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DETERMINANTS OF MALNUTRITION AMONG CHILDREN IN RURAL FARM HOUSEHOLDS IN OGUN STATE, NIGERIA

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ABSTRACT
Malnutrition in children is one of the most serious public health problems in Nigeria and also in the world. Therefore, the objective of the study was to measure the prevalence of stunting, wasting and underweight and to assess the socio-economic factors that influence the anthropometric indicators among children residing in rural farm households of Ogun State Nigeria. A cross sectional study was employed and 206 farm households were interviewed using a structured, personally administered questionnaire consisting of socio-demographic factors, maternal characteristics, farm production characteristics and anthropometric measurement was used to gather data for 100 children. Nutri-survey, SPSS and Stata software were used to perform descriptive statistics and logistic regression analyses. The summary statistics of nutritional status of children in the study area revealed that the prevalence of stunting, underweight and wasting was 70%, 25 % and 8%, respectively. In view of World Health Organisation recommendation into two age disaggregated groups, male children were found to be more stunted and wasted than females in the study area. Age($p<0.05$) and sex of the child($p<0.05$), Farm size($p<0.01$), household size($p<0.05$), access to safe water($p<0.05$), years of formal education of the household head ($p<0.05$) and access to health services ($p<0.01$) are factors that significantly affect the incidence of stunting, underweight and wasting in the study area. Thus, efforts should be made to improve the health services and also provision of safe water to farm households for reducing malnutrition among children.

KEYWORDS: Children; Stunting; Wasting; Underweight; Farm households; Nigeria.

INTRODUCTION

Malnutrition is a poor health condition that is attributed to inadequate food or lack/inadequate right kind of food. It is a nutritional disorder caused by eating little or too much of a particular nutrient. Malnutrition in Children remain a major threat to public health in many parts of the world, particularly in developing countries. It is however an important topic in the sustainable development goals developed by the United Nations in 2015. More than one-third of children under five in Africa are having low height for their age (that is stunted). (World Health Statistics 2009). Nigeria has the second highest burden of stunted children in the world, with a national prevalence rate of 32percent of children under five years (UNICEF, 2020). Every year, over 1 million Nigerian children die before their fifth birthday and the United Nations Children's Fund (UNICEF) identifies malnutrition as the direct or underlying cause of 45 percent of all deaths of under-five Children (UNICEF, 2020).

The nutritional status of children is usually quantified in terms of anthropometrical measures like weight-for-age, height-for-age or weight-for-height. Malnutrition in children is the consequences of a range of factors often related to insufficient food intake, poor quality of food, severe and repeated occurrence of infections and poor nutritional child practices such as delayed breastfeeding in spite of good food supplementation (Rao *et al.*, 2004; Bawdekar and Laishram, 2008). While the problem of malnutrition in Nigeria is relatively well documented, its specific determinants are not well understood. To reduce malnutrition, one must understand its causes. Nonetheless, there has been a paucity of micro-level data and information regarding the key determinants of both acute and chronic malnutrition in Ogun State. Thus, this study is an attempt to contribute empirical evidence to fill this gap. Specifically, the study was carried out in Ogun State Nigeria. The findings of this study would provide useful evidence to examine to what extent household food security and child nutrition objectives are met at grass-root level. It also provides current evidence for better targeting of food insecure households and children with malnutrition problems. This would enhance the effectiveness of food security and nutrition interventions in the State. The paper proceeds by a brief summary of the research methodology which contains a vivid overview of the data set and analysis. Next, we describe our model results. This is followed by a concise discussion of the estimated results, which leads to our concluding remarks and policy implications.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in Ogun State, Southwest Nigeria. Ogun State was created on February 3rd, 1976 from the old western region. It lies within latitude 6^0N and 8 ^{0}N and longitude 2 ^{0}E and 15 ^{0}E. It is bounded on the west by the republic of Benin, on the east by Ondo State, on the North by Oyo State and on the south by Lagos state. The state is approximately 1.9 percent (16,762km) of Nigeria's 923,219km land area; and located in the moderately hot,

humid tropical climate zone of Southwest, Nigeria. It is made up of 20 Local Government Areas spread across the four main agricultural zones namely Egba, Ijebu, Remo, and Yewa. The population of the state stands at 5.408,808 million with its growth rate placed at 2.83percent per annum and about 60% of its population being rural (National Population Commission, 2015).

