Original Article

Nutrition Intervention Program and Childhood Malnutrition: A Comparative Study of Two Rural Riverine Communities in Bayelsa State, Nigeria

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Abstract

Background: The prevalence of malnutrition is high in the Niger delta region of Nigeria, in spite of the region's oil wealth and nutrition intervention programs have been found to be effective in similar circumstance. **Aim:** This study is to assess the nutrition intervention program, implemented by UNICEF in some rural communities of Bayelsa State, one of the six States in the Niger delta region of Nigeria. **Subjects and Methods**: The study was carried out in 2009 in Toruorua and Gbaranbiri, two rural riverine communities, in Baylesa State. Toruorua benefited from the nutrition intervention program of UNICEF between 1999 and 2008, while Gbaranbiri did not benefit. A comparative, cross-sectional study design was used, with the data collected using anthropometry and semi-structured questionnaire, administered on 105 respondents, chosen with the cluster sampling technique, popularized by UNICEF, from each of the study communities. Data were analyzed using EPI-INFO version 2002, Microsoft Excel software, and manually. Differences between the study communities were tested using the student's *t*-test for means, and Chi-square test for proportions. Significant values were set at $P < 0.05$. **Results**: A total of 210 questionnaires were administered and retrieved from both study communities, and the anthropometric measurements of equal number of under-five year children were also taken. There were no significant differences in the occupations of the respondents, and in the sizes of their households. The prevalence of wasting, under-weight and stunting were however found to be significantly higher in the reference community, as 20.0% (21/105) of the children were found to be wasted, compared to 5.0% (6/105) in the intervention community ($P < 0.01$); 17.1% (18/105) were found to be underweight, compared to 9.5% (10/105) in the exposed community ($P = 0.01$); while 24.8% (26/105) were stunted, compared to 10.5% (11/105) in the exposed community ($P = 0.01$). **Conclusion**: Nutrition intervention program delivered in a primary health care facility can positively change nutrition behavior and prevent childhood malnutrition.

Keywords: Nutrition intervention program, Childhood malnutrition, Nutrition education, Niger delta region, Nigeria

Introduction

According to the 2008 National Demographic and Health Survey, more than 31% of under-five children in the Niger delta region of Nigeria are stunted, and 12.8% are under-weight;[1] even as under-nutrition has been shown to pose a great danger to the survival and future wellbeing of children.[2] Studies attribute up to 52.5% of all deaths in young children to undernutrition, varying from 44.8% for deaths due to measles, to 60.7% for deaths because of diarrhea.[2] Under-nutrition has also been implicated in the etiology of several diseases, including heart disease, diabetes and cancer;[3] and shown to reduce the physical and mental development of children, and consequently their capacity to work and assume their full roles in the society as adults.[4]

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The high prevalence of childhood under-nutrition in the Niger delta might not entirely be due to household food insecurity,

as the region is the main oil producing region in Nigeria, and accounts for more 80% of the country's GDP. This is especially as several studies have linked poor feeding practices to under-nutrition, as caregivers might not make the best use of available resources. This has been attributed to reasons that include cultural beliefs and practices, lack of knowledge of the best foods for young children even when available in the home, and inappropriate advice.[5]

Nutritional intervention programs have however been found in various parts of the world to be capable of reducing the prevalence of childhood malnutrition;[6,7] and six interventions have particularly been found to be very cost-effective in a wide range of settings.[4] These interventions include exclusive breastfeeding for at least four months and, if possible, for six months; adequate complementary feeding starting at about six months with continued breastfeeding for two years; appropriate nutritional care of sick and malnourished children; adequate intake of vitamin A for women and children; adequate intake of iron for women and children; and adequate intake of iodine by all members of the household.[4] This study is to compare the nutritional status of a community that benefited from the nutrition intervention program, implemented by UNICEF in Bayelsa State, south-south Nigeria, with a similar community that did not benefit from the intervention. The results of the study would be useful in scaling up the program to cover other communities in the Niger delta region.

