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Risk Factors for Malnutrition Among Under-Five-Year olds in an Inner City Community in Ibadan: A Case-Control Study

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Summary

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Background: Morbidity and mortality rates associated with malnutrition in the under-five-year olds are high especially among children from the low socio-economic class, yet not all children from this deprived environment develop malnutrition.

Objectives: To identify risk factors associated with the development of malnutrition in the under-five-year olds in a homogeneous inner city community.

Design: A community-based, case-control study.

Materials and Methods: One hundred and thirty eight children (subjects and controls) aged less than five years living in the traditional area of Idikan, Ibadan, participated in the study. All households with children under five years were listed and visited over a period of three months. All children in these households were examined and those with weight-for-age less than 2 standard deviations of the NCHS median value were enrolled as subjects. A control, who was not malnourished, was selected for every subject identified; they were matched 1:1 by age and sex from the same compound or adjacent compounds.

Results: The youngest malnourished child was two months old while the mean age of the subjects was 22.5 ± 14.1 months. A significantly higher proportion of subjects than controls had primary caretakers who were not their parents (16.9 percent vs 6.2 percent; $p<0.0001$), and were commenced on complementary diet earlier ($t=2.06, p=0.04$). There were no significant differences in morbidity pattern among subjects and controls for fever, acute respiratory tract infections and diarrhoeal diseases ($p>0.05$). In the case-control analysis, low paternal education (incomplete primary school education and less)($p<0.0001$), not being up to date with immunization ($p=0.037$), and starting complementary feeds before the age of six months ($p=0.026$), were associated with an increased risk of malnutrition. When confounding covariates were controlled in multivariate analysis, only age less than six months at adding complementary feeds was significant ($p=0.038$) but only explained 51.6 percent in the variance due to malnutrition.

Conclusion: Infants should be breastfed exclusively for the first six months of life, and breastfeeding should continue up to the age of two years. Immunization coverage needs to be improved in the community. These measures should help in reducing malnutrition in the community.

Keywords: Malnutrition, Under-five morbidity, Low socio-economic environment, Immunization, Breastfeeding

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Introduction

INFANT and child mortality rates in Nigeria have remained high and the country is ranked among the top 15 nations with the highest under-five-year mortality rates in the world.[1,2] The commonest causes of morbidity and mortality in the country include malaria fever, acute respiratory tract infections (ARI), diarrhoeal diseases, vaccine preventable diseases such as measles and pertussis, and malnutrition.[3-6] Malnutrition has been identified not only as a major cause of death but also as a contributory factor;[4] it is

also related to lower cognitive test scores and poor school performance in older children. Mortality and morbidity rates associated with malnutrition are reported to be highest in children from the lower socio-economic class.[7-11] A low socio-economic environment has been shown to be an accurate and consistent predictor of poor health experience.[12] However, not all children from this deprived environment develop malnutrition. The aim of this community-based study therefore, was to identify factors, which are associated with the risk of developing malnutrition in the under-five-year-olds living in a homogenous lower socio-economic community. Identifying these factors will enable health planners implement a more realistic intervention programme, for reducing malnutrition and subsequently, mortality rates in the poorer communities.

Materials and Methods

Study Area

Ibadan, the study area is one of the oldest indigenous state capitals in the country. With a projected population of about four million people, it is made up of distinct zones, namely the inner core, comprising the traditional areas, the transitional zone and the sub-urban periphery.[13,14] Indigenous people whose occupations are mainly petty trading and subsistence farming characterize the inner core; these people are of low socio-economic status. The transitional zone consists of both indigenous and non-indigenous people who are mostly ethnic Yoruba. They consist mainly of civil servants or those engaged in trading and represent the middle socio-economic class. The periphery consists of people from diverse ethnic origins but mostly Yoruba. People in this area are professionals, businessmen, highly qualified academicians and top civil servants and they represent the higher socio-economic class.

Study population

Idikan community is located in the inner core, low socio-economic and traditional part of the city of Ibadan. With a population of about 6,400, children under five years make up about 18 percent of the total population.[15] The Idikan community has a primary health care clinic run on weekdays by doctors and nurses from the Department of Community Medicine, University College Hospital, Ibadan. Patients do not pay for services rendered but pay token sums for family registration at the beginning of each year and pay at each visit, for drugs received. Services are essentially primary care but do not include delivery and family planning services.

