International Journal of TROPICAL DISEASE & Health
16(1): 1-11, 2016, Article no.IJTDH.25292
ISSN: 2278–1005, NLM ID: 101632866

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Urban–Rural Disparities and Determinants of Nutritional Status of Under-Five Children: An Example of Akinyele Local Government Area, Ibadan

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Authors' contributions

This work was carried out in collaboration between all authors. Author ITI wrote the proposal, designed the study analyses and wrote the manuscript. Author OAA contributed to the study design, correction of proposal, analyses and writing of manuscript. Author AF contributed to the proposal, data collection and data analysis. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2016/25292
Editor(s):
(1) Siddharudha Shivalli, Department of Community Medicine, Yenepoya Medical College, Yenepoya University, Mangalore, India.
Reviewers:
(1) Oluwafolahan Sholeye, Olabisi Onabanjo University, Nigeria.
(2) Jorge Isaac Castro Bedrinana, Universidad Nacional del Centro del Perú, Peru.
Complete Peer review History: http://sciencedomain.org/review-history/14173

Original Research Article

Received 26th February 2016
Accepted 1st April 2016
Published 14th April 2016

ABSTRACT

Background: Nutrition is an important element of a child's survival and development. To achieve MDG 4 in Nigeria, nutritional status of under-five children needs to be improved as malnutrition remains an underlying factor in about one third of under-five deaths in Nigeria. Unfortunately, along with high prevalence of malnutrition, urban-rural disparities persist in child nutritional outcomes in Nigeria.
Objective: To determine the differences in and predictors of the nutritional status of children in urban and rural areas of Akinyele LGA, Ibadan.
Methods: A community based comparative cross sectional study was carried out in one urban and one rural ward of Akinyele LGA. Data was collected from mothers of 614 children. Anthropometric measurements were obtained from the children and Z scores generated using the WHO standard population. The children were classified as stunted, wasted or underweight using a cut off of -2 SD

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and severely stunted, severely wasted and severely underweight using a cut off of -3 SD.
Results: Of all the children, 56.2% were stunted, 17.4% were underweight and only 9% were wasted. Urban-rural location was significantly associated with stunting and underweight but not wasting. Rural dwellers were more likely to be underweight (OR 3.000, 95% CI 1.907- 4.718) and more likely to be stunted (OR 1.857, 95% CI 1.344- 2.565). The predictors of either or all of the nutritional indices were paternal education, having a sanitary toilet in the home, exclusive breastfeeding, socioeconomic status, birth order of the child, exclusive breastfeeding and complete immunization.
Conclusion: Disparities exist in the nutritional status of under-five children which is not due to location. Drivers of these disparities need to be identified in order for appropriate policies and actions to be taken.

Keywords: Urban-rural; disparities; malnutrition; children; Ibadan.

1. INTRODUCTION

Malnutrition, both a medical and a social disorder, that is often rooted in poverty [1], is a major public health and development concern with important health and socioeconomic consequences [2]. Combined with poverty, malnutrition contributes to a downward spiral that is fuelled by an increased burden of disease, stunted development and reduced ability to work [1]. Malnutrition potentiates about 56 percent of all deaths of children under five years of age in developing countries [3], and it is also the major risk factor for over 28 percent of all deaths in Africa—some 2.9 million deaths annually [4].

According to World Health Organisation (WHO) definitions, a child is defined as affected by chronic malnutrition, or stunting, when his or her Z score of height for age is lower than two standard deviations below the international normative median. Using the same criterion, global malnutrition (underweight) is defined for low weight-for-age scores, and acute malnutrition (wasting) corresponds to low height for-weight [5]. Clinically, malnutrition is characterized by inadequate intake of protein, energy, and micronutrients such as vitamins, and the frequent infections and disorders that result.

Child malnutrition is a major hindrance to human development; it jeopardises and impairs prospects for productive social integration in adulthood, reduces economic growth, and contributes to the intergenerational reproduction of poverty and inequality and prevents children from reaching their full physical and mental potential [6].

Apart from causing significant childhood mortality, stunting also leads to significant physical and functional deficits among survivors [5]. According to the latest reports, stunting contributes to 14.5% of annual deaths and 12.6% of disability adjusted life-years (DALYs) in under-five children [7] stunting impairs host immunity, thereby increasing the incidence, severity, and duration of many infectious diseases [8]. In countries where malaria infection is endemic, stunting increases the degree to which malaria is associated with severe anaemia causing considerably higher likelihood of mortality due to malaria [8].

