985. The cross-sectional study of 342 children, aged 4 years, from SlavonskiBrod and the nearby villages was taken in 2005. The bodyHeight, Weight, and mid-arm circumferences were measured and compared with the historical control data from the study performed in 1985 in the same area using the same methods. The data were compared according to sex and the place of residence. Results show that there were no significant differences in the body Height, Weight, mid-arm circumference and Body Mass Index (BMI) between the urban and rural children in 2005. The Children in 2005 were significantly shorter (103.7 +/- 8.3 cm vs. 108.3 cm in 1985, $P < 0.001$, one-sample T test) and had lower Weight (17.4 +/- 2.7 kg vs. 17.9 kg, $P = 0.001$, one sample T test) compared with their counterparts in 1985. In 2005 there was no significant difference in the Body Mass Index (kg/m2) between girls and boys in total (15.9 +/- 2.12, vs. 16.1 +/- 1.8, $p = 0.262$, Independent samples t-test). Differences between the urban and rural parameters have disappeared over the last 20 years, which could be assigned to life-style changes in the rural areas.

The dearth of information on nutritional status on pre-school and primary school children in many communities from Kogi state is of great concern to Government in terms of planning. Government needs such information for policy and developmental purposes in order to understand the economic status of some local populations viz-a-viz their overall living condition. This will also help in devising feasible ways of mitigating nutritional emergencies so as to assist international bodies like W.H.O, UNICEF, etc with data during such situations. For now, no substantive or reliable data on nutritional status of most children age groups from nearly all parts of Kogi state is available. Indices of protein energy malnutrition (PEM) needs to be linked to simple anthropometric parameters i.e there is need to find a correlation between the two. There is a need also to compare mental an academic performance of these group of children with their nutritional status hence the need for this work. The aim of this present studies therefore is to find the correlation between anthropometric indicators and issues of malnutrition among primary school population of jimgbe community (a community hosting the university where this research was carried out) by measuring different body parts like weight, height, upper arm circumference, waist circumference etc as indicators of anthropometry. Perform statistical analysis and compare with W.H.O standards. Draw some inference on the socioeconomic status of their parents or guardians based on the statistical results obtained with a view to advising stakeholders on the way forward.

Materials and Method

Anthropometric measurements

For anthropometric measurements (weight, height, waist and head circumference, chest circumference, hip, Arm, etc) the following equipment were used:

balanced beam scale; portable/wall mounted stadiometer with movable head piece, or measuring rod, typically mounted on balanced beam scales; flexible, but non-stretchable measuring tape or insertion tape; full body-length mirror with 10cm ´ 10 cm grid lines carpenter's level; several calibrated weights (e.g. 10 kg or 20 kg each) that can be combined to give test weights between 50 kg and 100 kg; Calibrated length rods of 150 cm and 200 cm.

The study Area

The study area was Jimgbe community (a neighbourhood adjoining the Salem University Campus) Ajaokuta Local Government council of Kogi State, Nigeria. The socio-economic status of the inhabitants of this area is highly a homogeneous one with most parents being low income earners like petty traders and subsistent Farmers, junior civil servants, teachers and artisans.

Hypothesis

There is no significant difference between the nutritional status of children in public primary schools in Kogi State and their growth/ health level.

Method

The ex-post- facto type of the descriptive research design was employed in this study. The sample for the study was made up of one hundred and thirty six (136) school children aged between 5 and 12 years who were selected using simple and stratified random sampling techniques from a Local Education Authority (L.E.A) Primary school in Jimgbe,Ajaokuta Local Government Area of

kogi State. A floor type model Z-T/60 stadiometer was used in evaluating the anthropometric parameters (Height & Weight) to calculate the Body Mass Index (BMI).

Anthropometric Measurements

Weight

Weight was measured to the nearest 0.1kg withan electronic scale (SECA 803) with children wearing only light clothing and without shoes. Weight was recorded twice and the mean value was calculated and used in the analyses. However, if the difference between the two measures exceeded 0.2kg, the subject was weighed again [13], while the scale was checked for accuracy with standard weights after about every twenty measurements.

