Afr. J. Med. med. Sci. (1999) **28**, 59- 63

Evaluation of the nutritional status of first year school children in Ibadan, Southwest Nigeria.

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Summary

Height for age, weight for age, and weight for height as indices of nutritional status were evaluated in 1309 pupils from different socioeconomic classes in Ibadan, Nigeria. The data obtained were compared with United States National Centre for Health Statistics (NCHS) reference population. When all the pupils studies were considered together 46.1%, 44.3% and 12.7 percent of the pupils were underweight, stunted and wasted, respectively. Both stunting and wasting were observed in 7.2% of the overall population. Only 0.6% were overweight. Generally, the proportion of stunting, underweight, wasting and both stunting and wasting increased as socioeconomic status declined, but the prevalence of overweight was higher in the 2 upper socioeconomic status schools. When all pupils were considered based on sex and irrespective of school types, significantly more male (49.5%) than female (37.4%) pupils suffered from stunting *(P<0.0001)*, wasting (13.8% versus 11.1% *P<0.01)* and underweight (54.3% versus 35.5%: *P<0.0001)*. More females were overweight than males though this did not reach statistical levels *(P> 0.05.)* The prevalence of malnutrition in this study was higher that of previous studies in this environment, which may be a reflection of the deteriorating economic situation of Nigeria.

Keywords: *Nutritional status, School children, Anthropometry evaluation*

Résumé

La taille par rapport à l'âge, le poids par rapport a l'âge et le poids par rapport a la taile consideré comme des indices du stauts nutritionol ont été evalués chez 1309 éléves de differents classes sociale à Ibadan, Nigeria. Les données obtenuent avaient été compares à celle du Centre National des statistiques de la sante des populaitons des Nations Unis (NCHS). L'orsque tòus les enfants etudies étaient considerés ensemble, 46, 1%, 44,3% et 12,7% des eléves etaient respectivement en dessous du poids normal, en dessous de la taille normale et cahexique. La taiille en dessous de la normale et la cachexie avait été observes chez 7,2% de la populaiton totale. Seulement 0,6% etaient au dessous du poids normal. Generalement, la proportion des courts, en dessous du poids normal, de cachexie et des courts cahexiques avait augmente avec le niveau decroissant du status socio-economique, mais la prevalence des eleves ayant le surpoids etait plus eleves dans les 2 ecoles ayant les enfants de status-sociale haut. L'orsque les eleves etaient considerés basé sur leur sexe et sans tenir compte du type d'ecole frequente, les garcons (49,5%) ont souffert de maniere significative compare aux fille (37.4%) de la courte taille (P 0,0001), pour la cachexie 13,8% contre 11,1%: P 0,01) et poids inferieur à la moyenne (54,3% centre 35,5% P 0,0001). Plus de filles ont eu le súrpoids compare aux garcons quolque ceci na pas attenind un ni veaux statistique (P 0,05). La prevalence de la malnutrition dans cette étude a ete plus élevé que celle observes dans les études precendentes dans cet environment. Ceci pourrait etre un reflet de la deterioration de la situation socio-economique du Nigeria.

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Introduction

Malnutrition is a public health problem in developing countries and probably more so in Nigeria because of the deteriorating socioeconomic situation [1,2]. Prevalence studies of anthropometric indices of nutrition in school age children showed that malnutrition is a major problem with 45-60% of school children being malnourished [3,4] and 50% and 34% of school children being underweight and stunted, respectively.

Malnutrition is usually associated with increased morbidity and mortality, such that 30-50% of deaths in the pre-school age group and 3-8% of deaths in the 5-14 year age group in Nigeria are associated with malnutrition [6]. The high prevalence of malnutrition may be directly attributable to the socioeconomic status of the parents since there are no school welfare services available to ensure a minimum standard of feeding more so now that the economy is in a very poor state.