Malnutrition in any stage of childhood hinders cognitive growth affects schooling and, thus, the lifetime earnings potential of the child. Malnutrition affects educational outcomes, including a reduced capacity to learn (as a result of early cognitive deficits or lowered current attention spans) and fewer total years of schooling [9]. In Zimbabwe, stunting, via its association with a 7-month delay in school completion and a 0.7-year loss in grade attainment, has been shown to reduce lifetime income by 7 to 12 percent [10]. In a study on the effects of nutritional status on primary school achievement score in Kenya, undernourished girls were more likely to score less on achievement tests [11]. A study conducted in Abeokuta, Nigeria, found that children who were stunted completed fewer years of schooling [12].

Recent data indicate that whereas malnutrition among preschoolers is substantially decreasing in Asia and Latin America and the Caribbean, it is on the rise in some countries of sub-Saharan Africa, whilst in many others they remain disturbingly high or are declining only sluggishly [13]. Globally, in 2012, 162 million under-five year olds were stunted, 51 million under-five year olds were wasted and 99 million under-five year

olds were underweight. In the same year, 37% of all stunted children, 28% of all wasted children and 29% of all underweight children live in Africa [14].

In the developing world, an estimated 230 million (39%) children under the age of five are chronically malnourished and about 54% of deaths among children younger than 5 are associated with malnutrition [15]. In Sub-Saharan Africa, the prevalence of malnutrition among the group of under-fives is estimated at 41% [2].

Nigeria has experienced and continue to experience high but slowly declining levels of malnutrition among its under-five population [14] Global ranking of stunting showed Nigeria to be the 32nd-highest out of 136 countries [16] and also that Nigeria is the country with the 3rd highest absolute number of children who are stunted; 41% of children under the age of five are stunted 23% are underweight, and 14% are wasted [16]. Nigeria has higher rates of stunting than some of its neighbors in the Africa region and income peers in other regions [16].

According to United Nations Children's Fund (UNICEF), Nigeria, with a prevalence of 46% of under-five children stunted, has the 12th highest level of child malnutrition in the world ahead of countries like Niger and Rwanda. The situation is worse in Northern Nigeria where half of children under the age of five are stunted and one in five children suffer from acute malnutrition [17].

Malnutrition rates among under-five children Nigeria also vary significantly across rural-urban locations. Both the 2003 and 2008 Nigeria National Demographic and Health Survey (NDHS) showed disparities in the prevalence of stunting among urban and rural children [18].

Poor nutritional status reflects an imbalance in dietary intake and/or infectious diseases, and therefore is affected by multiple environmental and socioeconomic factors [19]. Therefore, while the immediate causes of malnutrition are inadequate nutrient intake and high disease exposure, underlying factors include social and ethnic inequalities as well as lack of access to basic health services [6]. Furthermore, factors such as household socioeconomic status (SES), maternal education and household hygiene have been implicated [19]. Other demographic factors such as the child's age and sex, birth interval and mother's age at birth have also been linked with malnutrition [2].

The objective of this study was to determine the nutritional status of under-five children and its determinants in urban and rural areas of Akinyele Local Government Area (LGA), Ibadan and the determinants.

2. MATERIALS AND METHODS

The study was a community based comparative cross sectional study which was purely quantitative. It was conducted in one urban (Ojoo) and one rural ward (Ijaiye) of Akinyele LGA, Ibadan. The study population were children under-5 years old and their mothers/primary care givers living in the rural and urban communities of Akinyele LGA Ibadan. Under-fives with major handicap, disability or malformation were excluded. Children with chronic diseases (as determined by verbal reports from the mother) that can affect their ability to thrive like diabetes mellitus, asthma and sickle cell anemia were also excluded.

The sample size was determined using the formula for sample size determination for comparing two independent groups:

$$n/group = (Z^2 1-\alpha + Z^2 1-\beta)\ [(P_1(1-P_1) + P_2(1-P_2)/(P_1-P_2)^2\ ]$$ [20]

Power was set at 80%.

P1 was 23.1% Based on the prevalence of stunting in under 5-children in a rural part of Ile Ife, a town about 45 minutes' drive from the study area) [21,18] Calculations were done to detect a minimum difference of 10% between the rural and urban areas, with the urban area assumed to have 10% less prevalence of stunting. Calculated sample size was divided by 0.9 to compensate for non-response and then by 1.2 to compensate for clustering effect.