Height

Individual height was measured with a wooden stadiometer placed on a flat surface. The subject stood on the basal part of the device with feet together (without shoes). The shoulders, the buttocks and the heels had to touch the vertical measuring board. The children standing with their eyes in the Frankfort horizontal plane, the height was measured to the nearest 0.1 cm and recorded twice. Similarly, when the difference between the two measurements was higher than 0.5cm, a third measurement was taken and the mean of the two closest values was used in the analyses.

Mid-upper arm circumference (MUAC)

MUAC is a measure of the diameter of the upper arm, and gauges both fat reserves and muscle mass. It is primarily used for children, but can also be applied to pregnant women to assess nutritional status. Measurement is simple and requires minimal equipment. MUAC has therefore been proposed as an alternative index of nutritional status, in particular in situation where data on height, weight and age are difficult to collect. For children, a fixed (age-independent) cut-off point has sometimes been used to determine malnutrition. However, this risks over-diagnosing young children and under-diagnosing older children.

Other Anthropometric parameters

Parameters like Chest circumference and head circumference were also taken using standardized method and the results used to complement findings from the weight and height analysis.

Data Analysis

Both descriptive and inferential statistics were employed in analysing the data compiled for this study. The mean and standard deviation and student “t” test were used to analyse the data. Hypothesis was tested at 0.05 significance level.Nutritional parameters such as height-for-age (stunting),weight-for-age (underweight) and weight-for-height (wasting) were used to assess nutritional status of the children. This was interpreted by the Z-score classification system of World Health Organisation of child growth reference standard (2006).

Results and Discussion

Table 1: Distribution of study subjects according to age and gender from classes 1-6 (n=136)

Age (years)	Boys	Girls	Total
5	4	8	12
6	8	20	28
7	16	8	24
8	16	8	24
9	12	4	16
10	4	12	16
11	4	4	8
12	4	4	8
Total	68	68	136

Table 2: Mean of standard deviation of anthropometric data of L.E.A primary school pupils, Jimgbe

S/N	AGE	GENDER	HEIGHT (cm)	WEIGHT (kg)	BMI (kg/m^2)	C.C (cm)	H.C (cm)	M U A C (cm)
1	5	Boys	112.33±0.94	18.33±0.83	14.55±0.92	23.21±0.38	20.00±0.71	6.00±0.30
2	5	Girls	111.0±0.91	19.50±0.79	15.85±0.86	22.67±0.34	19.00±0.68	6.50±0.35
3	6	Boys	117.75±1.05	18.50±0.82	13.31±0.75	24.0±0.44	21.00±0.75	7.00±0.40
4	6	Girls	116.0±1.03	20.25±0.95	15.00±0.80	23.67±0.40	20.00±0.71	7.50±0.43
5	7	Boys	116.38±1.00	19.50±0.87	14.44±0.79	23.30±0.34	19.00±0.68	7.50±0.43
6	7	Girls	108.0±1.06	17.50±0.78	14.96±0.81	23.0±0.32	19.00±0.68	6.50±0.35
7	8	Boys	120.0±1.15	21.50±0.93	14.93±0.85	24.50±0.47	21.00±0.75	8.00±0.50
8	8	Girls	120.0±1.15	14.50±0.63	10.07±0.53	23.50±0.38	20.00±0.71	7.50±0.43
9	9	Boys	124.33±1.18	23.33±1.03	15.05±0.82	23.830±0.37	21.00±0.75	7.00±0.40
10	9	Girls	126.0±1.20	26.0±1.33	16.35±0.98	23.92±0.38	19.00±0.68	8.00±0.50
11	10	Boys	106.0±1.05	15.0±0.55	13.39±0.77	24.66±0.50	20.00±0.71	6.50±0.35
12	10	Girls	133.83±1.25	27.03±1.42	15.08±0.86	24.13±0.48	20.00±0.71	8.00±0.50
13	11	Boys	142.0±1.34	31.63±1.56	15.66±0.89	25.0±0.53	20.00±0.71	7.00±0.40
14	11	Girls	140.50±1.32	34.00±1.64	18.99±1.08	24.88±0.50	21.00±0.75	8.50±0.57
15	12	Boys	153.21±1.48	33.0±1.33	14.10±0.76	25.45±0.58	20.00±0.71	8.00±0.50
16	12	Girls	145.50±1.45	31.00±1.23	14.69±0.79	24.97±0.51	21.00±0.75	8.50±0.57