Height and weight are sensitive indices, which have been used to evaluate the nutritional status of a community [1] particularly in childhood. Using the same indices, Akinyinka *et al* (*in press*) recently demonstrated suboptimal calorie reserve in Nigerian neonates and this is more severe in males than females. This implies that sub-optimal nutritional status in school age children may even pre-date the birth (intrauterine growth retardation) of a significant proportion of these children.

The steady economic decline, with the associated increasing parental poverty and misery since the early 1980s, have made this study imperative in order to determine the prevalence of stunting, wasting, underweight and overweight in the different socio-economic groups in Ibadan, Nigeria.

Materials and methods

Study area: Ibadan, a city in the SouthWest of Nigeria with a population of about 2.5 million [9] has 286 registered government primary schools and 42 private primary schools. In 1991, the total enrolment was 47,192 pupils in the first year with 296,713 pupils in the whole primary school sector.

Calculation of sample size and sampling method: The sample size needed to be representative of the total population of primary one pupils in Ibadan Municipal schools was calculated using Epistat statistical programme [10]. The minimum sample size required was 1,043.

Sampling: The study was conducted using the multistage sampling method and the schools were stratified by the criteria of Barros *et. al*, 1991 [11]. This stratification was

based on (1) the type of schools; private or public and (2) the socioeconomic characteristics of the school cathcment areas. Using these two criteria, the schools were classified into 3 socioeconomic groups. Type 1 schools (high stratum) included all private schools in low density areas with a the minimum school fees of N1,500 per term. Type II (medium stratum) schools are public schools located in low to medium densely populated areas and Type III (low stratum) schools are public schools located in the inner core (indigenous) areas of Ibadan. The local government supports types II and III schools. The fees charged in Type 1 private schools would have precluded children from the lower socioeconomic strata.

Multistage random sampling techniques was used to select the schools, 10% of schools in each category were randomly selected by balloting from a comprehensive list of the primary schools in Ibadan Municipality. This gave 4,6 and 23 schools in the types I, II and III schools, respectively.

The number of pupils to be studied in each school type was calculated by probability proportional to the size of the actual number of primary one pupils in each of the school types chosen. Selection of pupils was by systematic sampling with a random start having calculated the sampling interval for each school type. A total of 1,534 pupils were studied with 298, 436 and 800 from types I, II and III schools, respectively.

A standard protocol to collect information such as date of birth, sex, physical examination and anthropometric measurements was pre-tested and validated before final administration on the study group. The ages of the children were verified from the school register. Height was measured using a specially made wooden stadiometer, measuring to the nearest centrimetre). Weight was measured using a Salter protable baby weighed model MP 235 (CMS weighing equipment Ltd, 18 Camde High street, London NW1 05H, England) to the nearest 0.1 kg. For children that weighed more than 25 kg Digital Electronic Scale, Thinner Spoet. Model MS-9 (1989 Measurement Specialties Inc. USA) was used. The scales were checked frequently for accuracy after every 20 measurements using a known standard.

Statistical analysis

Weight and height measurements were compared with the NCHS growth charts using the Epinut analysis module of Epi Info version 5.10b [12]. Comparison was made between the three school types, sex and age using the chi-square test and analysis of variance. Differences were shown to be statistically significant where $P<0.05$. To determine the proportion of stunting, wasting, underweight and overweight the following cut off points were used. Stunting: z score of height for age <-2SD Wasting: z score of weight for height <-2SD Underweight: z score of weight for age < -2.0SD Overweight: z score of weight for height > + 2.00 Cut–off points of <-3.0 SD was used to determine severe forms of malnutrition in the pupils studied (WHO, 1986) [13].

Results

Complete data was available in 1309 pupils out of the 1534 (85.3%) pupils studied.

Age and School types

Though the mean age (SD) of the pupils of Type II schools (81.9 ± 12.5 months) and Type III schools (86.7 ± 12.8 months) were statistically different ($P < 0.001$), these mean ages were significantly higher that the mean ages of pupils of Type I schools (75.6 ± 8.0 months) ($P < 0.001$). However, no sex differences were demonstrated in the mean ages of both males and females of each school type ($P > 0.05$) (Table 1).