The calculated minimum sample size for the study was 295 urban population and another 295 rural population, making the total minimum sample size for the two groups to 590 under 5 children and their care givers.

A multistage sampling technique was employed to obtain a representative sample of under-5 children. First stage involved the random selection, by balloting, of a Local Government Area (LGA) from a list of rural-urban Local Governments in Ibadan Municipality. All the wards in the selected LGA, Akinyele LGA, were then stratified into two groups- rural and urban.

Ijaiye, a rural ward and Ojoo, an urban ward were then selected by balloting. A sampling frame of all the communities in the two wards was drawn and five communities were selected from each ward by simple random sampling. Three enumeration areas were selected in each community by balloting. All houses in the selected areas were visited, (in houses that have more than one household, the household that was included was determined by balloting) and one child per household was selected by balloting.

Data were collected using interviewer administered questionnaires with both open and closed ended questions. Socio-demographic data were collected from mothers and anthropometric measurements were taken from the children to determine their nutritional status.

The questionnaire was adapted from the UNICEF Multiple Indicator Cluster Surveys and Nigeria NDHS Questionnaires. The length of children under two years of age was measured using a tape rule, while the height of older children was measured using a stadiometer. Weight of children under two years of age was measured by use of a digital infant weighing scale with a maximum capacity of 20 kg and graduation of 5 g and the weight of older children measured by use of a digital child weighing scale which had a maximum load bearing capacity of 150 kg, a minimum measurable weight of 6kg and a tolerance range ± 0.3 kg for weights less than 50 kg. Data was collected between February and March 2013.

Z scores of anthropometric variables were generated using the WHO standard population on WHO Anthro software version 3.2.2 and exported to SPSS where the children were grouped into stunted or normal, wasted or normal and underweight or normal based on a SD of -2 and severely stunted, severely wasted and severely underweight using a cut off of -3 SD.

Chi Square was computed to identify the factors associated with malnutrition and Logistic Regression was done to determine the correlates of malnutrition. The significant level of both statistical tests was set at 5%.

3. RESULTS

A total of 615 mother-child pairs were approached but one respondent refused to complete the questionnaire thereby giving a response rate of 99.8%. Of the 614 that respondents, 310 were from urban areas while 304 were from rural area.

The majority of the children from urban area were males 164 (53.1%). While majority of those from rural areas were females 159 (52.1%). The mean age of the children from urban location was 27.6±18.2 months which was slightly higher than the mean age of those from rural location which was 25.8±18.0 months. There was no significant difference between urban and rural location in terms of the children's age and sex (p= 0.20, p=0.40).

The overall mean age of the mothers was 30.5± 4.7 years. The mean age of mothers from urban areas was 31.3±4.5 years while that of mothers from rural was 29.63±4.1 years. There was a significant difference in the mean age of mothers between the two locations (<0.001). In both urban and rural locations, majority of the mothers were Christians; 197 (63.5%) and 170 (55.9%) respectively.

Table 1. Socio-demographic characteristics of the children by location

Variables	Urban N=310 n (%)	Rural N=304 n (%)	Total N=614 n (%)	Test statistic	P-value
Sex					
Male	164 (53.1)	145 (46.9)	309 (50.3)	χ^2=0.664	0.197
Female	146 (47.0)	159 (52.1)	305 (49.7)		
Age					
0-5 months	53 (47.7)	58 (52.3)	111 (18.1)		
6-11 months	21 (38.9)	33 (61.1)	54 (8.8)		
12-23 months	70 (53.8)	60 (46.2)	130 (21.2)	χ^2=5.157	0.397
24-35 months	58 (52.3)	53 (47.7)	111 (18.1)		
36-47 months	54 (48.6)	57 (51.4)	111 (18.1)		
48-60 months	54 (55.7)	43 (44.3)	97 (15.8)		
Mean age months	27.6±18.2	25.8 ±18.0	26.7±18.1	t-test=1.227	0.220

