Original Article

Risk factors for malnutrition among rural Nigerian children

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Protein Energy Malnutrition (PEM) remains a major public health problem in the developing world. The aim of this study was to determine the current nutritional status and the influence of feeding practices and family characteristics on the nutritional status of under-five rural Nigerian children. It was conducted using a cross sectional, community based survey design. From 344 households, 420 children were studied. Using the modified Wellcome Classification, the prevalence of PEM was 20.5 percent whereas the prevalence of underweight, wasting and stunting using the World Health Organization/ National Centre for Health Statistics (WHO/ NCHS) standards were 23.1 percent, 9 percent and 26.7 percent respectively. Young age was significantly associated with a higher prevalence of underweight (P = 0.004). Overcrowding, low maternal income and the use of infant formula feeds in children who have attained the age of 6 months and above were associated with a higher prevalence of wasting (P = 0.029, P = 0.031 and P = 0.005 respectively). Improved living standard of families, empowerment of mothers with the aim of augmenting family income and parental education on appropriate feeding practices may help in reducing the incidence of under-five malnutrition in communities. The low prevalence rate of malnutrition was probably due to activities of the NGO in this community. This method of intervention is similarly achievable in any other community.

Key Words: malnutrition, risk factors, children, rural, Nigeria, Africa

Introduction

The World Health Organization estimates that approximately 150 million children younger than 5 years in developing countries are underweight and an additional 200 million children are stunted.[1] Recent data in Nigeria showed that 34 percent, 16 percent and 27 percent of the under-fives in rural areas are reportedly underweight, wasted and stunted respectively while 22 percent, 14 percent and 25 percent of those in urban areas are also reportedly underweight, wasted and stunted respectively.[2] Malnutrition remains a major public health problem and it appears to be getting worse in selected settings.[3] Poverty and ignorance play important roles at the background in the causation of malnutrition especially in the developing world. Poor feeding practices have been identified in the developing world to arise from ignorance about adequate breastfeeding and appropriate weaning practices.[4] All these are closely related to the socioeconomic status and sizes of families. These factors are most expectedly prominent in the rural, under-developed settings where finances and knowledge about food choices are alarmingly poor. Therefore, this study was carried out to determine the current prevalence of malnutrition and the relationships between childhood feeding practices and family characteristics existing in a rural Nigerian community. This is expected to serve as an index of the well being of rural children and to provide data that should assist in the formulation of the necessary preventive and treatment strategies, particularly in this community.

Subjects and Methods

Location

The study was carried out in Ifewara, a rural community located in Atakunmosa West Local Government Area, of Osun State, south-western Nigeria. Ifewara with the estimated population of 3, 927 and household count of 1,849 is located 18 kilometers from Osu, the headquarters of the local government area, 36 kilometers from Osogbo, the capital of Osun State and 200 kilomaters from Lagos, a former federal capital city. The people of this community are basically mostly farmers, traders and craftsmen. A Non Governmental Organization (NGO) provides free health care for the under-fives through a privately owned clinic. The multistage cluster and random sampling techniques were used to select households and subjects. All under-five children in the entire households of the selected houses were studied. In each household, information was obtained on demographic, socio-economic and environmental characteristics. The anthropometric parameters of every child

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Accepted 26 May 2006

Table 1. Nutritional status of the study population using the Weight-for-Age Z-score (WAZ), Height-for-age Z- scores (HAZ) and Weight-for-Height Z-score

Nutritional status	WAZ	HAZ	WHZ
Normal (>- 2.00 SD)	323 (76.9)	308 (73.3)	382 (91.0)
Malnourished (- 2.00 to - 2.99 SD)	65 (15.5)	78 (18.6)	29 (6.9)
Severely Malnourished (-3.00 SD and above)	32 (7.6)	34 (8.1)	9 (2.1)
Total	420 (100.0)	420 (100.0)	420 (100.0)

Figures in parenthesis are percentages of the total in the respective column.

Table 2. Nutritional status in relation to the age of children

Z – Score (< - 2)	Age group (months) 12 – 23 (n = 105)	24 – 35 (n = 94)	36 – 47 (n = 120)	48 – 59 (n = 101)	*P* value
Weight for Age	37 (35.2)	22 (23.4)	19 (15.8)	19 (18.8)	0.004
Weight for Height	14 (13.3)	7 (7.4)	7 (5.8)	10 (9.9)	0.237
Height for Age	31 (29.5)	29 (30.9)	29 (24.2)	23 (22.8)	0.485

Figures in parenthesis are percentages of the total in the respective column.

were recorded and each child was clinically examined for gross evidence of malnutrition. Standardization checks on the tools for anthropometric measurements were done periodically. Children with evidences of chronic diseases were excluded.

