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# Factors influencing the pattern of malnutrition among acutely ill children presenting in a tertiary hospital in Nigeria

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**Abstract** *Introduction:* The burden of childhood malnutrition in Nigeria has remained unchanged for nearly a decade between the two Demographic and Health Surveys (NDHS) of 2003 and 2008.
The causes of malnutrition are complex and multifactorial. It results from the interplay of socioeconomic, dietary inadequacy and environmental factors.
*Objective:* To describe factors that influence the pattern of malnutrition in acutely ill children in a tertiary Hospital in central Nigeria.
*Methods:* Cross sectional and descriptive study. Children aged 6 to 59 months presenting with acute illnesses to the paediatric emergency unit were concurrently recruited over a 7 month period, (April-October 2012). All had comprehensive clinical assessment done including anthropometric (weight, mid arm circumference, height/length) measurements and z-scores calculated for the individual nutritional characteristics.
*Results:* A total of 379 children were recruited with a mean age of 21.7±13.9 months. There was no difference in the mean age between male and female (P=0.8). The prevalence of wasting was (26.9%), (18%) for stunting and (18.9%) for underweight. The prevalence of severe wasting, WHz scores <-3SD was (5.9%), (5.4%) for stunting and (4.6%) for underweight. The highest prevalence of wasting and stunting were in age groups 6-11 and 12-23 months, at 9.3% and 6.3% respectively. The factors associated with malnutrition included early introduction of complementary diets, number of children in the home, maternal illiteracy and lower socioeconomic status of the parents. Female children were commenced on complementary diets much earlier than male (P=0.01).
*Conclusion:* This study demonstrates the association between childhood malnutrition and factors such as early initiation of complementary diet, maternal illiteracy, number of children in the home and poor parental socioeconomic status.

## Introduction

Child nutrition is an important indicator for monitoring health status of the populations. Children who suffer from growth retardation due to poor diet tend to have more frequent episodes of acute illnesses and higher mortality[1-3]. There is strong evidence that malnutrition in children is associated with delayed mental development, poor school performance and reduced intellectual capacity[4-6]. In children under the age of 5 years, malnutrition even of mild to moderate severity is an important cause of increased mortality in many developing countries[2,7].

In Nigeria, the pattern and severity of childhood malnutrition for nearly a decade have remained essentially unchanged as shown in the reports of the Nigeria Demographic and Health Surveys of 2003 and 2008. In some populations, nutritional indices such as wasting and stunting have shown evidence of minimal improvement while in others; they have deteriorated

It is well-known that the causes of malnutrition are complex and multifactorial. However, dietary and environmental factors play a major role. Dietary inadequacy and other factors related to the mother such as her socioeconomic status and poor caring practices contribute

significantly to the risk for childhood malnutrition.[8,9] Most often, socioeconomic and environmental factors that impact significantly on malnutrition in developing countries include poverty, social in-equity, ignorance, inappropriate food preparation, large family size and unsanitary living conditions[7,10,11].

In South Asian countries for instance, high prevalence of childhood malnutrition is due to factors such as poverty, high population density, low status of women, poor antenatal care, high rates of low birth weight, unfavourable child caring practices and poor access to child health care[12]. This picture is similar to what obtains in most sub-Saharan African countries.

Previous studies have revealed that most mothers and/or caregivers of children with malnutrition in Nigeria had faulty perception of its causes. Many perceived malnutrition as a common childhood illness that they ultimately grow out of or as a condition that is caused by an evil spirit[13]. This wrong perception may be partly responsible for the persistence of high rate of childhood malnutrition in many parts of Nigeria despite various interventions. As we gradually approach 2015 when it is expected that a significant reduction in the under-fives malnutrition should have been achieved, based on the objectives of the Millennium Development Goals (MDGs), it is important to identify what progress has been made and what challenges still need to be confronted. The purpose of this study was to describe the pattern of malnutrition in children presenting with acute illnesses as well as identify factors that may influence it.