Table 2. Socio-demographic characteristics of parents by location

Variables	Urban N=310	Rural N=304	Total N=614	Test statistic	P-value
	n(%)	n(%)	n(%)		
Mothers age group					
16-25	20 (6.5)	52 (17.1)	72 (11.7)		
26-35	230 (74.2)	222 (73)	452 (73.6)	χ^2 =24.535	**<0.001***
36-45	59 (19.2)	29 (9.6)	88 (14.3)		
>45	1 (0.3)	1 (0.3)	2 (0.3)		
Mean age	31.3±4.5	29.6±4.1	30.5±4.7	t=4.580	**<0.001***
Mother's religion					
Christianity	223 (71.9)	192 (63.2)	415 (67.6)	χ^2 =5.398	**0.013***
Islam	87 (28.1)	112 (36.8)	199 (32.4)		
Wealth quintiles					
Lowest	1 (0.2)	122 (40.1)	123 (20.0)		
2nd	5 (1.6)	118 (38.8)	123 (20.0)		
3rd	64 (20.6)	59 (19.4)	123 (20.0)	χ^2	**<0.001***
4th	120 (38.7)	3 (1.0)	123 (20.0)	=448.457	
Highest	120 (38.7)	2 (0.7)	122 (19.9)		
Type of marriage					
Single mother	8 (2.6)	5 (1.7)	13 (2.1)		
Monogamous	287 (92.6)	260 (85.5)	547 (89.1)	χ^2 =12.634	**0.002***
Polygamous	15 (0.48)	39 (12.8)	54 (8.8)		
Mother's ethnicity					
Yoruba	290 (96.6)	267 (87.8)	557 (90.7)	χ^2 =5.962	**0.010***
Others#	20 (3.4)	37 (12.2)	57 (9.3)		
Mother's educational status					
No formal education	2 (0.7)	47 (15.5)	49 (8.0)		
Primary school completed	21(6.8)	167 (54.9)	188(30.6)		
Secondary school completed	207 (66.8)	86 (28.3)	293 (47.7)	χ^2=273.408	**<0.001***
Tertiary School completed	80 (25.8)	4 (1.3)	84 (13.7)		
Father's religion					
Christianity	197 (63.5)	170(55.9)	364(59.8)	χ^2= 3.714	0.059
Islam	113(36.5)	134(44.1)	247(40.2)		
Father's ethnicity					
Yoruba	197(63.5)	170(55.9)	367(59.8)	χ^2= 3.714	**0.032***
Others#	113(36.5)	134(44.1)	247(40.2)		
Father's educational attainment					
No formal education	2 (0.6)	28(9.2)	30(4.9)		
Primary school completed	5(1.6)	132(43.4)	137(22.3)	χ^2	**<0.001***
Secondary school completed	188(60.6)	139(45.7)	327(53.3)	=248.404	
Tertiary school completed	115(37.1)	5(1.6)	120(19.5)		

#Ibo, Hausa, Igede, Tiv, Ewe (Togolese), Akan (Ghanian).
** Statistically significant*

The was a significant difference in the type of marriage of the mothers between the two locations with (92.6%) of the women in urban areas being in monogamous marriages while 260 (85.5%) of women in rural areas being in monogamous marriage respectively (p=0.002). Majority of the mothers were Yoruba.

A significantly higher number of mothers from urban areas completed secondary school

education 207 (66.8%), 80 (25.8%) completed tertiary school and only 2 (0.7%) had no formal education) while 167 (54.9%) of mothers from rural areas completed only primary education, 86 (28.3%) completed only secondary education and 47 (15.5%) had no formal education (p<0.001).

Of fathers in urban location, 197 (63.5%) were Christians while 170 (55.95%) of fathers in rural areas were Christians, this difference was not statistically significant. However, significantly more fathers from the urban area were Yoruba i.e. 197 (63.5%) while only 170 (55.9%) fathers in the rural areas are Yoruba (p=0.03). There was also significant difference in educational attainment between the urban and rural areas with 188 (60.6%) having completed only secondary education and 115 (37.1%) having completed tertiary education, while 139 (45.7%) completed only secondary education and 5 (1.6%) completed tertiary education among fathers in the rural area (p-<0.001).

There was a statistically significant difference in the distribution of the urban and rural families into wealth quintiles. 120 (38.7%) of urban families were in the highest wealth quintile while only 1 (0.2%) were in the lowest quintile. In the rural area, only 2 (0.7%) families were from the highest wealth quintile while 122 (40.1%) were from the lowest wealth quintile (p<0.001)

A total of 345 (56.2%) children were stunted with a total mean Z-score of -2.1 (±2.1). A significantly higher number of rural children i.e. 194 (63.8%) were stunted with a mean Z score of -2.4 (±2.1) than 151(48.7%) of urban children with a mean Z score of -1.9 (± 1.2) (p<0.001) (OR 1.86, 95% CI 1.34- 2.57). Of the number stunted, 205 (59.4%) were severely stunted with 117 (38.5%) children in rural areas been more significantly severely stunted than 88 (28.4%) in urban area (p=0.005).