Table 1: The age and the anthropometric measurements mean ± (SD) of pupils based on school type and sex

School Type	Age (months)	Height (cm)	Weight (kg)
School Type I			
Total (n = 252)	75.6 (8.0)	114.8 (5.8)	19 1 (2.6)
Males (n = 126)	76.3 (7.9)	115.4 (6.0)	19.4 (2.5)
Female (n = 126)	74.8 (8.0)	114.2 (5.5)	18.7 (2.7)
School type II			
Total (n = 270)	81.9 (12.5)	110.70 (6.7)	17.8 (2.6)
Males (n = 147)	81.8 (11.7)	111.0 (6.7)	17.9 (2.5)
Females (n = 123)	82.0 (13.3)	110.40 (7.0)	17.6 (2.8)
School Type III			
Total (n = 787)	86.7 (12.8)	110.72 (6.7)	16.9 (2.5)
Males (n = 468)	87.3 (13.3)	110.5 (6.6)	16.9 (2.4)
Females (n = 319)	86.3 (12.5)	111.0 (6.8)	16.8 (2.5)

Height and school types

The mean height of pupils of Type I schools (114.8 ± 5.8 cm) was significantly higher than the 110.7 ± 6.8 cm and 110.7 ± 6.7 cm of Types II and III schools, respectively ($P < 0.001$), however, there was no significant difference between the heights of pupils of Types II and III schools ($P > 0.005$) (Table 1).

Weight and school types

The weight of pupils in Type I schools (19.1 ± 2.6 kg) was significantly greater than the 17.8 ± 2.6 kg and 16.9 ± 2.5 kg of pupils of Types II and III schools, respectively ($P < 0.001$), however, no significant difference was shown to exist between the weights of pupils in Types II and III schools ($P > 0.05$). The distribution curves for weight for pupils of Type III schools deviated furthermost from the NCHS standard compared with the distribution curve for the Type I schools (Fig. 1).

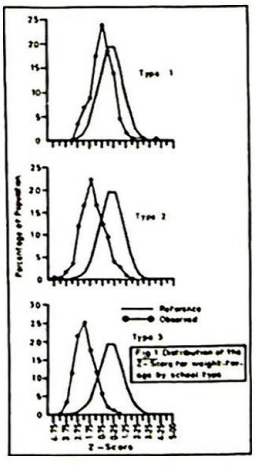

Fig. 1. Distribution of z-score weight for age by school types.

Nutritional status and school types.
When nutritional status was classified according to school types (Table 2), significantly more children were underweight *($P < 0.001$)*, stunted *($P < 0.001$)*, stunted *($P < 0.0001$)*, and wasted *($P < 0.0001$)* in Type III schools compared with Type I schools, however, more pupils were overweight in Types I and II schools compared with type III schools *($P > 0.05$)* (Table 2). Similarly, Table 2 demonstrated that irrespective of school type, more male than female pupils suffered from stunting, wasting and underweight. The distribution curves for weight for height of pupils of Type III schools deviated furthermost from the NCHS reference standard compared with the with the distribution curve for the Type I schools (Fig. 2) which approximated closely with the NCHS reference standard.

Table 2: The distribution of anthropometric indices of malnutrition based on sex and school type (Mean ± SD)