Subjects and Methods

Study area

Bayelsa State is one of the six States in the south-south geopolitical zone of Nigeria, and one of the top producers of crude oil. It is geographically located within latitude 4°15/North, 5° 23/South and Longitude 5° 22/West and 6° 45/East, and has a population of about 1.7 million people (projected with the 2006 Nigerian national census). The study was carried out in two rural communities, in two Local Government Areas of Baylesa State. Toruorua a community in the Sagbama Local Government Area (LGA) of the State that benefited from the nutrition intervention program of UNICEF between 1999 and 2008 was compared with Gbaranbiri, a similar community in the Kolokuma-Opokuma LGA that did not benefit from the program. Both communities are rural and riverine, with a population of about 3, 500; who are mainly subsistent farmers and fisher folks, and predominantly people of Ijaw ethnic group. The communities are accessible mainly through the water ways, and have piped-borne water and health center. The main diet of the adult population is mainly derived from the local produce, and consists of cassava, plantain and fish.

Study design

A comparative, cross-sectional study design was used, with the data collected using a structured interviewer-administered, semi-structured questionnaire and anthropometry. Toruorua community was chosen as the intervention community because it benefited from the nutrition intervention program of UNICEF between 1999 and 2008, while the Gbaranbiri community was used as the control/reference community, because it did not have any formal intervention program during the period.

Sample size estimation

The study was designed to detect a 10% difference in proportion of children with malnutrition, with an alpha error of 5%, acceptable beta error of 20%, and a statistical power of 80%; and assuming a 12.8% prevalence of under-weight in the control communities.[1] Using the usual formula for sample size determination for comparing proportions from two populations,[8] the minimum required sample size was thus determined to be 86 per group, but made up to 105 to take care of non-responses.

Sampling technique

A multi-stage sampling technique was used for the study. At the first stage, the eight Local Government Areas in Bayelsa State were stratified into UNICEF focus and non-UNICEF focus LGAS, depending on whether they benefitted from the nutrition intervention program; one LGA was randomly chosen from each of the stratum, using the Table of random numbers. The same method was used in the second stage in the choice of the study communities, while the final stage of the sampling process involved the selection of households. Because the houses in the study communities are haphazard and without a delineated street network, houses for the study were chosen using the cluster sampling technique popularized by UNICEF.[9] Once a house is chosen, all the eligible households residing in the house were studied. A household was defined as an aggregation of persons who lived together and shared a common source of food; and a household is considered eligible for the study only when it lived in the study community from 1998 to 2008, when UNICEF had the nutrition intervention program. The questionnaire was administered on an adult woman in each of the households, while anthropometric measurements were taken from the youngest under-five year child in the household.

Data collection

The data were collected in October, 2009 by SW (the first author) and assisted by six assistants recruited from the communities. These assistants were trained on questionnaire administration, and on anthropometric measurement, using the training and standardization manual developed by the Food and Nutrition Technical Assistance Project (FANTA).[10] The questionnaire was interviewer-administered, and used to collect information on the socio-demographic characteristics of the respondents, breast feeding practices, complementary feeding, child care practices, and micronutrient supplementation. The questionnaire was pretested, using nursing mothers attending the immunization clinic of the University of Port Harcourt teaching hospital, Port Harcourt.

The anthropometry of the under-five children was measured using a bathroom weighing scale, and a locally constructed standometer; and carried out according to the standard method.[10] The ages of the children were determined using the road-to-health cards, or the confirmations of their parents. Three types of malnutrition were assessed in the study: Underweight measured by weight-for-age, and defined as weight-for-age Z score (WAZ) < −2, stunting measured by height-for-age, and defined as height-for-age Z score (HAZ) < −2; and wasting measured by weight-for-height, and defined as weight-for-height Z score (WHZ) < −2.[11]

Ethical consideration

The approval to undertake the study was sought and obtained from the Ethical Review Committee of the University of Port Harcourt Teaching Hospital, Port Harcourt; the Bayelsa State ministry of health, and the Community Development Committees and Chiefs of the study communities. Informed consent was also sought and received from all the study participants.