A total of 55 (9%) of all the children were wasted with a mean Z score of -0.79 (± 1.9). Urban area had a mean Z score of 0.87 (±1.8) while rural area had a mean Z score of 0.70 (±2.0). Of the 55 that were wasted, 32 (58.2%) were from rural areas and 29 (53%) were severely wasted. Of children from urban area, 23 (7.4%) were wasted while 32 (10.5%) of children from rural area were wasted. There was no statistically significant difference between the rural and urban areas in the proportion wasted (p-0.114, OR-1.47; CI 0.84-2.57) and severely wasted respectively (p=0.166). However, the mean Z score for wasting was significantly lower in the rural than in the urban area (p<0.001).

A total of 107 (17.4%) children were underweight with a mean Z score of -0.8±1.4. Of these, 37 (34.6%) were severely underweight. Thirty-one (10.0%) of urban children were underweight with a mean Z score of -0.5±1.2 while 76 (25%) of children from rural area were underweight with a mean Z score of -0.5±1.2 this difference was statistically significant (p<0.001). In contrast, the mean Z score for underweight (p=0.28) for rural and urban children was not statistically significant. However, a significantly higher proportion of rural dwelling children were severely underweight compared to urban dwelling children (p=0.002) (OR 3.000, 95% CI 1.17- 4.72).

In the urban areas, being a male child (p-0.02), being in the older age group (p-0.003), and immunization status not being up to date (p-0.04) were all found to be associated with stunting. In rural areas, being in the older age in groups (p<0.001), older birth order (p-0.04) and the child not having been or not being exclusively breastfed (p<0.001).

In the total population, factors associated with stunting were; being in the older age group (p<0.001), the child not having been or not presently being exclusively breastfed (p-0.006), immunization status not being up to state (p=0.047), having a father with a primary education or less (p=0.02), being in the lowest wealth quintiles (p<0.001) and not having a sanitary toilet (p=0.001).

In the urban area, being in the younger age group (p<0.001) was found to be associated with wasting. In rural area, being in the younger age group (p<0.001) and being the first or fourth and above in the birth order (p=0.046) were found to be associated with wasting. In the total population, being male (p=0.02), being in the younger age group (p<0.001) and being the first or fourth and above in the birth order (p-0.02) were found to be associated with wasting.

In the urban area, the only factor associated with underweight was not having been or not presently being exclusively breastfed (p=0.04) while in rural area, not having been or not presently being exclusively breastfed (p=0.02), having a father with primary or less education (p=0.04) and lack of a sanitary toilet facility (Fisher's=0.03) were found to be associated with underweight.

