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Spatial Pattern of Household Food Insecurity and Childhood Malnutrition in Akinyele Local Government Area, Nigeria

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Abstract

Food insecurity and malnutrition are persistent problems in Nigeria. Analysis of spatial pattern of these problems at community level is important to target the affected with appropriate intervention. This study determined the prevalence and spatial pattern of food insecurity and childhood malnutrition in Akinyele Local Government Area, Oyo State Nigeria. Data were obtained from 409 mothers of under-five children across 40 communities in the study area, which included information on socio-economic characteristics, food insecurity, hygiene practices, height, weight and coordinate of points of survey. Community was the unit of analysis and Geographical Information System was utilized to present visual information about the communities and descriptive statistics to present the non-spatial data. More than half (52.6%) of households were classified as food insecure. Overall prevalence of childhood stunting, underweight, and wasting were 41.6%, 19.8% and 5.6% respectively. Spatial pattern of food insecurity and malnutrition varied across the study area and suggested that the rural communities have higher degree of food insecurity. In conclusion, there is high prevalence of food insecurity, stunting, wasting and underweight among under-five children and their distribution varied across the study area. The maps generated from this study could be used for proper resource allocation and targeting of nutrition intervention and development efforts.

Keywords: Household food insecurity, childhood malnutrition, spatial pattern, community analysis

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1. Introduction

Food insecurity is a situation of limited or uncertain availability of nutritionally adequate and safe foods or a situation of limited or uncertain ability to acquire acceptable food in socially acceptable way, (Bickel *et al.,* 2000;Barrett, 2002).Food security within the family and the larger community is essential for adequate nutrition. Food insecurity is one of the factors that predispose an individual to malnutrition. Several studies have shown that food insecure households are more likely to have malnourished children. Osei*et al.,* (2010) and Alaimo*et al.,*(2001) reported that household food insecurity was strongly and negatively associated with dietary intake, anthropometric status and learning ability of children. Household food insecurity has been associated with several health and nutrition outcomes, in both developed and developing countries, by negatively affecting food consumption, either through reduced quality or quantity of food, household food insecurity can potentially worsen nutritional status (Gundersen *et al.,* 2009).According to statistics, more than half of the Nigerian population, especially women andchildren live in severe social deprivation, and many households are food insecure (Akinyele, 2009).The FAO (The State of Food Insecurity in the World (SOFI), 2002) enlisted Nigeria as a country among other countries faced with serious food insecurity problem, and her positions among the most failed countries in the last few years stood as follows: In 2005, it was (54th), 2006 (22nd), 2007 (17th), 2008 (18th), 2009 (15th) and 2010 (13th) (Abdullahi*et al*, 2010; Adebayo, 2011). In Nigeria, about 18% of households in Nigeria were found to be food insecure in 1986 and over 40% in 2005 (Sanusi*et al.,* 2006).Ijarotimi and Odeyemi (2012) assessed the prevalence of food insecurity among rural communities and its effects on nutritional status of children (8-15 years) in Ondo State, Nigeria and discovered that 37% of the families were food secure while the remaining 63% were food insecure.

Studies have shown that malnutrition is high in rural Nigeria; the figures differ with geopolitical zones, with 56% reported in a rural area of South West and 84.3% in three rural communities in the northern part of Nigeria (Okwu*et al*., 2008; Oluwatayo, 2008). According to Senbanjo*et al.,*(2009), influence of socio-economic factors on nutritional status of children in a rural community of Osun state revealed that the overall prevalence of stunting, wasting and underweight are 37, 18, 29% respectively (NDHS, 2013), According to Akinyele (2009), most of the programmes setup by the government in focusing on food and nutrition security have not realised self-sufficiency neither did it reduce malnutrition.

This he attributed to lack of effective planning of the government infrastructural programme among others. Development of spatial pattern of food insecurity and malnutrition at community level is important to further target the affected with the appropriate intervention as this will aid proper planning. This study is focused on the determination of the prevalence and spatial pattern of food insecurity and childhood malnutrition in Akinyele Local Government Area.