($P<0.02$ with respect to WHO standards)
Key: C.C: Chest circumfrence, H.C: Head Circumfrence, MUAC: Mid Upper Arm Circumfrence

Table 3: Frequency and % distribution of Nutritional status of L.E.A jimgbe primary school pupils

Nutritional Status	Frequency	%	BMI (Kg/M^2)	
Malnourished	120	75	< 18.5	Stunting
Normal	16	25	>18.5 <24.00	
Overweight	0	0	>24.00	
Obesity	0	0	>40.00	
Total	136	100		

BMI < 18.5 = Under Weight, BMI 18.5-24.5 = Healthy weight range, BMI 25-30 = Overweight (grade 1Obesity,BMI >30-40 = Obese (grade 2 obesity),BMI >40 =Very obese (morbid orgrade 3 obesity)

Table 4: Nutritional status of school children weight for age (wasting) in Jimgbe primary School Pupils

	Total		5-6yrs		7-8yrs		9-10yrs		11-12yrs		Boys (n=68)		Girls (n=68)	
	n	%	n	%	n	%	n	%	n	%	N	%	N	%
Normal	34	25	16	24	23	34	10	15	13	11	12	18	28	41
Moderate	43	32	20	29	15	22	08	12	18	27	32	47	16	24
Mild	04	03	06	09	02	03	10	15	04	03	16	24	16	24
Severe	55	40	26	38	28	41	40	58	33	49	08	11	08	11

Table 5: Nutritional status of school children height for age (Stunting) in Jimgbe primary School Pupils

	Total		5-6yrs		7-8yrs		9-10yrs		11-12yrs		Boys (n=68)		Girls (n=68)	
	n	%	n	%	n	%	n	%	n	%	N	%	N	%
Normal	24	35	16	24	27	40	18	27	05	07	12	18	28	41
Moderate	14	21	16	24	13	19	06	09	10	15	32	47	16	24
Mild	02	03	08	11	02	03	01	01	05	07	16	24	16	24
Severe	28	41	28	41	26	38	43	63	48	71	08	11	08	11