Cases were defined as all children under five years whose weight-for-age fell below two standard deviations (<2SD) median values of the National Center for Health Statistics.[16] All households with children under five years in the community were listed and visited over a period of three months. All children were examined and those who fulfilled the selection criteria were enrolled as subjects. A control, who was not malnourished, was selected for every subject identified; they were matched by age and sex from the same compound or adjacent compounds. The controls were selected as randomly as possible and dates of births were matched with those of the subjects to within one month, if over one year of age, and same age if under one year. All primary caretakers of both the subjects and controls were interviewed by one of the authors and a trained research assistant, who also examined all the enrolled children. The purpose of the study was explained and consent was obtained from the primary caretaker. The tool used was a set of precoded open and closed-ended structured questionnaire, which had been pretested in a neighbouring community in the inner city that was not part of the study population. Low educational level was defined as no formal education, Arabic education alone, or incomplete primary school education. Children with at least, one episode of fever, diarrhoea and acute respiratory tract infection (ARI) which lasted two days or more in the eight weeks prior to the study, were considered to be positive for exposure to that illness. Information regarding the duration of breastfeeding was obtained from the caregivers of subjects and controls who were no longer being breastfed. Body weight of the child was measured in kilograms to the nearest 0.05 kilogram using a standard measuring equipment, which was checked daily using known weight and calibrated between use. Immunization records and dates of births were crosschecked with the child's home-based clinic records.

Statistical analysis

Data were entered into the computer using EPI INFO version 6.04 and analyzed using the same software.[15] Data was exported to SYSTAT programme for regression analysis. All identified malnourished children were referred to the Idikan Primary Health Care clinic nutrition rehabilitation programme for follow-up.

Results

One hundred and thirty eight subjects and controls, matched by age and sex were enrolled. The youngest malnourished child among the 69 subjects was two

Table I

Characteristics of Subjects and Controls

Characteristics	*Subjects*	*Controls*	*p-value*
Mean duration of breastfeeding (months)	17.1 ± 5.9	17.5 ± 3.7	0.74
Mean maternal age (years)	25.2 ± 4.0	27.0 ± 5.4	0.031
Mean paternal age (years)	33.8 ± 4.1	34.1 ± 6.4	0.855
Mean age when complementary feeds added (months)	4.5 ± 1.43	5.4 ± 2.5	0.04
Prevalence of fever	45 (65.2)	39 (56.2)	0.45
Prevalence of ARI*	29 (42.0)	30 (43.5)	0.87
Prevalence of diarrhoea	25 (36.2)	20 (29.0)	0.67

*ARI = acute respiratory infection
Figures in parentheses represent percentages

Table II

Comparison of Risk Factors in Subjects and Controls

Risk Factors		*Exposure*			
		Yes	*No*	*P value*	*Odds Ratio (95% CI)*
Incomplete immunization	Subjects	25	44	0.037	2.23
	Control	14	55		(1.04-4.8)
ARI in the last 8 weeks	Subjects	29	40	0.86	0.94
	Controls	30	39		(0.48-1.85)
Fever in the last 8 weeks	Subjects	45	24	0.29	1.44
	Controls	39	30		(0.73-2.87)
Diarrhoea in the last 8 weeks	Subjects	25	44	0.36	1.39
	Controls	20	49		(0.68-2.85)
Index child > 3rd	Subjects	12	57	0.66	0.83
	Controls	14	55		(0.35-1.95)
Total children in family >3	Subjects	18	51	0.84	1.08
	Controls	17	52		(0.5-2.3)
Primary caretaker not parent	Subjects	10	59	0.08	2.84
	Controls	4	65		(0.85-9.5)
Low paternal education	Subjects	19	56	<0.0001	12.7
	Controls	2	67		(2.67-83.0)
Low maternal education	Subjects	9	60	0.59	1.33
	Controls	7	62		(0.47-3.8)
Age of mother <21yrs	Subjects	20	55	0.78	1.11
	Controls	17	52		(0.53-2.35)
Complementary feeds started before 6 months of age	Subjects	39	30	0.026	2.15
	Control	26	43		(1.03-4.51)

ARI = Acute respiratory infection

months old while the oldest was aged, 59 months. The mean age of all the subjects was 22.5 ± 14.1 months. Table I shows the characteristics of the primary caretakers as well as those of the subjects and controls. The biological mothers of malnourished children were significantly younger than the mothers of controls (t=2.18, p=0.03). The subjects were commenced on complementary diet at a significantly younger age when compared with the controls (t=2.06, p=0.04). All the children were breastfed for varying lengths of time and the duration of breastfeeding was not significantly different in the two groups (p>0.05). Fever was the most commonly reported morbidity found in 84 (60.1 percent) of both groups; it was reported in 45 (65.2 percent) of the subjects and 39 (56.5 percent) controls. This was followed by ARI in 59 (42.8 percent) of all the children [29 (42 percent) subjects and 30 (43.5 percent) controls], and diarrhoea in 45 (32.6 percent) of both groups [25 (36.2 percent) subjects and 20 (29 percent) controls]. Prevalence rates for diarrhoea and fever were higher among the subjects, but the differences were not significant (p>0.05).

