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THE EFFECT OF VACCINATION AND CHILDHOOD MORBIDITY ON NUTRITIONAL STATUS OF PRESCHOOL CHILDREN IN THE NIGER DELTA REGION OF NIGERIA.

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ABSTRACT

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Background: Malnutrition is a major contributor to childhood morbidity and mortality especially in developing countries. Lack of vaccination and recurrent childhood diseases are important contributors to the burden of malnutrition in these countries.
Methods: A cross sectional study was carried out in Okrika town, the headquarters of Okrika Local Government Area in Rivers State, Nigeria. A multistage random sampling method was used to recruit 410 under-fives. A structured questionnaire was used to obtain demographic and vaccination data, history of diarrhoea, fever and respiratory tract infection.
Results: Of 410 under-fives studied, 217 (52.9%) were males. Forty three (10.5%) were underweight, 219 (53.4%) fully vaccinated, 42 (10.2%) unvaccinated while 56 (13.6%) and 68 (16.5%) had fever and symptoms of respiratory tract infection (RTI) respectively. The prevalence of underweight malnutrition was significantly higher among unvaccinated children (26.2%), among those with RTI (23.5%), fever (21.4%) and diarrhoea (30.8%). The risk of underweight malnutrition was 3.6 times and 2.8 times higher in those with RTI and fever respectively.
Conclusion: Complete vaccination, prevention and prompt treatment of childhood illnesses among under-fives will improve their nutritional status.

INTRODUCTION

Malnutrition also known as the "silent killer" even if overt or hidden, is a major contributor to childhood morbidity and mortality especially in developing countries.[1] Several factors including inadequate vaccination and recurrent childhood diseases are contributors to the increasing prevalence of malnutrition in developing countries.[2]

Diarrhoea and other infectious diseases affect both dietary intake and utilization, and therefore have negative effects on the nutritional status of children. In addition, malnourished children have depressed immunity, making them more susceptible to recurrent or severe infections and the risk of dying from common childhood ailments such as diarrhoeal diseases, measles and respiratory tract infections.[3] Those that survive are more likely to suffer from frequent illnesses, which will further negatively affect their nutritional status resulting in a vicious cycle of

malnutrition-infection-malnutrition that ultimately results in chronic malnutrition.[4, 5]

Childhood vaccination against vaccine preventable diseases improve the immunity of children and also protects them from diseases such as measles, pertussis, and tuberculosis that could negatively affect their nutritional status.[6,7] Studies have shown a higher prevalence of malnutrition among unimmunized under-five children.[8,9] Surprisingly, while the prevalence of malnutrition is on the increase in Nigeria, the proportion of fully immunized children is on the decline.[2] This study was therefore carried out to ascertain the effect of vaccination and common childhood illnesses on the nutritional status of under-five children in the Niger Delta region of Nigeria.

MATERIALS AND METHODS:

It was a community cross sectional study conducted in Okrika Town, the headquarters of Okrika Local Government Area, one of the twenty three Local Government Areas in Rivers State, in the Niger Delta region of Nigeria. It is located in the southern part of the state, about twenty kilometres from Port Harcourt City by land. It is accessible by land and water. "Kirike" is the language spoken by the indigenes, whose predominant occupation was originally fishing. However, due to westernization, many people now engage in "white collar jobs" in the oil industries and different forms of business. The Okrika jetty is used for the export of petroleum products from the Nigerian National Petroleum Corporation's (NNPC) refinery located at its boundary with Eleme town.

The study population was made up of under-five children present in selected households and whose caregivers gave informed consent. The sample size was obtained using the standard formulae[10] ($n = z^2 (pq)/e^2$. Where n = minimal sample size, z = confidence interval (1.96), p = prevalence of underweight malnutrition 33.2%,[11] q = 100 – p and e = sampling error 5%. Twenty percent of the calculated sample size was added as attrition to obtain the total sample size of 410. Households and eligible under-fives for the study were selected using a multistage random sampling method. Only one under-five child was recruited from selected households. Ethical approval for the study was obtained from the Ethics Committee of the University of Port Harcourt Teaching Hospital and a written permission was also obtained from the Okrika Local Government Authority. Permission was also obtained from the Community Development Committee (CDC) Chairman of selected communities and a written informed consent obtained from the caregiver of each selected child.

A structured questionnaire was used to collect demographic data as well as history of diarrhoea, fever and respiratory tract infections. The vaccination history of the children was ascertained from their vaccination card or verbally as described by the caregiver.The children were then weighed using standardized Omron digital scale model HN-283 for children aged above 12 months and *My Weigh* infant digital scale Model MBS 2010 for children aged 0 -12 months. The WHO Anthro 3.2 software was used to calculate the weight-for-age Z scores (WAZ). The family's socioeconomic classification was determined using the classification by Olusanya et al.[12]

The data were analysed using Statistical Package for Social Sciences (SPSS) version 17.0. All children with WAZ scores <-2SD (underweight) were subjected to bivariate and multivariate analysis. The results of the study were presented as frequencies, percentages, means and standard deviation scores in tables and charts. The Pearson Chi Square test was used to test for associations between sub groups. A probability value of less than 0.05 was considered statistically significant at 95% confidence interval.

RESULTS

A total of 410 under-fives aged 0-59 months (mean 26.61 ± 15.95 months), were studied. These included 217 (52.9%) males and 193 (47.1%) females, with a male: female ratio of 1.1:1. Ninety six (23.4%) children were aged 24-35 months, (Table I).

Table I: Age and sex distribution of study population.

Age Group (months)	Female No (%)	Male No (%)	Total No (%)
0-11	50(25.9)	40(18.4)	90(22.0)
12-23	41 (21.2)	55(25.3)	96(23.4)
24-35	47 (24.4)	46 (21.2)	93(22.7)
36-47	31 (16.1)	43 (19.8)	74(18.0)
48-59	24(12.4)	33 (15.2)	57(13.9)
Total	**193 (47.1)**	**217 (52.9)**	**410 (100)**

The caregivers of 377 (92%) children were married, 20 (4.9%) separated/divorced, 3 (0.7%) widowed and 10 (2.4%) single mothers. Four hundred and one (97.8%) children were Christians and 9 (2.2%) were from other religious sects. Three hundred and eight (75.1%) children were from nuclear families and 102 (24.9%) from extended families. Three hundred and sixty nine (90%) mothers had antenatal care during the index child's pregnancy and 41 (10.0%) did not. One hundred and seventy six (42.9%) children were delivered in primary health centres, 104 (25.4%) in hospitals, 60 (14.6%) at home, 52 (12.7%) and 18 (4.4%) at maternities and churches respectively. Although the highest educational level attained by caregivers was post secondary education, most females 271 (66.1%) and males 322 (79.1%) had secondary education (Fig 1). There were 59 (14.4%) children in the high socioeconomic class, 154 (37.6%) middle and 197 (48%) in the low socioeconomic class.

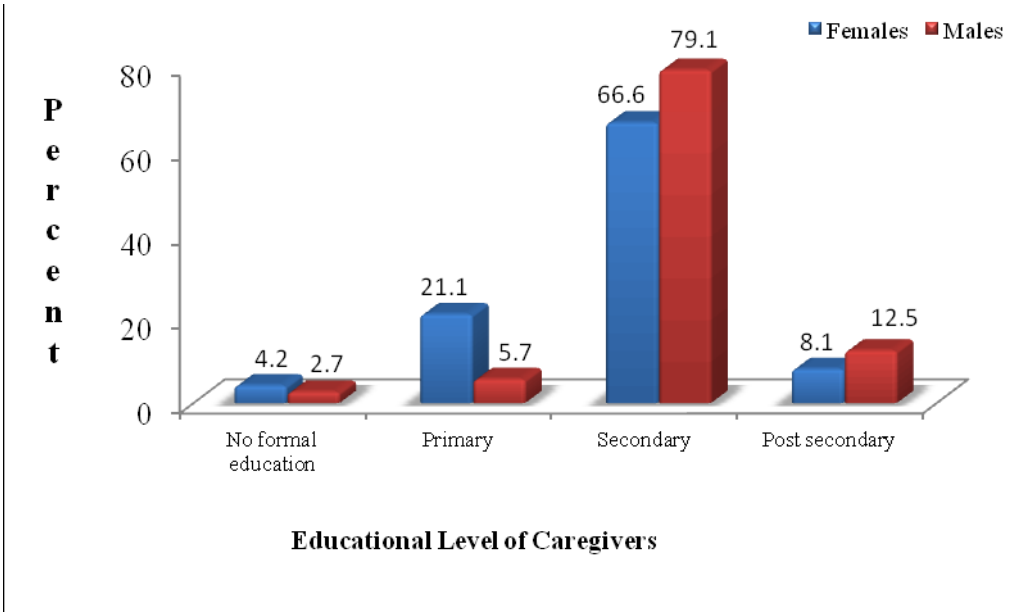

Figure 1: Educational level of caregivers

Nutritional status of under-fives

Of the 410 children studied, 367 (89.5%) had normal weight-for-age Z score and 43 (10.5%) were underweight. More females 23 (11.9%) than males 20 (9.2%) were underweight, Fig 2.

Relationship between vaccination status and underweight malnutrition

More than half of the children, 219 (53.4%) were fully vaccinated, while 42 (10.2%) were not vaccinated, Fig 3. More females 29 (69%) than males (31%) were

unvaccinated, (Table II). Underweight malnutrition was most prevalent among children who had not received any form of vaccination (26.2%) and least among those fully vaccinated (7.3%). The difference was statistically significant, Table III.

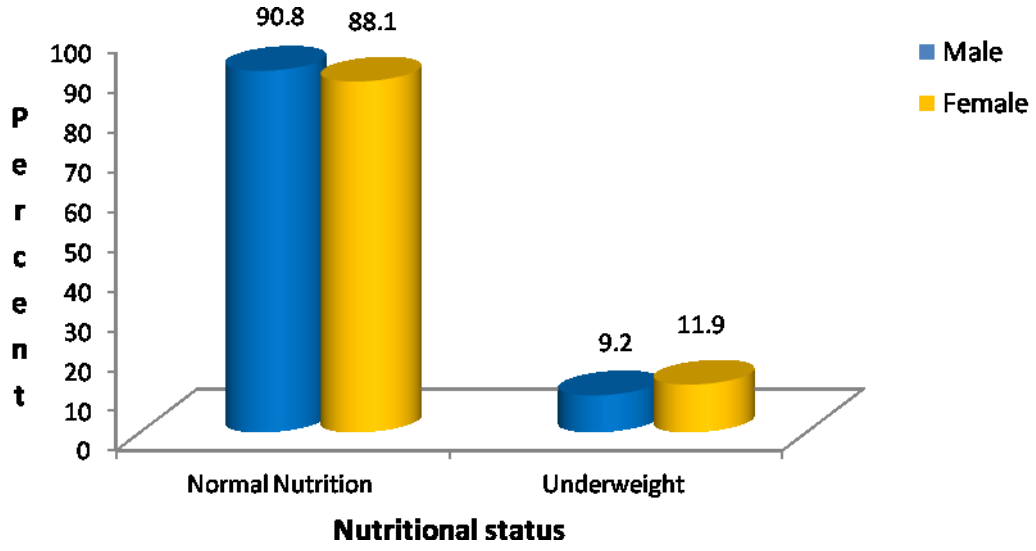

Figure 2: Prevalence of underweight malnutrition in the study population.

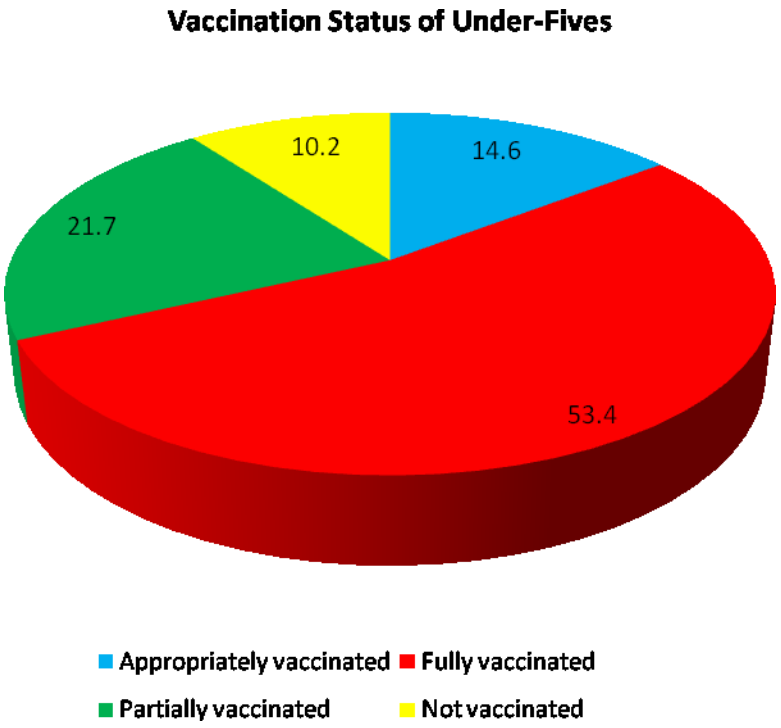

Fig 3: Vaccination status of under-five children

Table II: Gender distribution of vaccination status of the study population.

Vaccination status	Gender		Total
	Female N (%)	Male N (%)	N (%)
Appropriately vaccinated	38 (63.3)	22 (36.7)	60 (100)
Fully vaccinated	87 (39.7)	132 (60.3)	219 (100)
Partially vaccinated	39 (43.8)	50 (56.2)	89 (100)
Unvaccinated	29 (69)	13 (31)	42 (100)
Total	**193 (47.1)**	**217 (52.9)**	**410 (100)**
χ^2	19.630		
p value	0.000		

Table III: Prevalence of underweight malnutrition among different demographic variables.

Parameters	Total	Underweight		χ^2	P value
		Yes N (%)	No N (%)		
Vaccination Status					
Appropriately vaccinated	60	5 (8.3)	55 (91.7)		
Fully vaccinated	219	16 (7.3)	203 (92.7)		
Partially vaccinated	89	11 (12.4)	78 (87.6)	20.900	0.000
Not vaccinated	42	11 (26.2)	31 (73.8)		
RTI					
Yes	68	16 (23.5)	52 (76.5)	14.769	0.000
No	342	27 (7.9)	315 (92.1)		
Fever					
Yes	56	12 (21.4)	44 (78.6)	8.270	0.004
No	354	31 (8.8)	323 (91.2)		
Diarrhoea					
Yes	13	4 (30.8)	9 (69.2)	5.883	0.015
No	397	39 (8.3)	358 (90.2)		

Relationship between childhood illnesses and malnutrition

Thirteen (3.2%) children had diarrhoea, 68 (16.5%) respiratory tract infection and 56 (13.6%) fever. The prevalence of underweight malnutrition was significantly higher among children who had symptoms of respiratory tract infection, fever and diarrhoea, P value < 0.05, Table III. Multivariate analysis showed that the risk of underweight malnutrition was 0.2 times lower in appropriately vaccinated children compared to those who were not vaccinated and 3.6 times higher in those who had RTI. Furthermore, there was a 2.8 times higher risk of underweight malnutrition among under-fives who had fever than those who did not, (Table IV)

Table IV: Risk factors for malnutrition in the study population using logistic regression

Risk Factors	Odds Ratio	Confidence interval	P value
Immunization status			
Appropriately immunized	0.222	0.094-0.532	0.001
Fully immunized	0.559	0.248-1.257	0.160
Partially immunized	0.867	0.304-2.471	0.789
Unimmunized*	1.00	-	-
RTI			
RTI absent*	1.00	-	-
RTI present	3.590	1.811-7.117	0.000
Fever			
Fever absent*	1.00	-	-
Fever present	2.842	1.360-5.938	0.005
Diarrhoea			
Diarrhoea absent*	1.00	-	-
Diarrhoea present	0.245	0.072-0.833	0.024

DISCUSSION

The 10.2% prevalence of underweight malnutrition found in this study is comparable to 8.5-14.1% reported in similar studies in Nigeria[13,14] and Ghana.[15] It was however lower than the prevalence rates of 29% obtained in a rural community in Northern Nigeria. This difference could be as a result of regional differences in study sites, the level of urbanisation and socioeconomic status of the communities, as studies have shown malnutrition to be more prevalent in the northern parts of Nigeria and in rural communities.[2,11]

The proportion of fully vaccinated children of 53.4% observed in the present study was higher than the 40-45.5% reported in studies carried out in India[9,16,17] but much lower than the 85.7% reported by Oyefara[18] in an urban community in Lagos State, Nigeria. The differences observed in the various studies could be as a result of regional differences. Additionally, while the India studies were carried out in urban and rural communities, our study was in a semi-urban community.

The 21.6% prevalence rate of partially vaccinated children in this study was lower than the 46.6% recorded by Bhavsar et al[16] in a study conducted in an urban garbage slum in India but it was comparable to the 24% prevalence rate reported in a study conducted among under-fives in a semi urban community in Sierra Leone.[19] The prevalence of unvaccinated children of 5.5% reported by Mohammed et al[20] in India was lower than the 10.2% reported in our study. These differences in vaccination rates among under-fives are not unexpected as it has been reported that the acceptance and utilisation of vaccination programs varies from place to place depending on the prevailing, cultural, religious and socio-economic factors in that community.[21,22] Additionally, the lower prevalence of unvaccinated children reported in the India study could be due to the fact that infants were excluded unlike our study that included infants.

The higher prevalence rates of underweight malnutrition observed among unvaccinated under-fives in this study was in keeping with similar observations reported in studies conducted in India[9,16] and Papua New Guinea.[8] In agreement with the findings from this study, other studies[1,17]also reported a statistically significant increased risk of underweight malnutrition in unvaccinated children, demonstrating the protective effect of vaccination on malnutrition. The higher prevalence of malnutrition in unvaccinated children could be attributable to their increased susceptibility to vaccine preventable diseases as a result of diminished immunity to these diseases. These infections when they occur cause growth faltering because of reduction in food intake and high metabolic demands.[23,24]

In agreement with different studies carried out in Ethiopia,[25,26] this study also demonstrated that infection was a risk factor

for underweight malnutrition as the prevalence of underweight malnutrition was significantly higher in children who had fever and respiratory tract infection. This finding however contrasts with that of Olack et al[27] in South Africa, who did not find any statistically significant association between these childhood illnesses and underweight malnutrition among under-fives. The reason for this difference could not be ascertained. However longitudinal follow up studies[28,29] carried out among sick under-five children demonstrated faltering growth in the sick children, probably as a result of poor appetite, malabsorption, and increased metabolic demands of the body. In addition, it has been reported that some caregivers withhold food from their children when they were ill and do not give the extra meals required to restore nutrients lost in the course of the illness.[3,30] It is therefore important to counsel caregivers not to withhold food from children when they are sick and the importance of giving extra meals for catch up growth during the convalescent period.

CONCLUSION

Inadequate vaccination had deleterious effect on the nutritional status of under-fives in this study. There was a higher risk of underweight malnutrition among under-fives who had diarrhoea, fever and respiratory tract infection. It is therefore imperative for caregivers and health workers to work together to ensure that all under-five children are vaccinated appropriately in addition to paying more attention to their nutritional requirements when they are ill.

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