Sampling Design

The target population for this study was farm households. A Multi-stage sampling technique was used in selecting respondents for the study. This was accomplished by using the Agricultural Development Programs (ADP's) division into zones, blocks and cells. In the first stage, two zones were selected randomly selected which are Abeokuta and Remo zones. Five blocks were randomly selected (Someke, Obafemi, Ilewo, Opeji and Ilugun blocks) in the second stage while the third stage involved the random selection of twelve cells (Ilugun, Adu, Alabata, Egbatedo, Ibara- orile, Idera, Ilewo-orile, Isaga-orile, Kajola, Kila, Kobape, Olodo). In the last stage, seventeen (17) households were selected per cells and it gave a total of 206 households. In the 206 sampled households, there were 100 children below the age of five from whom anthropometrics measurements such as age, height and weight were collected.

Empirical Model and Data Analysis

The nutritional status of children can be studied using clinical signs of malnutrition, biochemical indicators and anthropometrics surveys. The anthropometrical indicators are generally considered as nutrition status indicators based on the internationally defined (standard) cut-off points (WHO, 1995; Cogill, 2003). However, the use of anthropometrics measurement has some advantages over other approaches. This is because they are cheaper and relatively easier to obtain. Theoretically, the body of a child responds to malnutrition in two ways that can be measured by anthropometrics survey. First, a reduction in growth over the long-term results in low height-for-age or stunting. Second, a short-term response to inadequate food intakes is assessed by weight relative to height (wasting). The combination of short-term and long-term food shortage and growth disturbances produces low weight-for-age (underweight) (de Onis, 2000). To this end, anthropometric data were converted into weight-for-age Z-scores (WAZ), height-for-age Z-scores (HAZ) and weight-for-height Z-scores (WHZ) in relation to the World Health Organization (1995) reference population. More specifically, Z-score for an individual *i* is calculated using Eqn. (1):

$$Z - score = \frac{X_i - X_r}{\delta_r} \qquad (1)$$

Where,

X_i = an observed value for *ith* child in a target population;

Xr = a median of the reference population; and

δr = a standard deviation (SD) of the reference population.

A Z-score of -2 standard deviation is the most commonly adopted cut-off point for all nutrition indicators. Consequently, in this study, a child with Z-scores below -2 SD in respective nutrition status indicators was deemed to be malnourished that is stunted (-2δ HAZ), underweight (-2δWAZ) or wasted (-2δ WHZ). The individual height-for-age, weight-for-age and weight-for-height Z-scores were derived from raw anthropometric data using Nutri-survey computing software.

Logit Model

The probability that a child's nutritional status is normal, which is indicated through HAZ, WAZ, WHZ, can be specified using eqn. (2) (Siddiqi *et al.*, 2011):

$$P(M_i = 1/k) = \frac{1}{1+e^{-(\alpha_0+\alpha_i k_i)}} \quad \text{.....(2)}$$

Where, *k* is a vector of explanatory variables influencing nutritional outcomes; *e* is the base of natural logarithm (2.718); *α s* are regression coefficients to be estimated; and *i* indexes individual children below the age of five. The main explanatory variables along with their anticipated impact on the child nutrition status were highlighted in Table 1. Our hypotheses on the variables have been guided by economic theory, previous empirical studies and local knowledge on the problems being studied. The explanatory variables are composed of child, household and environmental health characteristics.