Figure 1: comparison of mean height of boys and girls

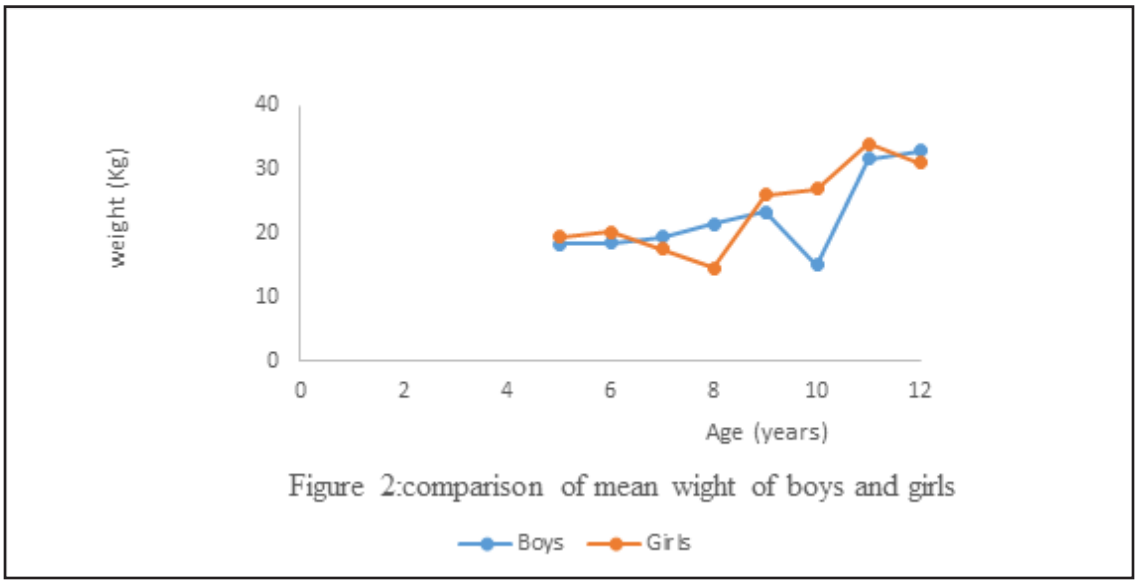

Figure 2:comparison of mean wight of boys and girls

The anthropometric results obtained were from 136 respondents according to sex and age. The population studied were found to be 50% (n =68) boys and 50% (n = 68) girls, respectively. The weights and heights of the children were not significantly different between the ages of 5-6 and 7-8 years ($p<0.02$). However, a significant difference was observed between the ages of 9 and 12 years old as they got older. Table 1 and 2 shows the distribution of study subjects according to age and gender from classes 1-6. Classification by body mass index (BMI) (Table 3) showed that only 25% of the children had normal growth in terms of their weight, 75% were severely underweight and malnourished. Among the normal children, 34% were found to be within the ages of 7 – 8years, while 11% were within 11 – 12 years old (Tables 4 and 5). Only 18% of children with normal nutritional status were found to be boys while 41% were girls. Among the moderately to mildly underweight children, about 29% were within the ages of 5- 8 years old while 27% were within 9-12 years old. In terms of gender, 24-47% of the boys could be considered to be within the moderately to mildly underweight category, while only 24% of girls were in that category. The severely underweight group which consists of a total of 49% of 11-12 years(Table 4 and Figure 2) underweight has 38% within the ages of 5-6 years old and 58% within 9-10 years old, while 11% were both boys and girls. Table 5 shows the classification of nutritional status of children as percentage height for age following computation of Z- scores in accordance with the WHO reference standard. Classification by age showed that only 40% of the children between ages 7-8have normal growth in terms of their height, 71% ages 11-12 were found to be severely stunted in growth (Table 5 and Figure 1). Among the children experiencing normal growth, 24-27% were found to be within the ages of 5 – 8 years but only 18% of these children were also found to be boys, while the rest 41% were girls. Whereas, among the moderately to mildly stunted children, 24% were within the ages of 5-6 years old, while 11% were within 7-8 years old (Table 5). The severely stunted group which consisted of a total of 63- 71% within the age group of 9-10 years and 11-12 years respectively. The age group gave 24% for both boys and girls as been severely stunted.

Stunting and wasting are widespread among school-age children in developing countries (Jeffrey, 2006). Wasting refers to a low weight – for – height that is below 2SD of the median value of the NCHS/WHO International weight – for – height reference. A prevalence of wasting or acute malnutrition between 5–8% indicates a disturbing nutritional situation, while prevalence greater than 10% corresponds to a serious nutritional emergency (flegal et al; 2002). Underweight is defined as low weight-for-age at below 2SD of the median value of the NCHS/WHO International reference for weight-for-age. Stunting refers to shortness that is a deficit or a linear growth that has failed to reach an individual's genetic potential, and it is technically defined as low height for age at below 2SD of the median value of the NCHS/WHO International Growth Reference (Goonefilleke et al; 1997). Many reports have shown that the problem of malnutrition among Nigerian children is real. Report by WHO showed that 37.7% and 39.1% of preschool children were respectively, stunted and underweight in Nigeria (Nduba, 1998). In this work, there was a high prevalence of malnutrition among pupils schooling in Jimgbe Local Education Authority (LEA) primary school of Ajaokuta Local Government Council of Kogi state. With about 40 % severely wasted and 41% severely stunted (Tables 4 and 5). Also that 63-71% of the stunted children were found between the ages of 9- 12years old, while about 38-41% were found in ages 5-8years (Tables 4 and 5). This suggests manifestation of malnutrition as age progresses (Jeffrey, 2006). This is in line with studies recorded in some documented literature elsewhere (Mamun, 2014).