2. Methodology

2.1 Study Location

This study was carried out in Akinyele Local Government Area, Ibadan, Oyo State, Nigeria which was purposely selected because rural areas form the bulk of the Local Government land area and according to Okwu*et al.,* (2008) and Oluwatayo (2008), malnutrition among children is high in the rural area. Oyo State is located in the South West region of Nigeria with 33 Local Government Areas and her capital in Ibadan municipality. Akinyele Local Government Area is one of the 6 peri urban and rural Local Government Areas of Ibadan metropolis and it is located between Latitude $7^0$25'0''N, Longitude 3^0 39'4''E and Latitude $7^0$42'39''N, Longitude $4^0$07'00''E. Akinyele Local Government land area is about 464.892 square kilometre, with a population density of 516 person per square kilometre and has about 797 localities with a total population of 211,359 comprising 105,633 males and 10,726 females and 12 political wards according to the National Population Census conducted in 2006.

2.2 Sample and Sampling Procedure

Multistage random sampling technique was employed by generating numerical labels. First stage involved random selection of 4 wards out of 12 wards in the Local Government Area. At the second stage, proportional-to-size ward sampling will be used to select 40 communities from the 4 wards. The number of communities from each ward was determined by the proportionate of total communities within each of the wards against the desired 40 communities. Finally the number of households selected from each community was portion to the size of the community after which systematic selection at an interval of four households was done.

A total of 409 households with under-age five children were selected; the index child was the youngest in the selected household.

2.3Data Collection Procedure and Instruments

Data for the study were collected using interview administered questionnaire, which contained detail on food security measures, socio-economic characteristics, hygiene practices, and anthropometric measurements to assess nutritional status of under-five children. The questionnaire was translated to the local language for those who were not fluent in the spoken English language, and was later translated back for easy analysis.

Food security measure was obtained using United States Department of Agriculture (USDA) household food insecurity questionnaire which contain a set of 18 questions that provides indicator variables that underlie the standard measurement scale for severity of food insecurity and hunger, this was scored and aggregated at community level to get the community-level food security status. The food security scale was simplified intoa small set of categories, each one representing a meaningful range of severity and this was used to discuss the percentage of the population in each of these categories. Four categories were defined: food secure - shows no or minimal evidence of food insecurity, food insecure without hunger – There are concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported, food insecure with hunger (moderate) – shows there are reductions in the food intake of adults, but not observed with children, and food insecure with hunger (severe)– shows where the children's food intake has been reduces to an extent indicating that the children have experienced hunger (Cook *et al.,* 2000)

Anthropometry measurements measurement of each child was taken and this includes weight, height/length of child, date of birth, sex of child. Weight was recorded using an electronic floor bathroom scale (SECA). Weights were taken using the standard procedure, which was recorded to the nearest kilogram. A UNICEF height measuring board (Stadiometer) was used for the height measurement (Cogill, 2003). Height was measured using standard procedures and was recorded to the nearest centimetre. The measurements were repeated, and mean values were recorded and used for the analyses.

Z-score for weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) were obtained using 2006 WHO growth standard with ENA software to determine the nutritional status while the Z-scores (< -2 SD from the mean) were used to identify underweight, stunting, and wasting respectively (De Onis*et al.,* 2007) then then the overall prevalence was generated, and also, the prevalence at each community level was determined and viewed under the lenses WHO classification of malnutrition (WHO, 2010) to identify community with malnutrition of public health significance.

Environmental factors of interest include access to safe cooking and drinking water, cooking fuel, toilet facilities, electricity, setting and kitchen location. The definition of safe water in the analysis include protected or unprotected water source, cooking fuel type was defined as high pollution (wood, sawdust) or low pollution (kerosene, charcoal, gas). Proper toilet facility was defined as access to indoor toilet or outdoor/bush, proper kitchen location as indoor or outdoor, and electricity, yes or no, Setting was defined as whether the community is in urban, peri-urban or rural area.