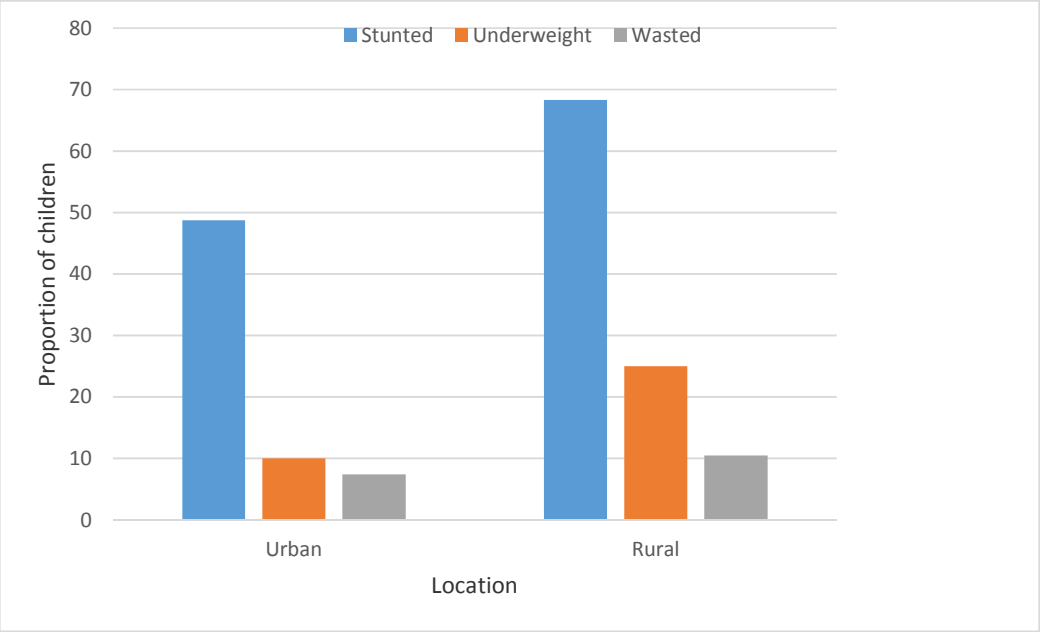

Fig. 1. Proportion of children stunted, underweight and wasted according to location

In the total population, birth order greater than 1st (p=0.002), not having been or not presently being exclusively breastfed (p=0.04), immunization status (p=0.002) maternal education (p=0.001) paternal education (p<0.001), lower wealth quintiles (p<0.001) and lack of sanitary toilet facility (p<0.001) were all found to be associated with underweight.

On running Logistic Regression, among the total population, children from within the 4th wealth quintile were found to be almost two times more like to be stunted than those from the 5th or lowest quintile [AOR 1.85, 95% CI: 1.07-3.21]. Children in age groups 0-5 months [AOR 0.13, 95%CI 0.07-0.25], 6-11 months [AOR 0.15, CI 0.07-0.32], 12-23 months [AOR 0.16, CI 0.09-0.31] and 24-35 [AOR 0.44, CI 0.23-0.84] months were much less likely to be stunted that children in age group 48-60 months.

Male children were twice more likely to be wasted than female children [AOR 2.07 CI 1.13-3.77]. Children with birth order 4th and above are about twice as likely to be wasted as children with birth order 2nd and 3rd [AOR 0.47, CI 0.23-0.94]. children age 0-5 months were about 8 times more like to be wasted than children 48-60 months old [AOR 7.90, CI 2.64-23.63] while children 6-11months old were about 4 times more likely to be wasted than children 48-60 months old [AOR 4.07, CI 1.16-14.29].

Children without sanitary toilet in their home are about three and half times more likely to be underweight than children with sanitary toilet in their homes [AOR 3.60, CI 1.53-8.47]. Children from the lowest wealth quintile are almost twice as likely to be underweight than children in the highest wealth quintile [AOR 1.95, CI 0.27-3.41].

4. DISCUSSION

While both underweight and wasting may reflect occasional weight loss as a result of recent disease episodes, stunting, also referred to as chronic malnutrition, is more representative of insufficient growth, due to persistent dietary deficiencies and/or illness susceptibility [6]. If children experience weight loss or "wasting" (low weight for height), they are suffering from acute malnutrition. Underweight is a composite measure of both stunting and wasting [17].

This study reveals that stunting is still highly prevalent and disproportionately affects the rural children. Though the prevalence of stunting found by this study is higher than the NDHS 2008 finding which put the national figures at 41% and 23%, South West Nigeria at 31.2% and 13.8% and the Oyo state figures at and 37.2 and 19% respectively and also that of the NDHS 2003, it still supports the fact that continues to be a major problem in Nigeria. Several factors could account for this difference in the prevalence

found by this study and that of the NDHS. It could be due to continuous increments in the number of children that are stunted reflecting the worsening socioeconomic and health situation in the country as the study was carried out five years after the 2008 NDHS [22]. The differences could also be due to the different methodologies employed by this study and the NDHS. Furthermore, it may also be attributed to the fact that the study used the WHO standard population which has been consistently shown to produce results with higher prevalence of malnutrition than that of the United State National Center for Health Statistics (NCHS) reference population which was used by the NDHS surveys [23]. However, the WHO reference population is more representative as it makes use of population representative of all regions of the world [24] while the US NCHS made use of only children in the US. The prevalence of stunting found in the study is also higher than the finding of Senbanjo et al in Ifewara where only 26.7 % were stunted in this rural community in which services and intervention had been provided by a non-governmental organization in the community [21].