## Methodology

A descriptive, cross sectional study using quantitative data collection methods. The study was conducted in the department of Paediatrics, Jos University Teaching Hospital in Nigeria. The Hospital is a tertiary health facility that provides all levels of care, and Paediatric department sees children from birth to eighteen years of age. Many of the patients seen in the hospital are un-referred and come mainly from Plateau state, the six neighbouring states and the Federal Capital territory. The department of paediatric offers services that include general, consultant paediatric and specialist care.

The study participants included children aged 6 to 59 months who were seen in the paediatric emergency unit and the paediatric outpatient department, from April to October 2012. Children whose illnesses had lasted two weeks or less and those whose parents/care giver gave consent were included in the study. Those with any congenital abnormalities, hereditary disease such as sickle cell anaemia, underlying disease conditions such as chronic renal disease, tuberculosis infection and cerebral palsy were excluded from the study. Children who were relatively stable were recruited into the study at the time of first contact with the researcher while those very sick and unstable, were recruited later after stabilization in the ward.

Data collected included the child's age, gender, anthropometry (weight, height, mid-upper arm circumference). Weight was measured using Seca® or bassinet scales with the subject standing or sitting respectively, bare foot, wearing only light clothing. Scale was checked for accuracy with standard weights after every 10$^{th}$ measurement, or whenever it was moved from one place to another. Weight measurements of each child were recorded to the nearest 0.1kg.

Height measurement was done in the recumbent position (i.e. length) for children less than two years of age using a stadiometer. Standing height was measured for children who are older than two years using a stadiometer fixed vertically to the wall. With the child bare footed, standing erect against the wall, and looking straight ahead with the lower border of the eye sockets at the same horizontal plane as the external auditory meat us, the height was recorded to the nearest 0.1cm. For children less than two years of age, measurement was done on a horizontally fixed stadiometer. The head was held to a fixed board while a mobile foot board was moved against the soles of both feet for recording of the length, recorded to the nearest 0.1cm.

The mid upper arm circumference (MUAC) was measured in all the children using an inelastic tape and measurement recorded to the nearest 0.1cm.

Other data collected included findings from physical examination and laboratory investigations on different specimens as indicated. All measurements and physical examination were done by the researcher. The weight-for-height, height-for-age and weight-for-age standard deviation (SD) score (z-scores) were computed using the World Health Organisation (WHO) anthro version 3.2.2. The World Health Organisation's Z-scores weight for height, height for age and weight for age were used to define wasting, stunting and underweight respectively.

The breast feeding/complementary dietary history and the socio-demographic information of the parents were obtained from interviewing the mothers in most cases or where both parents were available and done by the researcher. These included the mother's educational status, father's occupation, marital status of the mother and number of children in the home. The social economic status for the parent was categorised according to the tool developed for Nigerian population by Olusanya et al[14]. All the information obtained was entered into a proforma designed for the study.

Ethical approval for the study was granted by both the Research and Ethical Committees of the Jos University Teaching Hospital and University of Western Cape.

Data was collected over a seven month period from April to October 2012.

All the data obtained were entered into EPI Info computer software version 3.4.3. Analysis of data was done using EPI Info, Stata IC 10, Texas 77845 USA, 800-STATA-PC. The student't' test was used to compare means while Chi-square test was applied to compare for proportion and multivariate analysis were needed, accepting level of significance as ($p < 0.05$).

## Results

Three hundred and seventy nine children were enrolled for the study during the period. The age ranged from 6 to 57 months with a mean of 21.67 ± 13.94 months. There was no difference in the mean age between male and female (P=0.76). The mean weight of the children in the study was 10.6±3.1(Kg) while, the mean length/ height was 82±12.9(cm). Mean mid upper arm circumference was 14.9±1.5(cm).One hundred and nine (28.8%) children were aged less than 12 months. Majority of the children in the study, 237 (85%) were younger than 24 months. There were more males 224 (59.1%). Acute respiratory infection was the commonest reason for emergency visit followed by malaria at 36% and 27.1% respectively. The highest number of children with malnutrition was seen in the first 23 months of life. This is shown in Table 1.