Table1. Description of Explanatory Variables, Measurement and Expected Sign

Variables	Definition	Measurement	Expected sign
Child characteristics			
Age	Continuous, Age of child	Completed months	-
Gender	Dummy, sex of child	1 for boy 0 for girl	-
Household characteristics			
Household size	Continuous, household size	Adult equivalent(AE)	-
Cultivated farm size	Continuous, farm size	Hectares (ha)	+
Total livestock holding	Continuous, Total livestock holding	Animal unit(ANU)	+
Education of the household head	Continuous, education of household head	Years of schooling	
Environmental conditions			
Water source	Dummy , household source of safe water	1 for safe water, 0 otherwise	+
Access to health facility	Dummy, household access to health facility	1 for access, 0 otherwise	+

RESULTS AND DISCUSSION

Characteristics Sample Households Head and Children

Descriptive analysis of data regarding age of the household head shows that the sampled household heads' age ranged from 19 to 83 years with mean of 48.6 years. The average age reported in this study is higher than 43.4 years reported in Ogunnaike *et al*., (2019). This implied that the respondents are still in their economic active age. About 88.3% of the sample households were male-headed and the remaining (11.7%) were female-headed, the survey shows that the average household size was 5 persons with mean farming experience of 25years and about 74.3% of the

household head formal education. This is in line with Awoyemi *et al*., (2012) that reported 83.5% formal education. Also, formal education is expected to influence the awareness of child malnutrition and to educate them more about nutrition. Kuku-Shittu *et al.,* (2012) reported a higher household size of 6 persons. Although, high household size may be attributed to the fact that majority of the household heads are polygamous. With regard to the marital status of the sample respondents, 90.8% were married, 6.8% were widowed and 0.5% was divorced, this is because majority of the spouses served as care givers to the children. Given that malnutrition and diarrhoea are so common in developing countries, it was interesting to note the source of water that households are using. Hence, according to the survey, about 61.7% of the sample households were using water from safe source. Safe water, in this context, refers reasonable access to an adequate amount of water that is either treated surface water or water that is not treated but uncontaminated (such as from public tap, boreholes and deep wells). In response to the question regarding the access to health facility, the survey result indicates that about 82.5% of the sample households have access to a health facility. More than half (56%) of sample children were male and the average age of children in the study area is found to be 40 months.

Table 2: Description of Socio-Economic Characteristics of Household Head and Pre-school Children

Characteristics	Frequency	Percentage
Age		
< 30	15	7.3
31-40	57	27.7
41-50	60	29.1
51-60	34	16.5
>60	40	19.4
Total	206	100
Mean	48.6	
Years of Experience		
<20	95	46.1
21-40	89	43.2
41-60	20	9.7
>60	2	1.0
Total	206	100
Mean	25	
Household Size		
<5	134	65.0
5-10	67	32.5
11-15	4	1.9
>15	1	0.5
Total	206	100
Mean	5	
Sex of Household Head		
Female	24	11.7
Male	182	88.3
Total	206	100
Education		
No formal education	53	25.7
Primary	85	41.3
Secondary	53	25.7
Tertiary	15	7.3
Total	206	100
Marital status		
Divorced	1	0.5
Married	187	90.8
Single	4	1.9
Widowed	14	6.8
Total	206	100
Water Source		
No	79	38.3
Yes	127	61.7
Total	206	100
Health Service		
No	36	17.5
Yes	170	82.5
Total	206	100
Sex of the child		
Male	56	56
Female	44	44
Total	100	

Age (months)		
<24	28	28
24-48	46	46
>48	26	26
Total	100	
Mean	40.5	

Source: Computed from Field Survey, 2016

The Level of Nutrition among the children in the study area.

It is widely believed and scientifically proven that improved nutrition and health enhance the learning ability of the children. It leads to an increase in the strength of the labour force and thereby it contributes positively for the economic growth. In the present study, the results for the level of child nutrition status are presented using three common anthropometric indicators: height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ) Z-scores.