Table II compares the various risk factors. Low paternal education (incomplete primary school education and less)(p<0.0001), not being up to date on immunization (p=0.037), and early commencement of complementary feeding before six months (p=0.026) were significantly associated with the development of malnutrition in this homogenous low socio-economic environment. However, when logistic regression analysis was used to construct a model of variables to predict the occurrence of malnutrition in children under five in the community, only the introduction of complementary feeds before six months was significant (p<0.038). Quasi-maximum likelihood adjusted odds ratio was 2.6 (confidence limit 1.1-6.9) and this risk factor explained 51.6 percent in the variance due to malnutrition. Adjusted odds for complete immunization was 0.931 (Confidence limit 0.57-1.5) p=0.77, and for low parental education, it was 1.7 (0.7-4.1) (p=0.23).

Discussion

In this community-based study, attempts were made to examine factors which can be modified in order to improve the nutritional status of the under-five-year olds in the community. Studies in other parts of the world have identified a number of risk factors and some of these have been consistent. An example is low maternal education;[18-21] one year of maternal education has been associated with a nine percent decrease in under-five mortality, and children of better educated mothers, other things been equal, tend to be healthier.[22] Following analysis of matched data, low paternal rather than maternal education was significantly associated with the development of malnutrition in this fairly homogeneous community. This study suggests that father's education also has a role to play in the development of malnutrition. Recurrent infections have been associated with malnutrition, especially diarrhoea.[23-26] Lindtjorn *et al*, in a prospective study carried out in Ethiopia, found that malnourished children had significantly higher incidence of diarrhoeal diseases than their well nourished counterparts, signifying that malnutrition in itself increased the risk of infection among under-five children.[26] From the present study, neither diarrhoeal disease nor ARI or fever, in the last eight weeks before the study, was significantly associated with the nutritional status of the child. However, diarrhoea and fever were more prevalent in the malnourished children than in the controls lending support to earlier findings.[26]

Although immunization is offered free of charge at the Idikan Primary Health Care, it is remarkable that neither the subjects nor the controls had higher vaccination completion rates which was in fact, worse among the subjects. The community rate was however, higher than the national rate and this may be due to the proximity of the clinic to the users.[2] The finding that children of high birth orders (>3) were not at an increased risk for malnutrition is somewhat contrary to findings by Vella *et al*[27] which showed that high birth order with low socio-economic background in East Africa had a significant effect on nutritional status.

Breastfeeding is usually associated with improved growth, at least during the first few months of life and malnutrition in general, tends to be rare in this period in normal children when feeding is optimal. Although most of the women continued to breastfeed their babies well into the second year of life, earlier addition of complementary feeds (before six months) was common among malnourished children and this was the single most important antecedent factor to the development of malnutrition in the study population. There is the likelihood that babies who received complementary feeds earlier, received less breast milk and perhaps more bottle feeds which their parents could barely afford; this may in part, explain the increased risk for malnutrition seen in this study. In June 1991, WHO and UNICEF jointly launched the Baby Friendly Hospital Initiative (BFHI) following the adoption of the Innocenti Declaration on the protection, promotion and support of breastfeeding.[28] To accelerate the promotion and protection of breastfeeding, the BFHI was embarked upon in 1992 in 12 countries, including Nigeria. Exclusive breastfeeding for the first six months of life which

was officially launched in the country in 1992, has the dual advantage of improving the nutritional status of infants and reducing infant morbidity and mortality. The mean ages at which complementary feeds were introduced in both our subjects and controls were less than the six months stipulated for exclusive breastfeeding. Such an early dietary indiscretion might have a deleterious effect on the children's health beyond the breastfeeding period. Greater efforts need to be made to encourage exclusive breastfeeding for the first six months in children, particularly those of low socio-economic background.

In the matched analysis, low parental education and incomplete immunization were associated with increased risk for malnutrition. However, following regression analysis, low parental education and immunization were no longer significant suggesting that the role of these factors in the development of malnutrition in children was not direct.

It is possible that bias could occur with the design used in this study, but efforts were made to choose the controls as randomly as possible. We also realise that recall of information remains a potential source of bias; however, attempts were made to overcome this by keeping recall questions to the minimum. Despite these potential shortcomings, this study indicates that many families in low socio-economic environments are living in poverty. Social and health indicators such as primary school enrolment and completion rates, infant and under-five-year mortality rates, malnutrition rates, large family and population sizes are indicators of poverty in sub-Saharan Africa. More attention to the identified risk factors would among other intervention activities go a long way towards alleviating poverty in low socio-economic communities in the country.

We conclude that in order to minimize the prevalence of malnutrition in low socio-economic communities such as obtains in Idikan, it is imperative that parents are encouraged to ensure that their infants are breastfed exclusively for the first six months of life, and breastfed up to the age of two years; this will enable the child to remain healthy perhaps beyond the breastfeeding period. In addition, the Idikan Primary Care Clinic in partnership with the community should not relent in its efforts at improving immunization coverage in the community. Efforts should also be intensified to encourage school enrolment for all; this will, on a long term basis, improve the health of the under-five children in the community.

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