School Type	Age (months)	% Underweight	95% CI	% Stunting	95% CI	% Wasting	95% CI	% Overweight
Type I								
M + F (n = 252)	75 6 (8 0)	9 9	6 6 – 14.4	6.4	3 8 – 10 3	7.5	4.7 – 11 7	1.2
M (n = 126)	76.3 (7.9)	12.0	7 1 – 19.3	8.8	4.7 -15.5	7.9	4.0 – 14.4	0
F (n = 126)	74.8 (8.0)	7.9	4 0 – 14.3	4.0	1.4 – 9.4	7.1	3.5 – 13.5	2.4
Type II								
M + F (n = 270)	81.9 (12.5)	33.3	27.8 – 39.3	42 2	36.2 - 48.3	6.5	4.1 – 10.2	1.3
M (n = 270)	81.8 (11.7)	39.5	31.6-47.9	42.5	34.4 – 50.9	7.6	4.1 – 13.1	1.2
F (n = 123)	82.0 (13.3)	26.0	18.7 – 34.8	41.8	33 1 – 51.1	5.3	2.3 – 11.0	1.6
Type III								
M + F (n = 787)	86.7 (12.8)	62.1	56.8 – 65.5	57.2	53.6 - 60.7	16.7	14.1 – 19.5	0.1
M (n = 468)	87.3 (13.3)	70.3	65.4 –74 4	62.5	57 9 – 66 8	17.6	14.3 – 21 4	0 2
F (n = 319)	86.3 (12.5)	50.2	44.6 - 55.8	49.2	43 5 – 54 9	15.3	11 5 – 19 9	0

Table 3: The percentage distribution of nutritional status in both sexes according to school types and age.
( ) – *number of pupils evaluated*

Ages (months)	Underweight			Stunting			Wasting			Overweight		
	I	II	III	I	II	III	I	II	III	I	II	III
<60	0 (7)	20 (5)	50 (6)	0 (7)	20 (5)	16 7 (6)	0 (7)	0 (5)	16 7 (6)	0 (7)	7 1 (5)	0 (6)
61-72	5.7 (8)	14.6 (69)	37.7 (69)	6.8 (88)	14.6 (48)	31.9 (69)	5.7 (8)	6.3 (48)	15.9 (69)	2.3 (88)	0 (48)	0 (69)
73-84	12.0 (125)	30.7 (137)	58.8 (345)	4.8 (125)	43.1 (137)	53.4 (345)	10.4 (125)	7.4 (137)	14.8 (345)	0.8 (8)	1 5 (137)	0.3 (345)
85-96	17.9 (28)	43.6 (55)	68.3 (246)	17.9 (28)	48.2 (55)	63.9 (246)	7 1 (28)	9 1 (59)	21.2 (246)	0 (28)	0 (55)	0
97-108	0 (4)	64.7 (17)	70.7 (75)	0 (4)	82.4 (17)	68.0 (75)	0 (4)	11.8 (17)	12.2 (75)	0 (4)	0 (17)	0
109-120	0 (4)	66.7 (6)	85.3 (34)	0 (4)	100 (6)	75.8 (34)	0 (4)	0	29.4 (34)	0 (4)	0	0
>120	0 (4)	100 (3)	93.8 (15)	0 (4)	100 (3)	100 (15)	0 (4)	0	0	0 (4)	0 (3)	0

Table 4: Classification of nutritional status of pupils based on z-scores (n = 1309) and 95% Confidence

Nutritional classification	Z-scores	Percentage of pupils	95% C.I.
Underweight (weight for age)	<-2SD	46.1	43.4 – 48.9
	<-3 SD	10.2	8.7 – 12 0
Stunting (weight for age)	<-2SD	44.3	41 5 – 47.0
	< - 3SD	18.2	16.1 – 20 4
Wasting (weight for height)	<2SD	12.7	10.9 – 14.6
	<3SD	1.6	1.0 – 2.5
Overweight (weight for height)	>+2SD	0.62	0.1 – 1.2
Both stunting and wasting		7.2	

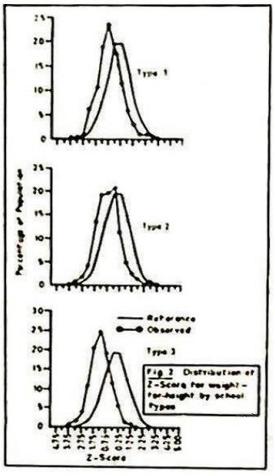

Fig. 2: Distribution of z-score for weight for height by school types

Table 4 shows that 46.1% and 44.3% of the 1309 pupils were underweight and stunted (z-sore <-2SD), however, severe underweight, stunting and wasting were detected in 10.2%, 18.2% and 1.6% of all pupils evaluated, respectively (z-score <-3SD).