**Table 1:** Age distribution and pattern of malnutrition

| Age in months | WHz scores <-2 N(%) | HAz scores <-2 N(%) | WAz scores <-2 N(%) |
|---|---|---|---|
| 6-11 | 109(21.3) | 106(11.4) | 109(12.8) |
| 12-23 | 128(17.5) | 129(19.7) | 127(13.4) |
| 24-35 | 70(17.1) | 72(12.5) | 73(15.3) |
| 36-47 | 35(12.5) | 34(0) | 34(3.1) |
| 48-59 | 37(22.9) | 38(10.8) | 36(13.5) |

*Nutritional status*

The overall prevalence of malnutrition in the study was 26.9% for wasting (WHz-scores <-2SD). In the case of stunting (HAz scores <-2SD), the overall prevalence was 18% while for underweight (WAz scores <-2SD), it was 18.9%. The prevalence of severe forms of malnutrition (z-scores <-3SD), for wasting was 22(5.9%), (19) 5.4% for underweight and (17)4.6% for stunting. The prevalence of severe wasting (WHz scores <-3SD) was highest in the age group 6 to 11 months at (10)9.3% while severe stunting (HAz scores <-3SD) had the highest prevalence of (9)6.3% in the age group 12 to 23 months.

*Factors associated with nutritional status of the children*

The prevalence of moderate and severe forms of malnutrition among 102 children in relation to some socio-demographic parameters is shown in Table 2. Severe malnutrition was influenced by the factors shown in Table 3. Wasting had a significant relationship with early introduction of complementary feeding, (before the sixth month of life) as compared with later commencement at six months or beyond. Similarly, both stunting and wasting were significantly associated with the presence of more than three children in the home and where mother had no formal education. Wasting was associated with lower social economic status of the parents while stunting was significantly related to the child's place of delivery.

**Table 2:** Socio-demographic factors and prevalence of malnutrition, *(n=102)*

| | WFH | | WFA | | HFA | |
|---|---|---|---|---|---|---|
| | <-2SD (%) | <-3SD (%) | <-2SD (%) | <-3SD (%) | <-2SD (%) | <-3SD (%) |
| *Complementary feeding* | | | | | | |
| <6 months | 85.1 | 61.5 | 41.4 | 79.0 | 34.4 | 57.9 |
| ≥6 months | 14.9 | 38.5 | 58.6 | 21.0 | 65.6 | 42.1 |
| *Number of children in the house* | | | | | | |
| ≤3 | 9.3 | 7.5 | 55.2 | 26.3 | 7.1 | 3.9 |
| >3 | 21.9 | 5.2 | 44.8 | 73.7 | 12.5 | 8.3 |
| *Place of delivery* | | | | | | |
| Home | 21.4 | 7.9 | 13.8 | 42.1 | 6.8 | 11.9 |
| Hospital | 10.4 | 4.8. | 69.0 | 52.6 | 19.2 | 4.2 |
| PHC | 23.1 | 3.9 | 17.2 | 5.3 | 14.2 | 5.0 |
| *Mother's education* | | | | | | |
| University | 9.6 | 3.2 | 13.8 | 0.0 | 4.3 | 3.2 |
| Secondary | 10.4 | 6.3 | 51.7 | 36.8 | 7.7 | 3.2 |
| No formal education | 24.5 | 14.5 | 34.5 | 63.2 | 17.8 | 14.5 |
| *Father's occupation* | | | | | | |
| Professional | 11.3 | 2.1 | 20.7 | 0.0 | 15.6 | 21.0 |
| Middle level | 10.4 | 6.0 | 27.8 | 42.1 | 43.8 | 31.6 |
| Unskilled | 17.5 | 13.4 | 51.7 | 57.9 | 40.6 | 47.4 |
| *Social status* | | | | | | |
| Upper | 10.7 | 1.5 | 20.7 | 0.0 | 18.8 | 21.1 |
| Middle | 10.2 | 7.3 | 31.0 | 26.3 | 34.4 | 10.5 |
| Lower | 17.6 | 13.0 | 48.3 | 73.7 | 47.0 | 68.4 |