Socio-economics index was estimated with principal factors comprising father's and mother's education level, total monthly income, father's and mother's occupation. The respective factors were scored, aggregated and classified into quintile; those below 20th quintile were classified as having low socio-economy index.

A hygiene index indicator summarised the various hygiene practice observed within the communities which covered 2 clusters of hygiene behaviour which include, food storage and preparation and environmental hygiene, this was scored and aggregated at community level (Uthman, 2008).

2.4 Data Analysis

Community was the unit of analysis; therefore, the interpretation was limited to community-level relationship. The spatial distribution of food insecurity and malnutrition was visualized using ARCGIS 10.1. The community points were obtained on which information regarding latitude and longitude of the central point of each community was created. The food insecurity and malnutrition (stunting, wasting and underweight) were matched to the point of the community.

Based on the community food insecurity estimates, all communities were grouped into 4; Food secure, food insecure without hunger, food insecure with mild hunger and food insecure with severe hunger. Descriptive statistics was used to present the non-spatial data using SPSS version 20, the relationship between community-level variable and food insecurity were determined using Pearson-product-moment correlation and Chi square to determine the significance in the proportion of the food insecure and food secure.

2.5 Ethical Issues

Permission was obtained at the Local Government secretariat; a list of allcommunities within the Local Government Area was also obtained. The Community head of each participating and selected community were informed about the objectives of the study and voluntary participation was sought. Informed consent was given by each of the participants. The protocol of the study was reviewed by the Institutional Review Board of the University College Hospital/University of Ibadan.

3. Results

The overall prevalence of food insecurity in the study area was 52.6%, which signifies that about 1 out of every 2 households was food insecure. At community level, about 75% of the communities surveyed experienced some degree of food insecurity in the 12months preceding the survey (Table 1).

Table 1: Degree of Food Insecurity across Communities in the Study Area

Degree of Food insecurity	Frequency	%
Food secure	10	25
Food insecure/No hunger	23	57.5
Food insecure/Moderate hunger Food	3	7.5
insecure/Severe hunger	4	10
Total	40	100

The overall prevalence of stunting, wasting and underweight among the children were 41.6%, 5.6% and 19.8% respectively. At the community level, the prevalence of stunting, wasting and underweight ranges from 5% to 80% on the basis of the WHO classification of malnutrition (WHO, 2010).

Some communities were identified to have very high prevalence of malnutrition indicating a serious public health problem (Table 2).

Table 2: Community-Level Variables in Akinyele Local Government Area Stratified by Household Food Security Status

Variable	All(N)	Food Insecure n(%)	Food Secure n(%)	P-value (r)
Environmental Condition Index				
Low	4	4(10)	0(0)	0.001(-0.55**)
Medium	32	26(65)	6(15)	
High	4	0(0)	4(10)	
Socio Economic Status				
Low	19	16(40)	3(7.5)	0.044(-0.320*)
Medium	16	12(30	4(10)	
High	5	2(5)	3(7.5)	
Hygiene Index				
Low	0	0	0	0.011(-1.56)
Medium	31	25	6	
High	9	5	4	
Nutritional status				
Stunted (%)				
<20 †	5	4(10)	1(2.5)	0.785(0.059)
20-29††	5	3(7.5)	2(5)	
30-39†††	10	7(17.5)	3(7.5)	
40 above††††	20	16(40)	4(10)	
Underweight (%)				
<10†	17	11(27.5)	6(15)	0.308(0.126)
10-19††	7	5(5)	2(5)	
20-29†††	6	6(15)	0(0)	
30 above††††	10	8(20)	2(5)	
Wasted (%)				
<5†	25	21(42.5)	4(10)	0.370(-0.184)
5-9††	7	4(10)	3(7.5)	
10-19†††	5	2(5)	2(5)	
20 above††††	3	3(7.5)	1(2.5)	

*p<0.01, **p<0.05 for Pearson-Product- Moment correlation.