The influence of age on the distribution of anthropometic indices showed that irrespective of school type, these indices were significantly more pronounced in Type III schools compared with Type I schools (Table 3).

Discussion

The nutritional status of children in this study was compared with a reference population defined by the U.S. National Centre of Health Statistics (NCHS) as recommended by the World Health Organisation [14-16]. International standards have been shown to be appropriate for children in developing countries [14-17]. The use of this reference population is based on the finding that well-nourished young children of all population groups follow very similar growth patterns [15-17]. The local reference by Janes [18] was not used as a reference in this study to allow for international comparability and more so because these reference values were obtained about 20 years ago.

The study showed that the socioeconomic level of the parents affect the age at which children enter school. Nigerian children are expected to start primary school at the age of six. However there was a wide variation in the age at entering school in this study which is similar to findings in other studies [4,5,11]. In this study children in Type I schools had ages corresponding to their class unlike in the Types II and III schools where the children were older. The relatively old children in Types II and III schools may be due to late entry into the primary schools which may be attributed to poverty and ignorance of parents of these children and associated child labour, which are common in these lower strata schools. Children in the Type I schools enter into school earlier because of the advantaged social class to which they belong and also because most of the mothers are working mothers who send their children to school earlier while they work.

The study also showed that the sex distribution in Types I and II were similar with a male:female ratio of 1:1. However, Type III schools showed a preponderance of males (1.5:1). This may be a reflection of the belief of the socioeconomic relevance of a male child in the society. The main observation in this study as in earlier studies [5,11,18-21] was the high overall prevalence of 46.1% of underweight pupils in all the school strata, but this was more evident in Type III pupils where 62.1% of them were underweight compared with 9.9% in Type I. These findings may imply that indices indicative of a poor socioeconomic situation such as infections and poor food intake may be responsible for the high prevalence of underweight in school Type III in this study.

Stunting was demonstrated as a main problem in the pupils studies (44.3%), but was more prevalent in Type II schools (42.2%) and Type III schools (57.2%). Stunting usually starts very early in life and is related to a chronic nutritional deficiency state and high prevalence of infections.

The findings in this study and confirmed by Barros *et al.* (1991) [11] showed that though the overall prevalence of wasting (12.7%) was found to be low in the total population studied, wasting was highest in the Type III school pupils. The reason for this is not clear. Though overweight was not demonstrated to be a major public health problem among the children studied however, the prevalence of obesity was demonstrated to be highest in Types I (1.2%) and II (1.3%) school pupils. The findings in this study confirmed the fact that prevalence of obesity is generally higher among the rich in developing countries but among the poor in the developed countries [22]. The higher prevalence of overweight in females in the school types may be due to gender-specific essential fat.

Generally across the socioeconomic strata, girls had better indices of nutrition than boys did and these indices may be long standing. Akinyinka *et al* [8] demonstrated that female newborn have greater calorie and protein reserves compared with boys such that they start life at a disadvantage which is sustained even up to school age.

Prior to the early 1970s, improvement in nutritional status was reported in many developing countries, but this was not observed in this study. Rather, these indices were poorer compared to others [18,23] in the same environment. The deterioration in the nutritional indices may be multifactoral, since physical growth is an expression of synergism of ethnic traits, genetic potentials, dietary habits and morbidity from diseases, which are prevalent in this community. Since the subjects studied are of the same ethnic background and have probably the same genetic potentials, it may be implied that the suboptimal growth may be due primarily to dietary inadequacy as a result of deteriorating living standards.

