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Full Length Research Paper

Lingering hunger among primary school pupils residing in rural areas of Borno State, North-Eastern Nigeria: implication for education and food supplementation programs

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Childhood hunger among rural settlers may be as a result of food insecurity, poor sanitation and illiteracy. The aim of this study was to assess and classify malnutrition into underweight or obesity among primary school pupils, and to provide information to policy makers on the need for education and food supplementation programs. Four hundred primary school pupils from eight different schools in Bama and Banki rural areas of Borno state were selected using the cluster random sampling method. While the WHO Z-scoring method was used to estimate malnutrition, food, dietary habits and physical activities were assessed by way of focal group discussions. Student t test was used to compare means and to test for significance of data. There were 220 (55 %) boys and 180 (45 %) girls in a ratio of 1.2:1. While 248 (62 %) pupils belong to low socioeconomic class, 200 (50 %) were found within 11-13 years age bracket. Overall mean age (SD) was 9 (2.73), 95 CI (6.89-11.11) years. Mean (SD) number of pupils with normal BMI and those with underweight BMI levels were 31.3 (19.01) and 102 (42.8) respectively, and comparison of this means was significant ($p < 0.0001$). None of our participants was found to be obese in this study. Dietary intake of 272 (68 %) subjects was inadequate in quality and quantity. Most participants 320 (80 %) trek to school, and nearly all subjects 360 (90%) participate in physical education. Large numbers of our study population were underweight, and the proportion of underweight children increased with age. This data suggest the need for education and food supplementation programs geared towards prevention and treating malnutrition in our cohorts.

Keywords: Hunger, Primary school pupils, Rural areas, Borno, North-Eastern Nigeria.

INTRODUCTION

Childhood hunger and malnutrition could have a far greater impact upon child health than was previously

thought (Economist 2008). The most recent estimates are that underweight among other childhood morbidities are responsible for 21% of disability adjusted life years and 2.2 million deaths annually (Black et al 2008). Hunger can arguably be tagged as the gravest single threat to the world's children especially in developing

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countries, more so, Sub-saharan Africa. No simple answer was given as to the cause of hunger in children. The United Nations Children Funds reported a complex array of interconnected basic determinants of childhood hunger such as ecological, economic, and sociopolitical (Unicef 1990). These determinants in the end affect food security, which is defined as secure access for all people at all times in sufficient quality and quantity in order to lead a healthy and active life (Save the Children 2007). Anthropometric indices such as weight, height and body mass index (BMI) could reflect the health and welfare of school children and can predict academic performance, health outcomes as well as reflect their socioeconomic profile (Opara 2010). According to previous report, a person is regarded as obese if the BMI is equal to 30 or more, overweight if it is between 25 and 29.9, normal if it is between 18.5 and 25, and underweight if it falls below 18.5 (WHO 1997). Review of anthropometric has lead to the adoption of a better anthropometric tool called the Z-scoring method which uses standard deviation to classify a child as normal, underweight or obese (Opara 2010). In most developing countries of the world like Nigeria, malnutrition in children are often associated with parental poverty, illiteracy and attendant high levels of communicable diseases (FMOH 2005 and Thiam et al, 2006). Nonetheless, however, Thiam et al in (2006) stated that obesity is now seen in children of affluent individuals/groups in developing countries, and countries, communities and households where both undernutrition and overnutrition exist are termed to have double burden of malnutrition. Childhood malnutrition mostly under fives has received attention from policy makers, researchers, academics, parents, and international health bodies that includes the World Health Organization (WHO 2006 and Van der Merwe, 2004). However, Van der Merwe in 2004 reported that underweight in children seems to be overshadowed by obesity. Moreover, attention to childhood malnutrition has focused mainly on children from developed countries (Van der Merwe 2004). This study were therefore undertaken to:

1) Assess and classify malnutrition into underweight or obesity using the Z-scoring method among primary school pupils in Bama and Banki rural settlements of Borno state, North-Eastern Nigeria.

2) Provide information to policy makers on the need for education and food supplementation programs in primary schools.

MATERIALS AND METHODS

Study Area

The study was carried out at Bama and Banki rural areas in collaboration with the University of Maiduguri Teaching Hospital (UMTH), North-Eastern Nigeria. Apart from being the largest health facility in the area, UMTH

serves as a referral centre for the six North-Eastern States and neighboring countries of Chad, Cameroon and Niger Republics.

Ethical Considerations

The study protocol was authorised by the Bama local government authority, medical research and ethics committee of the UMTH, department of education and principals of the chosen schools. Consent was sought from the parents/care givers of our participants. The approval was on the agreement that anonymity must be maintained, best practices be ensured, and that every finding would be treated with utmost confidentiality and for the purpose of this research only. All work was performed according to the international guidelines for human experimentation in clinical research (World Medical Association Declaration of Helsinki 2000).