The results shows that 75% of the subjects were malnourished, with the remaining 25% been normal (Tables 3-5). This result is in conformity with what Nnanyelugo (1980) found out that underweight and stunting were high among school age children (52.4% and 35.1% respectively) in Nigeria. The effect of the

parent's income on the height and weight of the subjects also correlated with some of the results shown in Tables 2-5. In some study done in America, children whose parents were in good income generating ventures were found to be 3cm taller than children whose fathers were labourers (Luo et al: 2006). This difference might be related to the fact that parents with high income range can normally afford more nutritious food for their children than those with low income range.

Nutritional status is the balance between the intake and utilization of food nutrients by man in the process of growth and development. It is an integral component of the overall health of an individual and provides an indicator of the well-being of children living in a particular region. The findings of this study revealed that the nutritional status of the school children in Jimgbe primary school of Kogi State fell below the class regarded as normal using the World Health Organization (WHO) BMI norms. It showed that 75.0% of the children sampled are severely malnourished. This finding is in agreement with some findings of (WHO) on the schoolchildren in Makurdi, a metropolis in Nigeria, where 52.7% or more of the children were underweight. When the nutritional status of school children in the Public owned primary schools in Kogi State were compared, the results showed that there was a significant difference between them. This difference is statistically significant when t-test was employed as the prevalence of malnutrition is significantly higher among the public schools than the private schools in Nigeria due to family income differences. The reasons for this difference in the nutritional status of these two groups of school children might not be far from the socioeconomic background, types of food common in the environment and storage and preparation modalities and the general environmental factors that pervade the state. The findings revealed that most of the parents of the children in public primary schools are low income earners while those of the children in the private owned schools are high income earners. In the same vein, parents without good education may not be able to select healthy nutrition for their children from the arrays of the available food items. Most of the parents of children in public primary schools in the Jimgbe, Kogi state are farmers, petty traders and the likes who cannot not adequately select what could bring better health from the food items available in the environment. This is in line with the submission of Whitney and Rolfes (2008), who stated that parents with low socioeconomic status cannot afford first class proteins like milk, egg, meat etc. which are sourced mainly from animals. And children that consume less vegetable and dairy products are significantly likely to suffer from anemia, iron depletion, and eosinophilia which are diseases associated with low nutritional status. From the findings of this study, it can be concluded that primary school children in Jimgbe, Kogi State are malnourished as most of them are underweight and also the nutritional status of the school children in public primary school is highly affected by parent's income level (a fall out of another survey conducted elsewhere). It is therefore evident that the nutritional status of the school children in the public schools need to be improved through various interventions such as improved nutrition enlightenment and improved feeding programmes. Supplementary feeding programmes planned and operated properly can result in the improvement of the nutritional status of children and should be considered as a suitable vehicle for adequate dietary intake to improve the nutritional status of the children.

References

1. Flegal K. M., Carroll M. D., Ogden C.L., and Johnson C.L. (2002) Prevalence and trends in Health Statistics. (2005). Available at: http://www.cdc.gov/nchs/data/ad/ad361.pdf

2. Goonefilleke, R.S., Edmond Cheuk, Fan., So, R.H.Y (1997). Foot Anthropometry in Hong Kong of the ASEAN 97 Conterence, Kuala lumpor, Malaysia, (1997). Pp.81-88.

3. Jeffrey Baron (2006). The assessment of the nutritional status of a community. WHO, Geneva. 50-76.

4. Luo, Q., He, H., Jang, LO.Study on the relationship between body mass index and Osteporesis McDowell M.A., Hughes J.P., and Borrud L.G. (2006) Health characteristics of U.S. adult by

5. Mamun, A.A (2014) Shifting of under nutrition to over nutrition and its determinants among women of reproductive ages in the 36 low to medium income countries. obes.res, 132-133

6. Nduba, V.I. (1998). Anthropometric indices of primary school children from two socio-economic status An .M.B.B.S. project submitted to University of Nigeria Nsukka. (Unpublished) 34-36.

7. Nnanyelugo, D.O. (1980). Nutritional status of children in Imo State- Nigeria, journal of nutrition. Science. 1.20-26

8. Whitney, E. and Rolfes, S.R. (2008). Understanding Nutrition. Eleventh Edition. United States: International. Student Edition. WADSWORTH CENGAGE LEARNING