**Table 3:** Relationship between complementary feeding, socio-demographic factors and severe forms of malnutrition

| Variables | Nutritional status (%) | P value |
|---|---|---|
| *Age at commencement of complementary feeding (Months)* | Wasting | |
| <6 | *n=75*(73.4) | 0.0173* |
| ≥6 | *n=27*(26.6) | |
| *Number of children in the home* | Severe stunting | |
| ≤ 3 | *n=11*(3.9) | 0.027* |
| > 3 | *n=8*(8.3) | |
| *Number of children in the home* | Severe wasting | |
| ≤ 3 | *n=5*(5.2) | |
| > 3 | *n=21*(7.5) | 0.030* |
| *Place of delivery* | Severe stunting | |
| Hospital | *n=13*(4.2) | |
| PHC | *n=1*(4.0) | 0.002* |
| Home | *n=5*(12.0) | |
| *Mother's education* | Severe stunting | |
| University | *n=3*(3.19) | |
| Tertiary/secondary | *n=7*(3.17) | 0.000* |
| No education | *n=9*(14.5) | |
| *Mother's education* | Severe wasting | |
| University | *n=3*(3.2) | 0.007* |
| Tertiary/secondary | *n=14*(6.3) | |
| No education | *n=9*(14.5) | |
| *Social status* | Severe wasting | |
| Upper | *n=2*(1.5) | 0.017* |
| Middle | *n=10*(7.3) | |
| Lower | *n=14*(13.0) | |
| *Father's occupation* | Severe wasting | |
| Professional | *n=2*(2.1) | 0.064* |
| Middle level | *n=11*(6.04) | |
| Unskilled | *n=13*(13.4) | |

* Pearson $chi^2$

Father's occupation was significantly associated with the duration of exclusive breast feeding. Based on the three occupational levels, exclusive breast feeding up to six months or more was more prevalent in children born to fathers in the middle cadre at 49.2% compared with 28.2% and 22.4% top professionals and unskilled workers respectively, (Chi=27.5, df=14, p=0.016). The influence of father's occupation did not have significant effect on the child's height and weight. Among the three occupational levels from professional to unskilled in that order, for height, (ANOVA df=96, F=1.12, p=0.17; for weight df=96, F=1.16 and p=0.2) respectively. There was an only marginal variation in the prevalence of malnutrition according to gender but this was not significant. Age at commencement of complementary feeding however, varied between genders. The mean age at commencement of complimentary feeding was 5.5±0.96 for female children and 5.9±1.62 for male; (Kruskal-Wallis test for 2 groups, $X^2$=5.9, df=1, p=0.015).

Table 3 shows factors that significantly affected the prevalence of severe malnutrition in the population studied. Age at commencement of complementary feeding, number of children in the home, place of delivery, mother's educational status and the parental social status have the most significant influence.

## Discussion

This study assessed the pattern of malnutrition in children who presented with acute illnesses and some factors that may influence their prevalence. The study demonstrated that the prevalence of both acute and chronic malnutrition is high among under-five children in Jos, Central Nigeria. The findings in the present study differs from that reported by the Nigeria Demographic and Health Survey (NDHS) in 2008[15] and from Ajao et al[16] from South west Nigeria in the general population. In both reports, stunting was (41%) and (39.3%) while prevalence of wasting was (14%) and (6.3%) respectively. Wasting is an indication inadequate dietary intake and is typically the result of a recent episode of illness or lack of food. Stunting on the other hand follows chronic insufficiency of nourishment and may also be affected by recurrent or chronic illness. The lower prevalence of stunting in this study as compared with the NDHS reports therefore, may be an indication of improved food supply and childhood nutrition in the population studied.