Study design / Sampling Technique / Study Population

The study was a cross-sectional randomized descriptive study of primary school pupils between 5 and 13 years of age from eight different primary schools in Bama and Banki communities. Fifty pupils were selected from each primary school. Primary schools were selected using simple random sampling methods, whereas the pupils that participated in this study were enrolled using the cluster random sampling method. Children were requested to obtain permission from their parents or guardian to participate in the study.

The minimum sample size was determined using statistical formula that computes 38.3% prevalence for malnutrition at 95 confidence interval and alpha levels of 0.05 (FMOH 2005, and Naing et al 2006). This equalled 365; however, 10% of this was added to maximize power. Therefore, the study population comprised of 400 primary school pupils. Participation in this study was voluntary. A child was eligible for participation in the study if he/she has met the following study inclusion criteria: (i) had no known underlying chronic illness or limb deformity, (ii) had no known underlying dysmorphology on physical examination. Pupils, who did not obtain parental consent or personally refused to participate in the study or did not return their consent forms, were excluded from the study.

A semi structured questionnaire completed by parents/subjects was used to obtain information on; age of pupils, parental education and occupation. Child socioeconomic class (SEC) was determined by Oyedeji scoring criteria using the education and occupation of their parents (Oyedeji 1985). Reliability of the questionnaire was assured by one investigator administering the questionnaire to all participants. Validity of the questionnaire was guaranteed by

conducting a pilot study among five randomly selected children. A focus group discussion was used to generate data on food/dietary habits and activity levels of our study group.

The main variable studied was subjects' BMI calculated from weight and height (weight/height^2) as a marker of body adiposity. Age, sex, SEC and food/dietary habits were also studied. Measurements were made while observing standard precautions. Underweight in our participants was classified as $<-2\text{SD}$ of WHO 2003 reference BMI Z-score for age and sex, whereas obesity was classified as $>+2\text{SD}$ of BMI Z-score for age and sex (Opara et al 2010).

DATA ANALYSIS

Means and standard deviations (SD) were calculated for the different classes of malnutrition and age of the pupils. Percentages and 95% confidence interval of the mean was calculated as described by Hanley et al (1982). Student t test was used to investigate the effect of mean of pupils with normal nutrition on mean of those that were underweight. Statistical analysis was performed using statistical package for social science (SPSS) statistical software version 16, Illinois, Chicago USA. Statistical significance was defined as a p value <0.05 . Tables were used for illustrations.

RESULTS

Table 1 shows sex, SEC and age group profiles of the primary school pupils who participated in this study. Four hundred primary school pupils were enrolled in current study. Boys were 220 (55 %) and the ratio of boys to girls was 1.2:1. While 248 (62 %) pupils belong to low SEC, 200 (50 %) were found within 11-13 years age bracket. Overall mean age (SD) was 9 (2.73), 95 CI (6.89-11.11) years.

Table 2 below shows the proportion of normal and underweight children according to their age groups. The mean (SD) number of pupils that had normal BMI and those with underweight BMI levels were 31.3 (19.01) and 102 (42.8) respectively; comparison of this means was significant ($p < 0.0001$). None of our subject was found to be obese in this study.

Responses to focal group discussions

Diet: Diets in 272 (68 %) of the children were inadequate in quality and quantity; basically containing carbohydrate. Chiefly locally made noodles, guinea corn, millet, maize and rice infrequently fortified with legumes or other macro and micronutrients. One hundred and sixty (40 %) pupils eat at least three times daily and

none of the children that participated in this study had regular snacks in between meals. One hundred and ninety two (48 %) of the participants indicated that they often purchased items from vendors at school. Of these children, 164 (85.5 %) bought items that could be considered junk food or not nutritious. A relationship between underweight and dietary habits was noted, with underweight children reporting non-nutritious dietary habits.

Physical activity: Three hundred and twenty (80 %) pupils in present study trek to school. All the schools (100 %) have physical education session in their syllabus and almost all children 360 (90%) participated. When asked about their opinions regarding their health status, 330 (82.5 %) subjects considered themselves healthy.

DISCUSSIONS

Present study indicated that a significant proportion of primary school pupils from the selected schools in Bama and Banki were underweight. This concurred finding by other colleagues elsewhere (Opara et al 2010). Factors ranging from low SEC, inadequate nutritive diets, physical exhaustion from walking to school and physical education in our subjects were identified to be some of the reason behind this finding. Another reason for this observation may not be unconnected to WHO report that rated (70 %) of Nigerians to be living below poverty line and rural areas may be worst hit (WHO 2006). A similar study that was conducted in Bangladesh found that (79 %) of households were simply too poor to adequately feed their children a healthy diet (Saved the children 2007). Based on this, Dewey and Adu-Afarwuah (2008) argued that educating care givers of children alone may not tackle the problem of malnutrition in setting where household food insecurity is prevalent, unless caregivers also have access to nutrient rich foods.