† =low, †† = medium, ††† = high, †††† = very high (Categorisation of public health significance WHO, 1995)

A highly negative significant relationship between food insecure and environmental condition as well as socio-economic factors ($p=0.001$, Pearson correlation $r=-0.55$ and $p=0.004$, Pearson correlation $r=-0.320$ respectively), analysis with Chi-square showed is no significant relationship in the proportion of hygiene index of the food secure and the food insecure and that there is no significant relationship between food insecurity and malnutrition (Table 2).

The map of food insecurity developed showed a clear pattern of its distribution and it also showed where the problem was most severe (Figure 1), among the 40 communities surveyed about 3 communities that were farther away from the Local Government Secretariat were severely affected (Figure 2). Also variation in the pattern of distribution of stunting, wasting and underweight across the study area was shown (Figure 3).

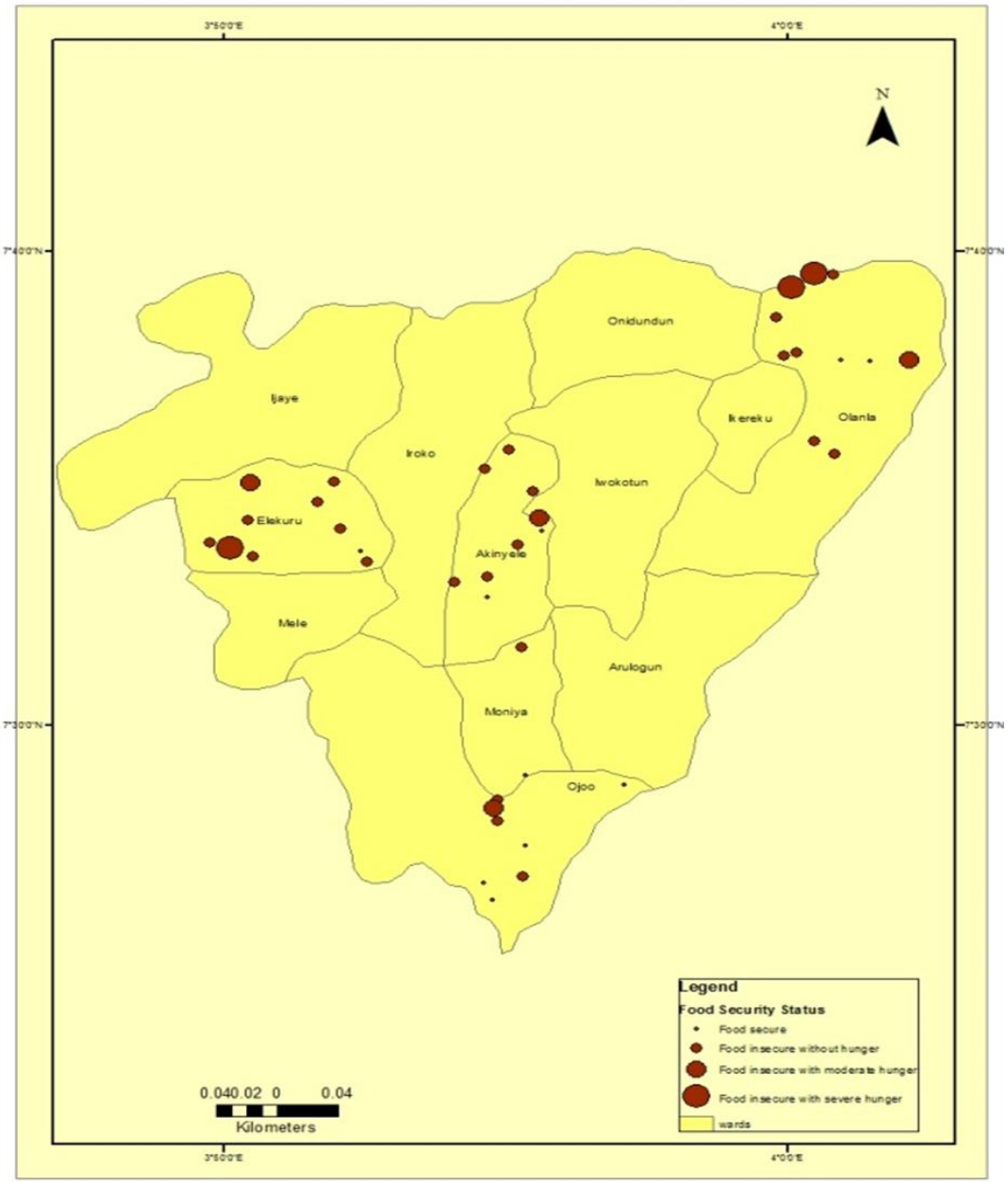

Figure 1: Food Insecurity Pattern within the Study Area

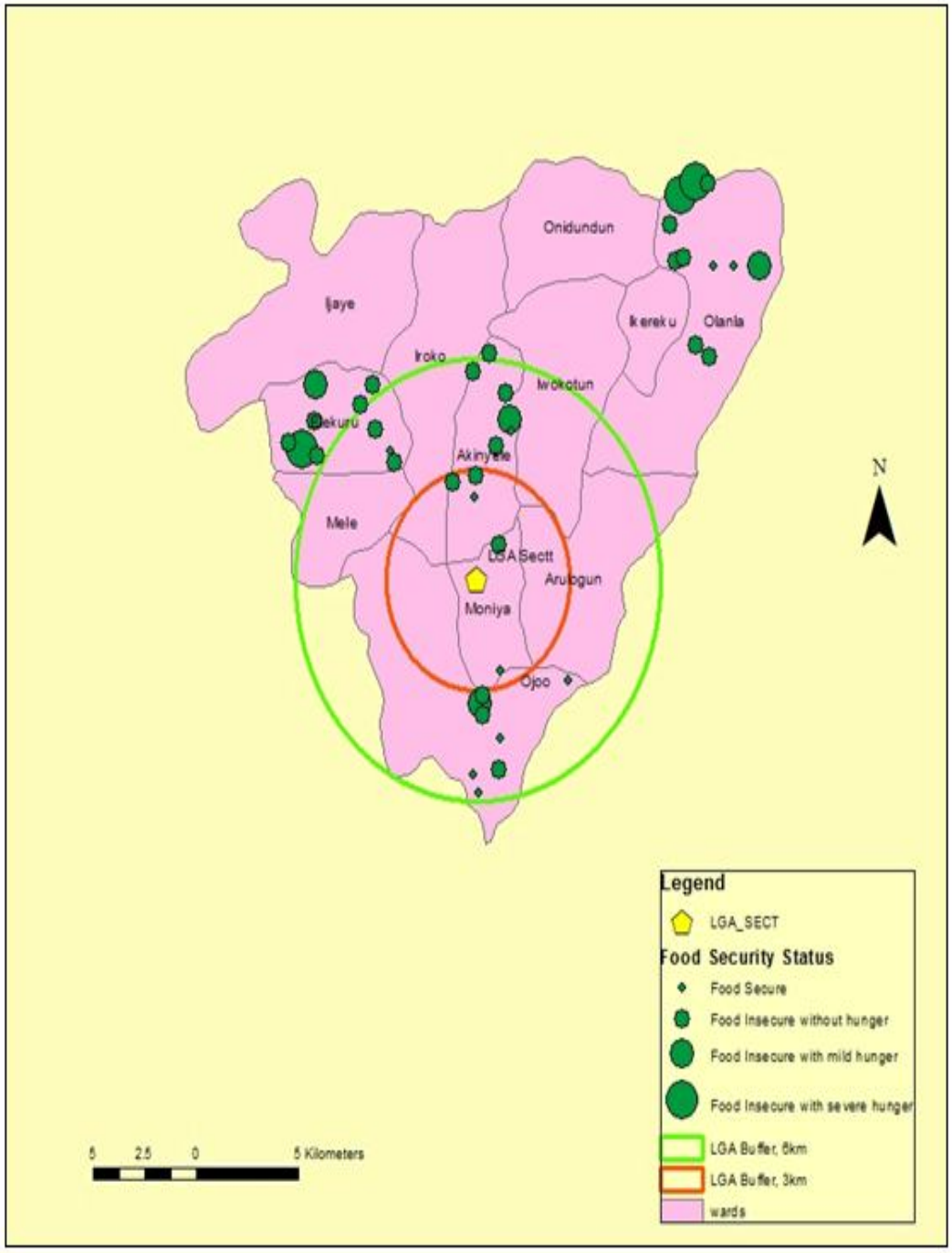

Figure 2: Buffer of 3km and 6km Radius around the Local Government Secretariat

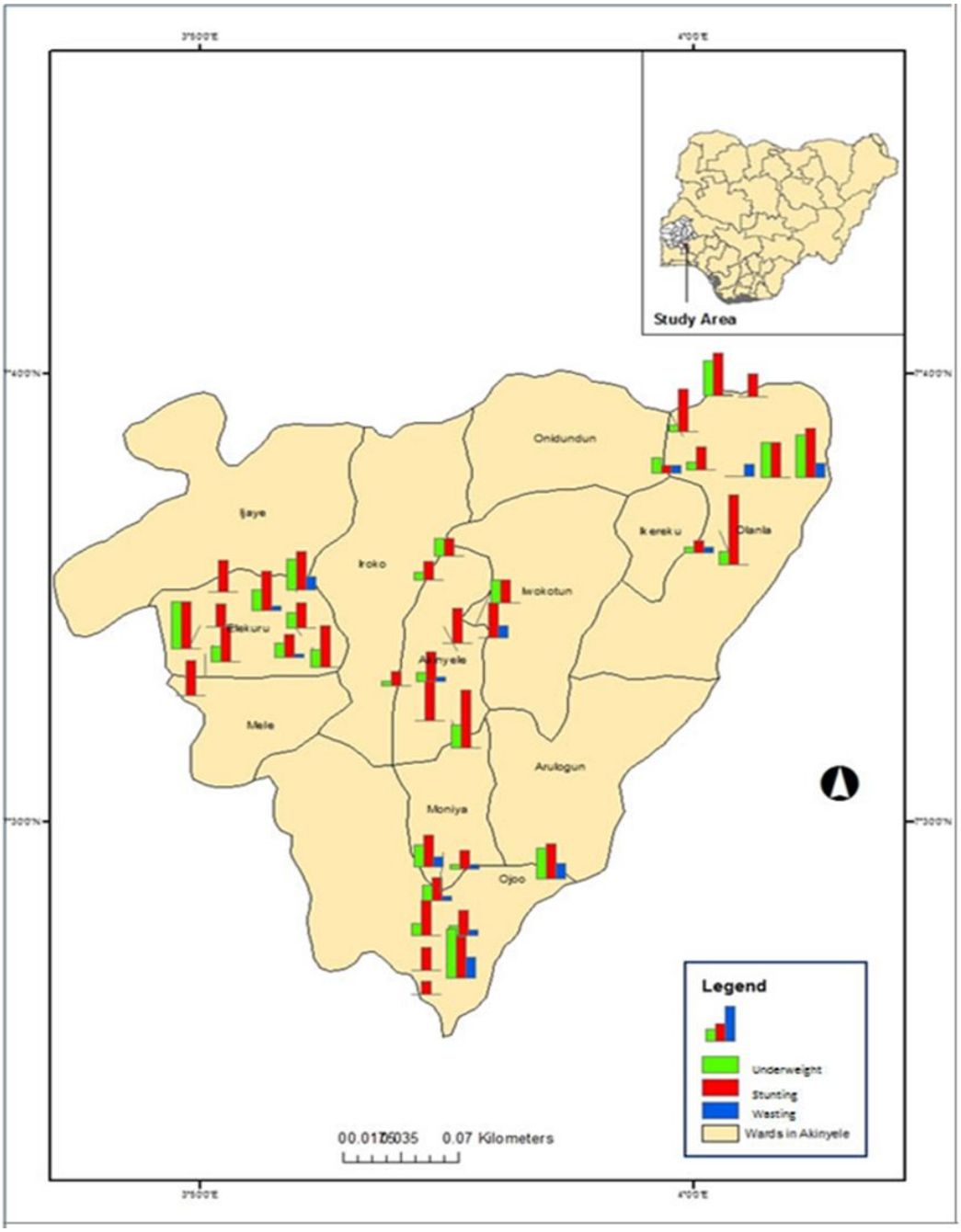

Figure 3: Malnutrition Pattern in the Study Area

4. Discussion