Malnutrition was diagnosed clinically using the modified Wellcome System of Classification.[5] The National Centre for Health Statistics/World Health Organization (NCHS/WHO) guidelines and cut off points[6] were also used to determine the degree of stunting, underweight and wasting. Underweight, wasting and stunting were diagosed when the Weight-for-Age (WA), Weight-for-Height (WH) and Height-for-Age (HA) were equal to minus two Standard Deviation (-2 SD) or below the mean of this reference international standards respectively.[6] Data anaysis was done using the Epi info 2002 and the SPSS for windows version 11 softwares.[7,8] Personal and family data were separately analyzed to avoid data duplication. Proortions and rates were compared using the Pearson Chi squared (χ^2) test. *P* values less than 0.05 were accepted as statistically significant.

Results

Age and sex distribution

A total of 420 children were studied from 344 households consisting of 348 mothers and 344 fathers. There were 218 (51.9 %) females and 202 (48.1 %) males giving a female: male ratio of 1.1: 1. The prevalence of undereight, wasting and stunting was similar in both sexes ($P > 0.1$ in each case).

Prevalence and types of PEM

Using the modified Wellcome classification, 334 (79.5%) children were normal while 86 (20.5%) children were malnourished. While there was no cases of kwashiorkor, underweight kwashiorkor, marasmic kwashiorkor and overweight, 82 (19.5%) of these children were undereight while 4 (1%) had marasmus. Table I shows the nutritional status according to the World Health Organization/National Centre for Health Statistics (WHO/NCHS) standard.

Relationship between age and nutritional status

The influence of age on the WAZ, HAZ and WHZ scores were as shown in Tables II. The prevalence of underweight was highest in the second year of life (35.2 %) and this was statistically significantly ($P = 0.004$).

Relationship between feeding practices and nutritional status

Four hundred and nineteen (99.8%) children were commenced on breast milk immediately after birth and 131 (31.2%) of these were exclusively breastfed for six months. The duration of breastfeeding varied between 3 and 36 months with the mean of 20.2$\pm$5.5 months. Children not exclusively breastfed had higher but non-significant prevalence of underweight, wasting and stunting compared to those who were exclusively breast-fed ($P = 0.416$, 0,157 and 0.645 respectively). Also, there was no statistically significant relationship between the total duration of breastfeeding and the prevalence of underweight ($P = 0.965$), wasting ($P = 0.553$) and stunting ($P = 0.856$). However, children who were breastfed for 12 to 24 months had consistently lower prevalence rates of malnutrition than those breastfed for shorter period or longer periods.

Of the 158 (37.6%) children who were given infant formula feeds, 149 (94.3%) children were introduced to infant formula feeds before the age of 6 months. The prevalence of underweight and stunting were non-significantly higher in those given infant formula feeds than in those that were not while wasting was slightly more prevalent in those not given formula feeds than the comparison group but without significance. Table III shows that children who were commenced on formula feeds before the age of six months had consistently lower prevalence rates of malnutrition compared to those who started after six months. However, the difference was only statistically significant with respect to wasting *(P =* 0.005).

Table 3. Nutritional status and age of child at onset of introduction of infant formula feeds

Z – Score (< - 2)	Age of child (months) Less than 6 months (n = 149)	More than 6 months (n = 9)	*P* value
Weight for Age	37 (24.8)	4 (44.4)	0.192
Weight for Height	10 (6.7)	3 (33.3)	0.005
Height for Age	43 (28.9)	3 (33.3)	0.774

Figures in parenthesis are percentages of the total in the respective column.