Wasting is also still highly prevalent though the prevalence of wasting and severe wasting found by this study was lower than the national average of 23.1 and 9.0% respectively, the southwest average of 13.3% and 4.0% respectively and the Oyo state average of 17.1% and 7.8% respectively all according to the 2008 NDHS data and also lower than the finding of Senbanjo in Ifewara of 15.5% and 7.6% respectively [18,21]. This study found that wasting disproportionately affected the rural children. A similar disparity, though of a higher magnitude, was also noted in the 2008 NDHS [18] However, the study by Lawal and Samuel in rural farming communities of Oyo state found the prevalence of wasting to be about half of that of this study. While studies in Iseyin, a peri-urban town in Oyo state by Awoyemi et al. [25] and by Samuel in high density urban location of Ibadan found the proportion of under-five children that were wasted to be much higher [26].

The prevalence of underweight In this study do not differ much from that of the Oyo state 2008 NDHS figures of 11.7% and 5.6% respectively, but is still unacceptably high [18]. Urban-rural disparity, same as noted in the 2008 NDHS, also exists in this prevalence. Prevalence of underweight for urban area is similar to that of the NDHS while that of rural area was quite high compared to the NDHS [18]. The prevalence of underweight varied from study to study. Awoyemi in Iseyin, reported 6% [25], Samuel in Ibadan reported 41.9% and Senbanjo in Ifewara reported 23.1% while Samuel and Lawal in Oyo state reported 14.9% [21,25,27].

Child's age was associated with stunting. Studies done in both Nigeria and worldwide have documented similar findings. Inclusive are the studies by Adekambi using 2008 NDHS data which revealed that age above 11 months was associated with stunting, that of Ojofeitimi in Ife, Uthman using NDHS 2003 and Kamal in Bangladesh [28-31]. This result is plausible considering that many of the younger children are still being breastfed, and chronic malnutrition sets in only after weaning [32].

Paternal education was also found to be associated with stunting and this is similar to the finding of Mustafa Kamal [31] and Espo et al in Malawi [33]. This is likely due to the fact that educated fathers are likely to earn more thereby raising the socioeconomic status of the family and higher socioeconomic status have been documented to be inversely associated with stunting. The male gender was also found to be positively associated with stunting, wasting and underweight. This corroborates the finding of different Nigerian studies like that of Adekambi, [28] Uthman,[30] and Babatunde et al. [32] and international studies like that of Espo et al. [33] in rural Malawi and Wanani in his meta-analysis of 16 demographic and health surveys from Sub-Saharan Africa [34].

Other factors found to be positively associated with stunting are incomplete immunization and not being exclusively breastfed. This is not unexpected as recurrent ill health in children will affect their growth and vice versa and exclusive breastfeeding and immunizations strengthen the immune system and protect the children against recurrent ill health. Being of a higher birth order was also positively associated with stunting this may be partly due to the fact that the more the children the thinner the resources will be spread and the less each child will have to eat, naturally the younger child will suffer most and chronically [35].

Lack of sanitary toilet facility in the home was also associated with stunting and wasting. The same finding has been documented by different studies [6,31,32,36]. This is not surprising as better sanitary conditions lower the risk of

diarrhea, infectious diseases and infestations. Studies have also found that both acute and chronic diarrhea are associated with malnutrition in children [37,38].

While this study showed a significant relationship between father's educational qualification and prevalence of underweight, a similar study by Senbanjo et al in Ifewara showed a similar but statistically insignificant relationship [39]. This was probably due to confounding because after controlling for confounders the relationship still existed but was no longer significant. The association between breastfeeding, birth order and immunization and underweight that was shown in this study also corroborates the finding of Uthman [30]. A negative effect of household wealth on stunting was revealed in this study as has been documented by several national and international studies [2,10,21,31,40-42].

5. CONCLUSION

In conclusion, this study has identified predictors of either or all of the nutritional indices to be: Paternal education, having a sanitary toilet in the home, exclusive breastfeeding, socioeconomic status, birth order of the child and complete immunization. These results are important not only for researchers but for policy makers and those involved in nutritional interventions, because they have to consider these factors identified as having the greatest effect on the nutritional status of children under five years of families of Akinyele, Ibadan. Therefore, focus needs to be placed on these factors rather than location per se when making policies that will improve the nutritional status of under-fives.

CONSENT

All authors declare that 'written informed consent was obtained from the mothers at the time of interview, for publication of this paper'.

ETHICAL APPROVAL

Ethical approval for this study was sought and obtained from the Oyo State Ethical Review board. Permission to conduct the study was obtained from the Local Government chairman, community leaders and heads of households.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
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