This study was carried out to determine the prevalence and spatial pattern of food insecurity and childhood malnutrition in Akinyele Local Government Area. The overall prevalence of food insecurity was 52.6%, showing that more than half of the surveyed population are food insecure, This overall prevalence of food insecurity among these households was higher than the finding in some studies, namely; 41% (Sanusi*etal.,*2006) and 40% (Babatunde*et al.*, 2007). However, higher prevalence of household food insecurity have been reported in other studies namely 82% (Zalilah and Tham, 2002), and 69.2% (Osei*et al.,* 2010).

This high prevalence is a predictive factor of high percentage of food insecurity among communities with stunting condition of severe public health significance (30% above) according to Table 2, food insecurity co-exist with severe stunting condition, this shows that long term growth faltering exist with condition of food insecurity in those community, indicating that food insecure communities are more likely to have stunting as a problem of public health significance.

The study also showed high prevalence of malnutrition among under-five children in Akinyele Local Government Area, which is higher than the NDHS (2013), however, this agrees with the findings documented in other previous studies (Osei*et al.,* 2010, NDHS 2008). The study showed a highly negative significant relationship between food insecure and environmental condition as well as socio-economic factors indicating that those with food insecurity has low environmental condition such as unsafe drinking and cooking water, poor toilet facilities, high pollution