The Z-scores were derived using the reference standards. As noted earlier, standard cut-off points and definitions are used for malnutrition. A summary statistic of nutritional status of children in the study area reveals that the prevalence of stunting (< –2HAZ), underweight (< –2WAZ) and wasting (< –2WHZ) is 70%, 25 % and 8%, respectively (Table 3). WHO recommends no less than two age disaggregated groups; more commonly, under 24 months and 24 months and above (WHO, 1995). In view of that, in both age groups, male children are found to be more stunted than females. Also, the prevalence of wasting in both age groups is found to be high for male children. The likely justification for stunting, which is an indicator for chronic malnutrition, can be because girls are genetically more robust than boys. This difference may also be linked to girls' greater access to food through their gender-ascribed role in food preparation. It may also be possible to note that the energy requirement is different for boys and girls (WHO, 1995, WHO, 2000).

Regarding the prevalence of underweight, in the first age group *i.e.*, 0-23 months surprisingly, it is prevalent among males only, while it is almost equal among both sexes in the age group between 24 and 60 months. Farther scrutiny of the results shows that the level of stunting, underweight and wasting in children younger than 24 months were 25.7%, 24.0% and 12.5% while it reaches 74.3%, 76.0% and 87.5% for 24-60 months old children, in that order. The analysis shows malnutrition is deeper among all categories of children in Ogun State.

Table 3: Prevalence of Stunting, Underweight and Wasting in the Study Area.

Category of child age (Months)	Gender group	Stunted (<-2HAZ)	Underweight (<-2WAZ)	Wasted (<-2WHZ)
Total children	Combined	70(70)	25(25)	8(8)
<24	Male	13(18.6)	6(24.0)	1(12.5)
	Female	5(7.1)	0(0)	0(0)
	Total	18(25.7)	6(24.0)	1(12.5)
>24	Male	30(42.9)	10(40.0)	4(50.0)
	Female	22(31.4)	9(36.0)	3(37.5)
	Total	52(74.3)	19(76.0)	7(87.5)

Figures in parenthesis are percentages. Source: Computed from Field Survey, 2016

Determinants of malnutrition

The result of logit regression analysis showed that the significant determinants of underweight were sex of child ($p<0.05$), farm size ($p<0.01$), household size ($p<0.05$), years of formal education of household head ($p<0.05$) access to health services ($p<0.01$) and access to a source of safe water ($p<0.05$). The significant variables that influence the incidence of stunting were age of child ($p<0.05$), gender of child ($p<0.05$), household size ($p<0.05$) and access to health services($p<0.05$). Furthermore, the significant variables that influences the incidence of wasting were gender of child ($p<0.05$), farm size ($p<0.10$) and access to health services ($p<0.05$). The marginal effect signifies that for female children the probability of the being stunted will be increased by 1.0% compared to their male counterparts. Whereas, the likelihood of the incidence of being underweight and wasted will be increased by about 1.7% and 2.6% respectively, if a child is female (Table 4). Among other important demographic variables, household size is also found to be significant determinant of the child nutrition status. Unexpectedly, the coefficient of the variable is found to be positive and statistically significant for HAZ and WAZ. In other words, a child in households with large number of members is relatively less stunted than a child in a household with few members, *ceteris paribus*. The marginal effect of the variable indicates that with an increase in household size by one person, the probability of the child not to be stunted or underweight will be increased by 2.4% and 2.0% respectively. This may be because children form large household size can benefit from economies of scale both in time available for childcare and in expenditure. Additionally, they can be better raised due to accumulated parental experience. However, it may be unlikely that this relationship holds indefinitely. Of course, this result is consistent with findings of Alderman and Christiansen (2004). In agreement with the *a-priori* hypothesis, the study found evidence that child nutrition status is determined by the access of the household to the nearest health centre and with reference to marginal effect result, the probability of the child being normal in HAZ, WAZ and WHZ with an increase in access to health centre by 2.7%, 1.2% and 4.5%, respectively. The coefficient associated with total farm land size, apparent in Table 4 is worth mentioning; as anticipated and consistent with previous studies (Mengistu *et.al.,* 2013), this variable is found to be positive and significant determinant of child nutrition status; interestingly, for all nutrition status indicators that this study implemented. In brief, children from household with large farm land size are more nourished than those with small farm land size, *ceteris paribus*. Specifically, the probability of the child to be normal in HAZ, WAZ and WHZ will increase by 2.5%, 1.4% and 5%, respectively, with 1ha increase in cultivated farmland. Furthermore, safe water sources play particularly important role in determining child nutritional status, as