The proportion of children who were still breast feeding between 12 to 24 months of age (80.8%) was higher than the national figure of 35%[6] as well as 56.9% recorded in rural South Africa.[14] However, the duration of breastfeeding in this study did not significantly affect nutritional status of these children contrary to the findings of other workers.[9] This could be because the resultant

Relationship between family setting and nutritional status

Two hundred and thirty-one (67.2%) families were monogamous. There were similarities in the prevalence of underweight (P = 0.321), wasting (P= 0.479) and stunting (P = 0.83) among children in both monogamous and polygamous homes (n – 113). The numbers of children from the mothers ranged between 1 and 11 with the mean of 3.09 $\pm$ 1.58 while the numbers of children in the families ranged between 1 and 25 with 4.41 $\pm$ 3.44 as the mean. Two hundred and eighty-two (81 %) mothers had less than 4 children each and children of mothers who had less than 4 issues had a slightly lower prevalence of under-weight and wasting compared to those who had more than 4 children (23.8% vs. 24.2%, P = 0.934 and 8.9 %vs. 12.1%, P= 0.416 respectively). The prevalence of stunting was higher among 77 (27.3%) children of mothers with less than 4 issues compared with 16 (24.2%) of those from mothers with more than 4 issues but without significance (P = 0.613).

Stunting, underweight and wasting were present among 30 (30.9%), 24 (24.7%) and 8 (8.2%) children in the first birth order respectively. These forms of malnutrition were also present among 24.6%, 20.7% and 7.8% respectively of the 222 children in the second to fourth birth orders. These were also present among 22.7%, 27.5% and 13.2% respectively of the 136 children in the fifth birth order and above.

Two hundred and eighty-eight mothers had more than one child each. The mean birth interval between the children of these mothers was 38.4 $\pm$ 16.2 months. When children of mothers with birth space of more than 3 years were compared with those of birth space less than 3 years, the prevalence of underweight (21.8% Vs 27.1%; P = 0.299), wasting (7.5% Vs 9.7%; P = 0.517) and stunting (26.3% Vs 30.3%; P = 0.453) were lower among the former but without significance.

Two hundred and fifty-three (73.5%) children lived in rooms with less than four people while 91 (26.5%) lived in rooms with more than 4 people. There was a significantly higher prevalence of wasting among children with more than four occupants per room (χ^2 = 4.79, P = 0.029). The prevalence rates of underweight and stunting were comparable in the two groups ((χ^2 = 0.76, p = 0.385 and χ^2 = 0.029, P = 0.868 respectively). Table IV shows the relationship between the income of the parents and nutritional status. While the earning power of the father bear no significant relationship to child nutritional status that of the mother was significantly associated with wasting ((χ^2 = 4.63, P = 0.031).

Discussion

This study identified prevalence of PEM in Ifewara using the modified Wellcome Classification as 20.5%. This is lower than the prevalence of 37.8% and 41.6% documented for an urban ghetto area of Lagos and rural area in Benue State of Nigeria respectively.[9,10] It is also lower than the prevalence of 48% for urban children in Ethiopia[11]. The finding of 23.1% of underweight and 9% of wasting compares well with the national figure of 27% underweight and 12 % wasting.[6] However, the prevalence of stunting (26.7%) in this study is much lower than the national figure of 46%.[6] Protein Energy Malnutrition is expected to be more prevalent in rural areas like Ifewara. It therefore appears paradoxical that the results of this study compare favourably with and are in some respects better than those of other composite Nigerian figures. In Ifewara, the availability of social amenities and access to basic medical care provided by a comprehensive health centre and a Non Governmental Organization may explain the low prevalence of PEM in this area.

The relationship between the age and the prevalence of malnutrition is shown by the observation in this study that, the children in the second year of life are most prone to malnutrition. This is probably due to inadequate and inappropriate complimentary feeding. The period between the ages of 6 and 18 months of life is critical especially with respective to childhood feeding. This is the time when complimentary feeding is usually introduced. If the caloric content of such foods is inadequate or the preparation and storage of food in the home are not hygienic, malnutrition will result.

Breastfeeding is widely practiced by the mothers in the community studied. The rate of exclusive breastfeeding over the first six months of life observed in this study (31.2%) was higher than the 9% previously reported from an urban area of Lagos,[9] than the national figure of 17% [6] as well as the rate reported from Chile.[12] This study did not reveal any definite relationship between exclusive breastfeeding and nutritional status. This could be explained by the fact that a lot of the children who were not exclusively breastfed actually had breast milk as their predominant diet in the first 6 months of life. This may not be too different from the findings in a comparative study of the growth performance of exclusively breast-fed babies and those given token amount of water but still having breast milk as their predominant diet. In the latter, it was observed that the anthropometric parameters did