Other investigators are of the believe that, focus should be on boosting caregivers knowledge on the right food and good sanitation as possible alternatives to reducing childhood malnutrition (Boseley et al 2008). One way by which mothers' education and good hygiene would boost nutritional status of children is through reduction of recurrent diarrheal diseases associated with lack of portable drinking water and bad sanitation. Rural communities similar to the one where our subjects are residing have been found to lack portable drinking water with inadequate sanitation relative to urban areas. Accordingly, the WHO reported that only (49 %) of rural dwellers in Nigeria have portable drinking water and only (48 %) had good sanitation (WHO 2006). With this in mind, the findings of this study would be anticipated.

A lower value of underweight compared with our observation was previously reported in participants attending private schools (Opara et al 2010). These

Table 1. Sex, socioeconomic class and age group distribution of the 400 pupils

Parameters	Frequency	Percentage (%)
Boys	220	55
Girls	180	45
<u>Socioeconomic class</u>		
High	152	38
Low	248	62
<u>Age group (years)</u>		
5-7	80	20
8-10	120	30
11-13	200	50

Table 2. Age and body mass index of the study group

Age group (years)	Body mass index (kg/m ²)		Total
	Normal n (%)	Underweight n (%)	
5-7	12 (3.0)	68 (17.0)	80 (20.0)
8-10	32 (8.0)	88 (22.0)	120 (30.0)
11-13	50 (12.5)	150 (37.5)	200 (50.0)
Total	94 (23.5)	306 (76.5)	400 (100)

schools are patronized by elite families, those in high SEC and the rich, the tendency for these families to over-school their children, while cutting down on food intake possibly explains this finding. Private schools are few, expensive and beyond the reach of most rural populace in Bama and Banki. These were the reasons our study population were enrolled from public schools. Current study revealed rising proportion of underweight with increasing age. This finding was consistent with that of other authors abroad (Rolland-Cachera et al 1997). The reason for this is unclear; however, many workers have published declining BMI after infancy to a nadir and to possibly rise again at puberty (Rolland-Cachera et al 1997). Growth velocity is known to be high in infancy and begins to slow down after one year of age; this probably explains the theory of post infancy BMI nadir aforementioned.

The presence of underweight in present study may be attributed to the food eaten by our subjects. Predominantly carbohydrate diets such as locally made noodles, guinea corn, maize, millet and rice, which are infrequently fortified with other macro and micronutrients, were the most eaten foods. Most of our children eat less than three times daily; therefore, in terms of quality and quantity, these foods are inadequate. Food preference and dietary patterns in our study population are associated with many factors such as, parental influences, home environment and food insecurity that may be influenced by parental SEC.

None of our subjects was found to be obese; this was similar to observation made in other participants from public schools (Opara et al 2010). The prevalence of

obesity was higher among children from affluent and high SEC, who were enrolled from private schools

(Anyika et al 2005). Media influence, globalization of food industry, nutritional transition to western diet and emergence of an obesogenic environment in schools were advanced as causes of obesity in children (Kennedy et al 2007).

Limitations

Caution may be needed in generalizing the results of the current study since only a small group of children were enlisted to participate in this work, moreover, the findings may be attributed to a range of unproven causes. Our subjects were selected from public schools, where school attendance is free or a minimal school fee is leveraged. This type of school attracts children from low income parents that are facing economic downturn, and unemployment, which in turn could have affected these children.

CONCLUSION

The results of present work showed that a large number of primary school pupils in Bama and Banki communities were underweight. It was also evident that as age increased, the proportion of children with underweight is also increased. This data suggest the need for food supplementation programs in order to deliver better quality food to prevent and treat malnutrition in our

cohorts.

RECOMMENDATIONS

It is recommended that a larger number of schools and more children should be included in future studies of this kind. Considering that primary schools in rural areas were used in this study, it is recommended that other schools from the public, private, urban and rural setting be used in subsequent works to obtain a representative cross-section of children in Borno state.

Competing interests

We the authors certify that we have no commercial associations for example, consultancies, stock ownership, equity interests, patent-licensing arrangements etc that might pose a conflict of interest in connection with the submitted article. All authors also declare that they have no conflict of interest.

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Contributors

BUA conceived and designed this study. BUA, NMU, AI, AAA and DT assessed and interpreted the data; all authors were involved in critical revision of the paper and drafting of report.

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