expected. Specifically, the estimation result shows that children from households, who use safe water sources, are less likely to be underweight and wasted, *ceteris paribus*. Further, the marginal effect analysis shows that safe water source users are 2.3% more likely to be normal in WAZ.
This is expected because with clean water, some diseases that can distort growth and development in children can be controlled and the possible explanation is access to clean water reduces the chance of exposure of the child to water borne diseases like diarrhoea that can lead to weight loss. These empirical findings are also consistent with findings from literature (Christiansen and Alderman, 2004; Siddiqi *et. al.*, 2011 and Yeasmin & Islam, 2016).

Table 4: Determinant of Malnutrition in Ogun State.

	Height for Age (HAZ)		Weight for Age (WAZ)		Weight for Height (WHZ)	
Variables	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Age	-0.027** (0.018)	0.037	-0.014 (0.015)	0.93	-0.0107 (0.016)	0.527
Gender	0.688** (0.486)	0.01	0.435** (0.508)	0.015	0.803** (0.77)	0.026
Household size	0.109** (0.113)	0.024	0.052** (0.123)	0.02	0.256 (0.112)	0.022
Farm size	0.139** (0.118)	0.025	0.019*** (0.123)	0.014	1.784* (0.925)	0.050
Animal unit	-0.057 (0.048)	0.23	0.216 (0.075)	0.29	1.070 (1.502)	0.47
Education level	-0.011 (0.049)	0.821	0.013** (0.048)	0.018	0.083 (0.092)	0.36
Water source	0.127 (0.524)	0.808	0.030** (0.47)	0.023	-0.711 (0.793)	0.370
Health service	0.632** (0.554)	0.027	0.147*** (0.65)	0.012	0.740** (0.670)	0.045
Log pseudo likelihood	-56.73		-54.22		-26.79	

Note: *, ** and *** show statistical significance at 10%, 5% and 1%, respectively.
Figures in the parentheses are robust standard errors. Source: Computed from field survey, 2016.

Conclusion and Policy Implication and Recommendations

The study showed high prevalence of child malnutrition (underweight) and stunting among children in Ogun State which was in line with some results reported elsewhere, Therefore, efforts to address malnutrition must be consistently pursued until substantial results are achieved. This implies that institutional arrangement must be put in place for ensuring sustainability of child health programs so that chronic growth disturbances that ultimately manifest in stunting and underweight will be addressed. All things being equal older children are more likely to be malnourished. This is probably due to reduced care and attention for older and weaned children. The needed institution for proper implementation and evaluation of the school feeding program put in place by the government must be set up in order to complement the food provided by the parents.

Access to and availability of health facility also reduce the probability of malnutrition. Therefore, improvement in rural health services will foster prompt health service attendance and reduce child mortality. In addition, efforts must be channelled towards empowering rural farmers in the State for increased income generation so malnutrition can be reduced. Assisting rural farmers presumes that the understanding of their risk and vulnerability is well noted and this can be achieved by setting up a kind of conditional cash transfer programs to cater for their health and children education.

Furthermore, access to safe water also reduce the probability of malnutrition. The provision of clean and safe water for rural farm households should be taken seriously by government. There is therefore need to resuscitate water management schemes in the State and their institutions to be able to cope with the water needs of the rural farm households. These will lead to drastic reduction in the incidence of water borne diseases such diseases as guinea worm, schistosomiasis, cholera and diarrhoea that can negatively affect the health and nutrition of young children thereby reducing malnutrition among children in the study area.

Also policies and awareness programmes about gender equity of children, adult education and improvement in living conditions (through public health programmes) should be targeted specifically to rural areas as they contribute to improvement children's nutritional status.

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