fuel etc. and poor socio-economic conditions which include low total monthly income, poor parental education and occupation.This agrees with the findings in other study that suggest that factors such as education, occupation, income were key determinants of food security as well as environmental conditions such as safe cooking and drinking water, cooking fuel, toilet facilities, electricity, setting and kitchen location(Sanusi*etal.,* 2006; Babatunde*et al.*, 2007; Osei*et al.,* 2010). This study suggests that low socio-economical status is a predictive factor of food insecurity; hence poverty, illiteracy, rural setting may be major determining factors of food insecurity.Another finding in the study was that household food insecurity was not associated with the prevalence rate of stunting, wasting and underweight.

This is consistent with the result of the studies in countries such as Nepal, Brazil and Guatemala and south-south Nigeria (Perez-Escamilla *et al.,* 2004; Osei*et al.,* 2010; CamilaChaparro, 2012; Ordinioha and Brisibe,2013) that suggest that other key determinants of child nutrition like environmental condition and care practice can confound the influence of food security on nutritional status of children. The pattern of distribution of food insecurity across the study area showed by the map(Figure 2) indicated that not all the communities are at risk of food insecurity and that communities at farther distance from the Local Government secretariat have more severe degree of food insecurity problem.Proximity of communities to the Local Government Secretariat determines their access to certain basic amenities like good water sources, toilet facilities etc. The maps developed on malnutrition showed that the problem of stunting, wasting and underweight varied across the study area irrespective of the setting (rural, peri- urban and urban), this is in agreement with findings of other studies that have examine variation of other childhood diseases in Nigeria(Uthman, 2010; Adebayo *et al.,*2004). The study also show that the prevalence of stunting is the highest depicting a high rate of chronic or long term state of malnutrition across the study area .

5. Conclusion

The overall prevalence rate of household food insecurity, stunting, wasting and underweight among under- five children is high and their distribution and severity varied across the study area.Food insecurity which is a characteristic of community farther away from the local government secretariat in the study area is associated with factors reflecting poor socio-economic and environmental conditions.Therefore the socio-economic and environmental wellbeing go a long way in improving household food security and the nutritional status of the children,the maps generated from this study could be used for proper resource allocation and targeting of nutrition intervention and development efforts.

Aknowlegdement

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