Data analysis

Data handling and analysis were carried out using EPI-INFO version 2002, Microsoft Excel software, and manually. Summary measures were calculated for each outcome of interest. Differences between the study communities were tested using the student's *t*-test for means, and Chi-square test for proportions. The Z-scores for weight-for-age, height-for-age and weight-for-height were calculated using the reference data from the United States National Center for Health Statistics (NCHS), and the World Health Organization, as contained in EPI-INFO version 2002.[11] For all statistical tests, *P*-value of 0.05 or less was considered statistically significant

Results

A total of 210 questionnaires were administered and retrieved from both study communities, and the anthropometric measurements of equal number of under-five year children were taken. The socio-demographic characteristics of the respondents are summarized in Table 1. There were no significant differences in the occupations of the respondents, and in the sizes of their households. However, the respondents in the exposed community (Toruorua) were significantly better educated ($P < 0.04$), mainly due to the higher proportion of respondents with secondary education, and the proportion of respondents in the reference community (Gbaranbiri) with no formal education.

Table 2 shows the anthropometry of the under-five children in the study communities. Whereas there was no significant difference in the age of the children, the prevalence of wasting, under-weight and stunting were all significantly higher in the reference community (Gbaranbiri). The prevalence of wasting in the exposed community was 5.0% (6/105), compared to 20.0% (21/105) in the reference community ($P = 0.03$); the prevalence of underweight was 9.5% (10/105) in the exposed community, compared to 17.1% (18/105) in the reference community ($P = 0.01$); while the prevalence of stunting was 10.5% (11/105) in the exposed community, compared to 24.8% (26/105) in the reference community ($P = 0.01$).

Table 3 shows the nutritional practices in the study communities.

Table 1: The socio-demographic characteristics of respondents

Variable	Exposed (%) (*N*=105)	Reference (%) (*N*=105)	*P*
Educational status of respondents			
No formal	13 (12.4)	30 (28.6)	
Primary	17 (16.2)	24 (22.9)	0.04
Secondary	63 (60.0)	40 (38.1)	
Tertiary	12 (11.4)	11 (10.5)	
Occupation of respondent			
Farming	29 (27.6)	31 (29.5)	
Fishing	11 (10.5)	14 (13.3)	0.50
Paid employment	41 (39.1)	37 (35.2)	
Student	9 (8.6)	6 (5.7)	
Housewife only	15 (14.3)	17 (16.2)	
Number of persons in respondent's household			
1-3	24 (22.9)	28 (26.7)	
4-6	38 (36.2)	40 (38.1)	0.001
>7	43 (41.0)	37 (35.2)	

Table 2: The socio-demographic characteristics of children

Variable	Exposed (%) (*N*=105)	Reference (%) (*N*=105)	*P*
Age (months)			
≤11	20 (19.0)	32 (30.5)	
12-23	28 (26.7)	17 (16.2)	
24-35	25 (23.8)	24 (22.9)	0.10
36-47	21 (20.0)	15 (14.3)	
48-59	11 (10.5)	17 (16.2)	
Sex			
Male	51 (48.6)	48 (45.7)	0.68
Female	54 (51.4)	57 (54.3)	
Weight-for-height			
<–2	6 (5.0)	21 (20.0)	
–2 to 2	85 (82.0)	78 (74.3)	0.03
>2	14 (13.0)	6 (5.7)	
Weight-for-age			
<–2	10 (9.5)	18 (17.1)	
–2 to 2	95 (90.5)	85 (78.1)	0.01
>2	0 (0.0)	5 (4.8)	
Height-for-age			
<–2	11 (10.5)	26 (24.8)	
–2 to 2	74 (70.5)	74 (70.5)	0.01
>2	20 (19.0)	45 (4.8)	

Respondents in the exposed community had significantly better nutrition practices than those in the reference community. They gave foods of greater varieties and frequency to their children ($P = 0.05$), and used more cooking oil and sugar that were fortified with vitamin A than the respondents in the reference community ($P < 0.001$). The practice of exclusive breast feeding to four to six months was higher in the exposed community, although the difference was not statistically significant ($P = 0.07$); the proportion of respondents that exclusively breast fed their babies to six months was however significantly higher in the exposed community ($P < 0.001$).