Age is also known to play a critical role in the development of malnutrition. This may probably have to do with the influence of complementary feeding with regard to timing of introduction and composition and subsequent breastfeeding practice. Other condition such as increased frequency of diarrhoeal disease which is known to initiate the process of malnutrition is related particularly to younger age. When the prevalence of overall malnutrition was categorized according to age groups, moderate wasting, WHz scores <-2 SD, was highest at (22.9%) in the age group 48-59 months while for severe wasting, the highest rate of 9.3% was seen in age 6-11 months. This finding however, contrasts with a previous study[16] from another part of Nigeria, where moderate wasting was most prevalent in age 30-35 months at 14.3%. Their study was among a population of apparently healthy children. Secondly, from the findings of NDHS there are clear differences in the pattern of childhood malnutrition in various regions of the country and this may have also accounted for the difference. The highest prevalence of severe wasting was in age group 6 to 11 months, the period immediately following introduction of complementary diet. Similar findings have been reported by other workers.[17,18] It is known that growth faltering in most infants starts from age seven months when breast milk is no longer adequate to meet the child's nutritional requirement or with the introduction of complementary diets[19].

Socioeconomic and demographic factors associated with malnutrition in this study were the mother's educational status, number of children in the home and parental social status. Maternal education has been consistently shown to be an important factor for child health, nutrition and survival. Wasting and stunting were identified in this study to be more prevalent in children with mothers who had no formal education. This is in conformity with previous reports[16,20,21,22,23]. The factors found to be specifically associated with severe wasting were lower socioeconomic status of parents and early introduction of complementary feeds. For children who were stunted, home delivery was the only specific factor. Lack of any formal education in the mother and greater than three children in the home were associated with both severe stunting and wasting in the study. The specific ways that maternal education affects child nutrition are not clear but may be related to the fact that educated mothers are more likely to be aware of the importance of nutrition, hygiene and health care generally[24]. It is also possible that being educated may enhance their economic power and therefore contribute to family income.

Our study has also shown that in homes where there were more than three children, malnutrition was more prevalent than in those with less number. This finding is similar to reports from other countries,[19,21,25] This association may be related to the amount of time the mother inevitably has with older children who have been weaned when there is a newer baby. Older children may be ignored as more attention is now focused on the new baby resulting in insufficient stimulation and care. It is also possible that the total number of members in the family may relate to the incidence of adverse circumstances such as availability of food per head, which may frequently be lower than that available to smaller families. This difference has been shown in the growth rate and decrease in per capita food intake with increase in family size.[16] It is however, worth noting that household food security and available income are equally important determinants of malnutrition as well and that large family size might not act alone.

Social status of the parents was determined by their educational status, occupation and income. The prevalence

of malnutrition was noted to be higher in children of parents in the lower social status. However, the father's occupation alone interestingly did not significantly affect the nutritional status of the child in this study. Similar finding has been reported previously[19]. Using the father's occupation alone, it was noted among Ethiopian children that the prevalence of malnutrition was not different among those whose parents were farmers from other skilled professionals. This finding may emphasize the importance of maternal contribution to child nutrition.

## Conclusion

In conclusion, the findings of this study again demonstrate the relationship between malnutrition in acutely ill children and such factors as time of initiation of complementary feeding, socio demographic indices such as maternal education, number of children in the home and parental social status. These findings suggest that for any successful preventive and control measures of childhood malnutrition, the critical role of girl child education, greater promotion of exclusive breast feeding for up to the first six months of life, adequate education on the timing and appropriateness of complementary feeding are paramount. Furthermore, improvement in the overall socio economic status of the population through skill acquisition and provision of job opportunities will go a long way to improve economic well-being, quality of life and thus reduction in childhood malnutrition.

The limitation of the current study is that, it is hospital based and focused on acutely ill children only. However, the findings are useful in reminding clinicians managing this group of patients that careful search for the presence malnutrition through simple anthropometric assessment in children presenting with acute illness is a worthwhile effort. Nutritional advice and counsel should therefore be included in the management outline for under-fives presenting with acute illnesses.

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