There is need for intervention programmes to combat or reduce these high rates of wasting, stunting and overweight in children. It is evident from the data that improving the socioeconomic base of the population as evidenced from the relatively lower prevalence of

malnutrition in Type I schools will improve this decline. It is hoped that an improved school meal programme and routine health checks may reduce the prevalence of this nutritional impairment.

References

1. Jellife DB. The assessment of the nutritional status of the community W.H.O. monogram series 1966 No. 53
2. Atoyebi FOT. Dietary intake of pre-school children in a village in Southwestern Nigeria determined by food analysis M.Sc. Thesis. University of Ibadan. 1983.
3. Toriola AL. Anthropometric assessment of nutritional status of Nigerian children. Trop Geog Med 1990; 42: 337-341.
4. Walker MBE. Health appraisal of children in some Ibadan schools. FMCGP Dissertation. National Postgraduate Medical College, Nigeria. 1991.
5. Olupitan KO. Nutritional status of primary school children in Ibadan using height and weight as anthropometric measurements. B.Sc. Thesis. University of Ibadan. 1991.
6. Asindi AA. Ibia, EO. and Udo JJ. Mortality among Nigerian children. Trop Med Hy 1990; 94: 152-155.
7. Akinlosotu RA and Hussain MA. Usefulness of height at first year in school as an index of nutritional status. Nig J Nutr Sci 1985; 6(1): 29-35.
8. Akinyinka OO, Sowumi A, Sanni KA, Falade AG. Arm area measurement as indices of nutritional reserves and water in the African newborn. Afr J Med Med Sci 1998 (in Press)
9. NISER Socio-economic survey of Ibadan city. Report of a survey commissioned by the Ibadan Metropolitan Planning Authority. Prepared by the Nigeria Institute of Social and Economic Research (NISER), Ibadan, 1987.
10. Kish and Leslie. Survey Sampling. John Wiley and Sons, New York, 1965.
11. Barros MBA, Maude SH. Ross DA, Davies PSW and Preece MA. Evaluation of the nutritional status of 1st year school children in Campinas, Brazil. Ann Trop Paediatr 1990; 10: 75-84.
12. NCHS growth curves for children. US. Dept of Health, Education and Welfare. Washington DC. PHS: 78-1650: 1977.
13. WHO. Use and interpretation of anthropometric indicators of nutritional status. WHO Working Group. Bulleting of the World Health Organisation 1986; 64(6): 929-941.
14. Kow F, and Balasubramaniam E. Are international anthropometric standards appropriate for developing countries? J Trop Peadiatr 1986; 37; 37-44.
15. W.H.O. A growth Chart for International Use in Maternal and Child Health Care: Guidelines for PHC personnel. Geneva WHO, 1978.
16. Graitcher PL Gentry E.M. Measuring children: One reference for all. Lancent 1988; ii 297.
17. Waterlow JC. Child growth standards. Lancet 1980; i. 717.
18. Janes MD Physical growth of Nigerian Yoruba children. Trop and Geog Med 1974; 26: 389-398.
19. Salami AA. Characteristics and determinants of child nutritional status in a rural area of Oyo State. B.Sc Thesis. University of Ibadan, 1988.
20. Kolawole IF. The effectiveness of height as a measure of nutritional status at 1st year in school in Ibadan. B.Sc. Thesis. University of Ibadan, 1990.
21. Ngandu NH, Nkowane BM and Watts TE. The health status of rural primary school children in Central Zambia. J Trop Med Hyg 1991; 94: 169-174.
22. Bieliki T. Physical growth as a measure of the economic well-being of a population: the twentieth country. In: Falkner F. Tanner J.M. eds. Human Growth– A comprehensive Treatise. Vol. 3: Methodology, Ecological, Genetic and Nutritional Effects on Growth New York: Plenus Press, 1986; 283-305.
23. Oduntan SO. The health of Nigerian children of school age (6-15 years). I and III. Ann Trop Med Parasitol 1974; 68 (2): 129-143.