Discussion

The prevalence of malnutrition in the reference community was generally lower than the average for rural communities in Nigeria, but significantly higher than the situation in the intervention community. For instance, the 17.1% prevalence of acute malnutrition recorded in the reference community was lower than the 26.5% average for rural communities in Nigeria,[1] and yet 7.6% higher than the prevalence of 9.5% recorded in the intervention community. This indicates that the study communities were more food secure than the average rural community in Nigeria; it also confirms the importance of nutrition intervention programs, as indicated in several other studies.[6,7] A review of 17 studies carried out in several developing countries had indicated that the provision of the appropriate complementary foods to children in food insecure households, can result in an extra gain of 0.25 kg in weight and 0.54 cm in height, in children aged 6-24 months; while the additional education of mothers about complementary feeding can contribute to an extra weight gain of 0.30 kg and a gain of 0.49 cm in height.[6]

The provision of appropriate complementary food is however more effective in correcting malnutrition in situations of food insecurity.[12] No complementary food was provided in the intervention community, probably because of the food security situation; therefore the effectiveness achieved by the program can to be attributed solely to nutrition education. A Peruvian study also got results that are consistent with those of this study, with only the nutrition education provided in health facilities.[7]

Table 3: Nutritional practices in the study communities

Variable	Exposed (%) (*N*=105)	Reference (%) (*N*=105)	*P*
Number of meals per day given to the child			
2	13 (12.4)	27 (25.7)	
3	81 (77.1)	71 (67.6)	0.04
>3	11 (10.5)	7 (6.7)	
Type of food fed to child			
Variety of foods	102 (97.1)	93 (88.6)	0.05
Fed either garri or rice	3 (2.9)	12 (11.4)	
Use of cooking oil fortified with vitamin A	46 (43.8)	8 (7.6)	<001
Exclusive breastfeeding up to 4-6 months	32 (30.5)	22 (21.0)	0.07
Exclusive breastfeeding to 6 months	26 (80.7)	11 (50.0)	0.01
Use of sugar fortified with vitamin A	84 (80.0)	8 (7.6)	<001

The adoption of the nutrition behaviors advised by the nutrition program, by mothers in the intervention community, played a significant role in achieving the significant reduction in childhood malnutrition. The 9.5% increase in the practice of exclusive breast feeding in the intervention community, though not statistically significant, played its part in saving the exclusively breast fed babies from diarrhea and other diseases that often precipitate malnutrition, but preventable with exclusive breast feeding,[4,13] and yet very prevalent in the rural riverine communities of the Niger delta region.[14] The two-week period prevalence of diarrhea in some rural riverine communities of the Niger delta region can be as high as 26.97%,[14] which is more than seven times the 3.6% average for the entire region, and at least twice the national average of 10.1%.[1]

The fact that mothers in the intervention community fed their children more frequently, and with greater variety of food, also contributed to the lower prevalence of malnutrition in the intervention community. This is especially as the staple foods commonly used in the communities for complementary feeding are known to have low energy-to-volume density, and are often deficient in essential nutrients.[4,5] This means that good nourishment can only be derived from the staple foods, when they are used in complementary feeding, if they are used in greater variety, and eaten in greater frequency, as advised in the nutrition program. This simple, but life-saving information is unfortunately not readily applied in the reference community.

The significant result obtained in this study is in spite of the massive contamination, through the mass media, of the reference community with the key nutrition messages, during the intervention period. This is a major limitation of this study, because the contamination dampened the observed differences between the comparative communities. It however points to the likely greater effectiveness of community based nutrition intervention programs, compared to mass media based programs. Studies have shown that most successful nutrition intervention programs are community based;[15] while the diffusion of innovation theory of communication recognizes that whereas the mass media is the best in achieving rapid penetration of information, it is social networks and interpersonal communication that spread information further within the community, help people evaluate it, and determine whether people act on it.[16] Considering the importance of nutrition education in tackling childhood malnutrition, the synergistic role that could be played by the mass media and the health workers need to be so recognized and adopted, for maximum effectiveness.

Conclusion

Nutrition intervention program delivered in a primary health care facility can positively change nutrition behavior and prevent childhood malnutrition.

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