Research Article

Household Food Insecurity and Nutrient Adequacy of Under-Five Children in Selected Urban Areas of Ibadan, Southwestern, Nigeria.

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ABSTRACT

In Nigeria, the impact of household food insecurity on nutritional status, especially the nutrient intake adequacy of under-5 children has not been fully explored. This study was aimed at evaluating household food security and nutritional status of under-5 children in Ibadan, southwestern Nigeria. A multi-stage sampling approach was used to select households with mothers who have at least one child under the age of five years. Information was elicited through an interviewer administered questionnaire and a multi-pass 24hr dietary recall method. The results reflect low food security status of households with more than half of households being food insecure (63%) and experiencing some form of hunger within the study period. