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RESEARCH ARTICLE

A COMPARATIVE ANALYSIS OF MALNUTRITION AMONG UNDER-FIVE CHILDREN IN RURAL AND URBAN COMMUNITIES IN OWERRI, IMO STATE, NIGERIA

***,[1]Merenu, I. A., [1]Uwakwe, K. A., [1]Duru, C. B., [1]Diwe, K. C. and [2]Emereole, C. O.**

[1]Department of Community Medicine, College of Medicine Imo State University Owerri, Nigeria
[2]Department of Medical Services, Federal University of Technology, Owerri, Nigeria

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ABSTRACT

Background: Malnourished children have lower resistance to infections; they are more likely to die from childhood ailments like diarrhoeal diseases and respiratory infections; and for those who survive, frequent illness sap their nutritional status, locking them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability.
Objective: To assess the prevalence, pattern and co-morbidities of malnutrition among under-five children in rural and urban communities of Owerri Capital Territory, Imo State.
Methods: A descriptive cross sectional study conducted among under-five children in Owerri from January 2008 to December 2012. A multistage sampling technique was employed to select three hospitals each from urban and rural areas, and the total number of eligible under-five children that attended the child welfare clinics constituted the sample population. The registers were used to trace the case notes and data was extracted using a pretested pro-forma. The study population of 693 comprised of 386 children from the urban and 307from the rural communities respectively.
Results: The prevalence of malnutrition was 25.3%, though 26.7% in the urban against 23.5% in the rural participants. Majority of the malnourished 117(66.9%) were from the 0-12 month age bracket. Overall, the observed malnutrition states were underweight (60.6%), overweight (26.9%) and marasmus (12.6%). Comparatively, underweight was significantly more in the rural malnourished (72.2%) than in the urban (52.4%) (χ^2 = 6.95, P = 0.01, OR = 0.43, CI = 0.22-0.81), whereas, overweight was significantly more in the urban malnourished (34%) than in the rural (16.7%) (χ^2 = 6.47, P = 0.02, OR = 2.57, CI = 1.23-5.40). Marasmus though did not differ significantly. Malaria (40%), pneumonia (20.6%) and diarrhoea (18.9%) were the commonest co-morbidities among the malnourished study population. Among the urban malnourished, however, malaria (38.8%) and pneumonia (26.2%) were the two most prevalent diagnosis at presentation, whereas for the rural, malaria (41.7%) and diarrhoea (25%) were the two most prevalent co-morbidities.
Conclusions and recommendations: Malnutrition is still prevalent among the under-five in Owerri. The most vulnerable group was the 0-12months, which calls for greater attention to exclusive breast feeding and weaning with nutrient and energy dense foods, as these are essential to reduce malnutrition in this group. Underweight being more prevalent in the rural malnourished children, points to the challenge of food security which is fundamental for child survival. Overweight being more prevalent in the urban malnourished should engender healthier dietary habits in children from affluent homes by the mothers. Malaria was the most prevalent co-morbidity in both urban and rural malnourished populations; hence more efforts should be directed at malaria control measures.

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INTRODUCTION

Malnutrition is insufficient, excessive or imbalanced consumption of foods. It manifests in different forms, such as under nutrition, over nutrition and micronutrients dificiency. (Smith and Haddad, 1999) Malnutrition in early childhood is associated with functional impairment in adult life as malnourished children are physically and intellectually less productive when they become adults (Smith and Haddad, 1999). A well-nourished child is one with access to adequate food supply, care and health. Such a child will have weight and height measurements that compare very well with the standard normal distribution of heights (H) and weights (W) of healthy children of the same age and sex. The best way to evaluate the nutritional status and overall health of a child is to compare the child's growth indices with the set cut-off points in the standard normal distribution of well nourished children that are associated with adequate growth. (de Onis *et al*., 2003) Malnutrition is associated with about half of all child deaths worldwide. Malnourished children have lower resistance to

Corresponding author: Merenu, I. A.
Department of Community Medicine, College of Medicine Imo State University Owerri, Nigeria.

infection; they are more likely to die from common childhood ailments like diarrhoeal diseases and respiratory infections. For those who survive, frequent illness sap their nutritional status, locking them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability.

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 (WHO Multicentre growth reference study group, 2007) Child mortality rates in Nigeria have remained high and Nigeria ranks among the top 15 nations with the highest under –five-year old mortality rate in the world. (Federal Office of Statistics Nigeria Demographic and health survey 1990; UNICEF 1999) Nigeria ranked 8th in the world in the prevalence of mortality rates of under-fives, with a staggering figure of 189/1000 in 2008. (WHO 2005; Laura, 2004) Malnutrition is the underlying cause in more than 50% of these deaths. (WHO 2005; Laura, 2004)

It has been estimated that every minute eight under-five children die in sub-Saharan Africa. Of the 46 countries in the African Region, 36 have under-five mortality rates (U5MRs) of above 100 per 1000 live births; 8 have U5MRs of at least 200 per 1000 live births; 5 countries have had static U5MRs in the past fifteen years while in 9 countries the U5MRs have reversed. Two thirds of the under-five deaths in the African Region are due to preventable causes. (Smith and Haddad, 1999; Federal Office of Statistics Nigeria Demographic and health survey, 1990) The chief causes of death are neonatal conditions and acute respiratory infections mainly pneumonia, malaria, diarrheal diseases, measles and HIV/AIDS, most of which are complicated by malnutrition that accounts for one third of all deaths in children under five years of age. Under-five deaths, most of which occur in the African Region, increased to 43% globally in 2005 from 31% in 1990. According to WHO, an estimated 10.6 million under-five children die each year, 4.6 million of whom die in the African Region.

Food insecurity in Africa threatens the lives of millions of vulnerable people especially displaced persons and people living with HIV/AIDS. (Smith and Haddad, 1999; Federal Office of Statistics Nigeria Demographic and health survey, 1990) Under nutrition is directly or indirectly responsible for 3.5 million child death every year, and at least 35% of the disease burden in under 5 year old children. Sub-Saharan Africa has one of the highest prevalence of low birth weight ranging from 7-42%. Exclusive breastfeeding rate is low and complementary foods are inadequate and inappropriate in the region. Maternal malnutrition increases the risk of death of the mother at birth and may be associated with about 20% of maternal deaths. Annually, almost one million children die from pneumonia, 769 000 from diarrhoea and a further 810 000 from malaria; 600 000 children under five years are infected with HIV each year, mainly through mother-to-child transmission of HIV, and 315 000 die from AIDS (WHO 2007; Federal Office of Statistics Nigeria Demographic and health survey, 1990; UNICEF 1999; WHO 2005). Although the degree to which indirect determinants of death are expressed varies between countries, malnutrition is a critical risk factor in most countries, and nutrition and food security remains a fundamental challenge to child survival.[8,9] There are multiple constraints in health systems that hamper effective scaling up of child health interventions. Insufficient human, financial and material resources coupled with limited managerial capability; and out-of-pocket payments are some of the factors that lead to poor service delivery and/or low coverage of interventions. Financial resources for child survival programmes and health interventions are far from adequate to reach every community in every district with low-cost interventions. (UNICEF 1999)

MATERIALS AND METHODS

Study area

The study was conducted in Owerri, the capital territory of Imo State, Nigeria. Imo State is located in the South Eastern part of Nigeria. Owerri consists of three Local Government Areas which include; Owerri municipal, Owerri North, and Owerri West. It has an estimated population of about 400,000 as at 2006 (http//www.unicef.org/infobycountry/Nigeria), and is approximately 40 square miles (100 km^2) in area.

Study population

The target population was under-five children that attended the child welfare clinics of urban and rural hospitals in Owerri Capital Territory from January 2008, to December, 2012. Exclusion criteria: untraceable case notes, case notes with inconclusive data, case note of children above 5 years, clients not residing within urban or rural areas of Owerri Capital Territory and case notes from hospitals that refused assent to use their records.

Study design

This was a descriptive cross sectional study using case notes and registers (out-patient, admission and mortality) of the period under review, retrieved from the hospital's Medical Records Department. Two research assistants were trained on folder tracing and data extraction. Pre-test for validity of study pro forma was conducted using a hospital in Umuna, Orlu Local Government Area of the state. Data collection was conducted between June and September, 2013. For the purpose of this study, communities within Owerri Municipal were considered urban, the adjoining communities of Owerri North and Owerri West were considered rural.

Sampling and sample size

A multi-stage sampling was employed. Firstly, the capital territory was divided into the central areas and outskirt areas. The central area was divided into three blocks: i) Works lay-out, Government house, Amakohia, Orlu road axis; ii) Okigwe road, Orji, Aladinma, Uratta axis and iii) Ikenegbu, Wethral road, Douglas road axis. One hospital was selected randomly by ballot from the hospitals in each axis namely: Amanda hospital, works layout, New Creation hospital, Orji and St. David's hospital, Ikenegbu. For the rural hospitals, one hospital each was selected by ballot from the hospitals in three major exit parts (outskirts) of the town, in such a manner as to

accommodate areas not earlier sampled: i) Umuahia road part (Holy Rosary hospital, Emekuku); ii) Umuguma road part (General hospital, Umuguma) and Port-Harcourt road part (Grape vine hospital, Avu).This was done to ensure wide coverage of children from different areas of the territory. Where permission was denied the nearest hospital was used. Secondly, the study population was derived from the total number of under-five clients whose case notes were eligible as recorded for the period under review. This formed the sample size.

Data collection

Data was extracted from the folders of eligible clients of selected hospitals for the period under review. The folders were retrieved through the medical records department of the hospitals using registers from child welfare clinics (out-patient), children emergencies, paediatrics wards. Relevant information was extracted using a pro-forma to obtain information on: socio-demographic parameters, presenting complaints, clinical presentations, anthropometric measurements and diagnosis. The weight for age of each child was used to determine their nutritional status according to the modified Wellcome classification (Wellcome Trust International Working Party, 1970). A child was considered malnourished if he/she had a weight for age of less than 80% of expected with or without oedema and well-nourished if the patients' weight for age was over 80% of expected without oedema.

Data analysis

Data was collated and entered into a computer using Instat and IBM SPSS (version 20, Armonk. NY: IBM Corp. 2011) was used for analysis. Frequency distributions, percentages and means of relevant variables were tabulated. Chi-square test was applied as test of significance and a P value of <0.05 was considered as statistically significant. Odds ratio and confidence intervals were calculated where applicable.

Ethical consideration

Approval was obtained from the Ethical review committee of Imo State University Teaching Hospital Orlu. Verbal permission was also obtained from the relevant hospitals. Confidentiality of information and anonymity were ensured.

Competing interests

The authors declare that they had no competing interests.
Author's contributions:

Uwakwe KA, Merenu IA, Duru CB and Diwe KC designed the study. Data analysis was by Uwakwe KA and Merenu IA. Literature review was by Emereole CO, and Merenu IA. Merenu IA and Uwakwe KA wrote the manuscript and all the authors read and approved the final version of the manuscript.

RESULTS

A total of 693 (97.5%) of the 711 children eligible for the study had their pro-forma analysed after cleansing and served as the study population. Out of this, 386 (55.7%) were from urban communities while 307 (44.3%) were from the rural. Mean age of the study population was 14.5 ± 0.6 months (urban = 13.7 ± 0.7 and rural = 15.6 ± 0.9). Majority of them 70.1% (486) were within the infancy age range, while 16.8% and 13.1% were within 13-36 months and 37-60 months age brackets respectively. There was no statistically significant difference in the overall age distribution of the children between the urban and rural populations (χ^2 = 2.770, P = 0.5969) (Table I). Above half (55.7%) of them were males, while 307 (44.3%) were females, also the sex distribution between the urban and rural populations did not differ significantly (χ^2 = 0.7873, P = 0.3749, OR = 1.161 and CI = (0.8573-1.571) (Table II).

The malnourished population was 25.3% (175) of the total study population of 693. Out of which 103 (58.9%) were from the urban communities, while 72 (41.1%) were from rural communities. A slightly higher proportion of the urban (26.7%) than rural (23.5%) populations were malnourished, though the distribution of the well nourished and malnourished did not differ significantly between the urban and rural populations (χ^2 = 0.7824, P = 0.3764, OR =0.8418 CI=(0.60-1.19) (table III). The males were more malnourished than the females of both populations and the 0-12 month's age bracket were more malnourished in both groups, there were no statistically significant differences in the sex (χ^2 = 1.57, P = 0.76, OR = 1.14 and CI = 0.62-2.08) and age (χ^2 = 2.88, P = 0.27, OR = NA and CI = NA) distributions of the malnourished between the urban and rural communities (Tables IV and V).

Upon analysis of the malnutrition states observed, 106 (60.6%) of the malnourished children were under-weight, while 47 (26.9%) and 22 (12.6%) were overweighed and marasmic respectively. Within groups, the most prevalent malnutrition states in both the urban and rural children in descending order were underweight, overweight and marasmus. Between groups, overall there was a statistically significant difference in the distributions of the different states of malnutrition between the urban and rural populations (χ^2 = 7.68, df = 2, P = 0.02, OR = NA, CI = NA). Comparing individual malnutrition states, a significantly higher proportion of the rural malnourished population was under-weighed (72.2%) compared to the urban malnourished (54.2%), (χ^2 = 6.95, P = 0.01, OR = 0.43, CI = 0.22-0.81), whereas, a significantly higher proportion of the urban malnourished population was overweighed (34%) compared to the rural malnourished population (16. 7%). Marasmus was almost equally present (Table VI).

There were statistically significant more children underweight in the rural than in the urban population (p 0.01). There was no significant difference in the prevalence of marasmus in both the urban and rural population. Overweight was significantly more prevalent in the urban than in the rural population. With respect to co-morbidities and or diagnosis at presentation, the most prevalent were malaria 70 (40%), pneumonia 36 (26.6%) and diarrhoea 33 (18.9%).

Table I. Age distribution of study population according to location

Age (months)	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	D/F
0-12	280 (72.5)	206 (67.1)	486 (70.1)	2.770	0.5969	4
13-36	62 (16.1)	54 (17.6)	116 (16.8)			
37-60	44 (11.4)	47 (15.3)	91 (13.1)			

Table II. Sex distribution of study population according to location

Sex	Urbann (%)	Ruraln (%)	Freq (%)	χ^2	P-value	OR (CI)
Male	220 (57)	166 (54.1)	386 (55.7)	0.7873	0.3749	1.161(0.8573-1.571)
Female	166 (43)	141 (45.9)	307 (44.3)			

Table III. Nutritional status of study population according to location

Nutritional status	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	OR (CI)
Normal	283 (73.3)	235 (76.5)	518 (74.7)	0.7824	0.3764	0.8418 (0.60-1.19)
Malnourished	103 (26.7)	72 (23.5)	175 (25.3)			

Table IV. Sex distribution of the malnourished population according to location

Sex	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	OR (CI)
Male	58 (57.3)	39 (54.2)	98 (56)	1.57	0.76	1.14 (0.62-2.08)
Female	44 (42.7)	33 (45.8)	77 (44)			

Table V. Age distribution of the malnourished population according to location

Age	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	OR (CI)
0-12	74 (71.8)	43 (59.7)	117 (66.9)	2.88	0.5778	NA
13-36	15 (14.6)	16 (22.2)	31 (17.7)			
37-60	14 (13.6)	13 (18.1)	27 (15.4)			

Table VI. Nutritional status of the malnourished population according to location

Nutritional status	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	OR (CI)
Underweight	54 (52.4)	52 (72.2)	106 (60.6)	6.95	0.01	0.42 (0.22-0.81)
Marasmic	14 (13.6)	8 (11.1)	22 (12.6)	0.24	0.63	1.26 (0.50-3.18)
Overweight	35 (34)	12 (16.7)	47 (26.9)	6.47	0.02	2.57 (1.23-5.40)

Table VII. Diagnosis on presentation/Co-morbidity of the malnourished population according to location

Diagnosis	Urban n (%)	Rural n (%)	Freq (%)	χ^2	P-value	OR (CI)
Malaria	40 (38.8)	30 (41.7)	70 (40)	0.14	0.76	0.89 (0.48-1.64)
Diarrhoea	15 (14.6)	18 (25)	33 (18.9)	3.02	0.12	0.51 (0.24-1.10)
Pneumonia	27 (26.2)	9 (12.5)	36 (20.6)	4.88	0.04	2.49 (1.09-5.68)
Others	21 (20.4)	15 (20.8)	36 (20.6)	0.01	1.00	0.97 (0.46-2.05)

Others were measles, HIV/AIDS, septicaemia, tuberculosis, urinary tract infection and typhoid fever; these accounted for 26.6%. The overall distribution of co-morbidities did not differ significantly between the urban and rural malnourished populations ($\chi^2 = 6.49$, df = 3, P = 0.09, OR = NA, CI = NA). Within groups however, the major co-morbidities in descending other for the urban malnourished population were malaria, pneumonia and diarrhoea, while for the rural it was malaria, diarrhoea and pneumonia. Between groups, the only co-morbid state with statistically significant difference in distribution between the urban and rural malnourished populations was pneumonia, which was more prevalent in the urban malnourished $\chi^2 = 4.88$, P = 0.04, OR = 2.49, CI = 1.09-5.68) (Table VII).

DISCUSSION

Out of a total of 693 subjects studied, 175 (25.3%) were malnourished while the remaining 518 (74.7%) had normal weight for age. Of the 175 malnourished children 106 (60.6%) were underweight, 22(12.6%) had Marasmus while 47(26.8%) were overweight. According to UNICEF, 23 $\pm$ 5% of under-five children from 2006 to 2010 in Nigeria were malnourished.[1`1] In this study, there were significantly more children underweight in the rural than in the urban population (P= 0.01). This may be explained by the fact that children in rural areas may have more infections and infestations than those in urban areas because of poor environmental

infrastructure and social amenities like potable water, healthcare and sanitation in rural areas.

There was no significant difference in the prevalence of marasmus in both the urban and rural population. Overweight was significantly more prevalent in the urban than in the rural population. The higher prevalence of overweight in urban dwellers may be due to consumption of junk foods which are high in refined sugars and fats. These foods are poor in nutrients and lead to deposition of excessive fat in the body eg soda drinks like coca-cola, fanta, pastries like meat pies, cakes etc while the rural children eat mainly simple healthy foods from their farms.

Malaria as co-morbidity in both urban and rural populations was not significantly different (P= 0.76). Diarrhoea was not significantly different in the two populations (P= 0.12). Pneumonia was however significantly more prevalent in the urban than in the rural population (P = 0.04). This may be as a result of the higher levels of air pollution in urban areas than in rural environment.

In a study in Ogun state (Fatusi *et al*., 2010), the level of malnutrition was 27.5%.These figures were similar to this study's findings of 25.3%. From the total of 175 malnourished children, more males 98(56%) were malnourished than females77 (44%). This is in keeping with many studies done in Africa which suggest that malnutrition among male children is consistently higher than in female children (Fatusi *et al*., 2010; Alemu *et al*., 2002; Bello and Ijaiye, 1998). This is true in both the urban and rural population. This may be related to the increased biological vulnerability of males to infections. The reason for this should be further investigated.

The nutritional status of the subjects in this study differ slightly in both the urban and rural study populations. More children were malnourished in the urban population103 (26.7%) than in the rural population 72(23.5%). This is surprisingly different from previous studies. A study by Alemu *et al.* (2002) indicated that children in rural areas were more likely to be malnourished than those in urban areas. Furthermore, 35(9.1%) of children in the urban study population were overweight as against 12 (3.9%) in the rural population, 54(14%) were underweight in the urban population while 52(16.9%) were underweight in the rural population. 14(3.6%) had marasmus in the urban population, while 8(2.6%) was found in the rural population.

The highest occurrence of malnutrition was in the age group 0 – 12months in both urban 74 (71.8%) and rural 43(59.7%) population, followed by the age group 13 -36 months in both urban15 (14.6%) and rural 16 (22.2%) populations. Those 37 – 60months had the least occurrence in both urban 14(13.6%) and rural13 (18.1%) populations. These findings tally with a study carried out at the university of Nigeria teaching hospital were the most common age group with malnutrition was found to be those 6 – 12 months. (Bello and Ijaiye, 1998) Diarrhoea and malaria were the common associated co-morbidities. (Bello and Ijaiye, 1998) This also tallies with the findings in this study. Tables 11-13 show that malaria remains the commonest disease associated with malnutrition in both the urban 40 (38.8%) and rural 30 (41.7%) study populations. Next is pneumonia in the urban 27(26.2%) population and diarrhoea in the rural18 (25%) population. Diarrhoea is third in the urban15 (14.6%) region while pneumonia 9 (12.5%) is third in the rural region. The higher prevalence of pneumonia in the urban areas may be explained by air pollution in urban areas. Other co-morbidities like HIV/AIDS, tuberculosis, measles, urinary tract infections etc make up 36(20.6%) in the urban study population, and 15 (20.8%) in the rural study population. In Maiduguri, Northern Nigeria (Hamidu *et al*., 2003), the associated co-morbidities of malnutrition were diarrhoea (41.6%) malaria (21.4%), pneumonia (1.5%), measles (6.6%) and others like TB, anaemia, UTI, sepsis, asthma, making up the other 28.9% (Hamidu *et al*., 2003).

Conclusion

Malnutrition is still a major health problem in our society, with a study prevalence of 25.3% in Child welfare Clinics in Owerri. It continues to affect both urban and rural populations in our environment. Males are more affected by malnutrition than female children, with underweight malnutrition being the commonest form of malnutrition in our environment.

Recommendation

Food security is very important to every nation. The contributions of the agricultural sector towards the development of high yield and disease resistant seeds for the farmers is crucial. Nutrition education is vital so also is the implementation of our child survival strategies especially, exclusive breast feeding for at least six months, and provision of nutrient dense complementary foods for weaning the children. From this study, malaria was shown to be a major co-morbidity in both urban and rural malnourished study populations, hence more effort should be directed at malaria control measures through the Roll Back Malaria Strategies.

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