Table 4. Nutritional status in relation to parent's monthly income

Z – Score (< - 2)	Monthly income (Naira) Less than ten thousand	More than ten thousand	*P* value
Father	(n = 145)	(n = 199)	
Weight for Age	35 (24.1)	48 (24.1)	0.997
Weight for Height	18 (12.4)	15 (7.5)	0.129
Height for Age	37 (25.5)	56 (28.1)	0.589
Mother	(n = 170)	(n = 178)	
Weight for Age	42 (24.7)	41 (23.0)	0.714
Weight for Height	22 (12.9)	11 (6.2)	0.031
Height for Age	42 (24.7)	51 (28.7)	0.406

Figures in parenthesis are percentages of the total in the respective column.

not differ significantly between the two groups of infants.[13]

The proportion of children who were still breast feeding between 12 to 24 months of age (80.8%) was higher than the national figure of 35 %[6] as well as 56.9% recorded in rural South Africa.[14] However, the duration of breastfeeding in this study did not significantly affect nutritional status of these children contrary to the findings of other workers.[9] This could be because the resultant nutritional status of a child after the age of 6 months will also depend on the proper implementation of complementary feeding. However, the nutritional status of children breastfed for more than 12 months was better than those breastfed for less than 12 months. Children who were breastfed longer than 24 months had almost similar nutritional status to those breastfed for less than a year. This appears to disagree with the report of Rao *et al.,*[15] that beyond infancy there was no advantage of partial breast-feeding.

There was no difference in the prevalence of underweight, wasting and stunting in children given formula feeds and those not given formula feeds unlike the Chilean study where the magnitude of weight for age deficiency was 1.2 to 5 times greater among children who were fed milk substitutes than among those who received breast milk.[12] A high proportion of children who were given infant formula feed commenced it before the age of 6 months. The risk of wasting was higher among children who were commenced on infant formula feed after the age of 6 months. The reason for this could be that after the age of 6 months breast milk is no longer adequate to meet the nutritional requirement of the child and the introduced formula feed may not have been prepared and given in the right proportion to meet the nutrient needs of the child. This finding is different from previous reports that the initiation of early complimentary feeding is associated with malnutrition.[9,16,17] It is however in keeping with the finding of higher degree of growth faltering in exclusively breastfed infants after 3-4 months of age.[18]

Although many factors are involved in the development of PEM, it is believed that poverty at the family level is the principal cause of child malnutrition. Whilst there was no relation between the income of fathers and the nutritional status of children, the income of the mothers was significantly related to wasting. The empirical position is that a woman's earnings will more likely be spent on family feeding than the husband's income. This is contrary to the belief that the earning power of father rather than that of the mother determines the finances of the family and is directly related to the nutritional status of children.[19] The implication of this finding is that if empowered economically, women could supplement the finances of the households and this may go a long way in reducing the prevalence of PEM.

In conclusion, the influences of family situations and feeding practices on nutritional status need to be highlighted. Health policy formulators and planners need to pay attention to these inter-related social matters. Already, family planning and birth control as well as nutritional supplementation are key components of the Child Survival Strategies designed to reduce childhood morbidity and mortality to the minimum. However, these campaigns need to be taken out of the health facilities into the communities where the target audience really is. Obviously, the interventions provided by the NGO in the community had had some landmark effects on the nutritional status of the children in this community. More of such NGO are really needed in the developing world where government machineries appear over-flogged.

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奈及利亞鄉村兒童營養不良之危險因子

蛋白質熱量營養不良(PEM) 仍然是開發中國家的主要公共衛生問題。 本研究目的為評估奈及利亞鄉村五歲以下兒童目前的營養狀況及哺餵狀況與家庭特性的影響。本研究為一個橫斷性社區調查設計，共有來自344個家戶的420名兒童被調查。使用修正過的Wellcome Classification 當作標準， PEM的盛行率為20.5%， 續以世界衛生組織/衛生統計國際中心(WHO/NCHS)制定的標準，體重過輕、耗損及發育遲緩的盛行率分別為23.1%、9%及26.7%。年齡愈小有較高的體重過輕盛行率(P=0.004)。六個月及以上的兒童中，住處過度擁擠、母親收入低及使用嬰兒配方餵食小孩有較高的耗損盛行率(P值分別為0.029、0.031及0.005)。改善家庭居住標準、增強母親賺錢能力以提高家庭收入及對父母進行適當的餵食行為教育，可能有助於降低這些社區五歲以下兒童營養不良的發生。該社區營養不良盛行率較低，可能是由於非政府組織(NGO)的活動所致，這種介入方法在任何其他社區同樣可以做到。

關鍵字：營養不良、危險因子、小孩、鄉村、奈及利亞、非洲。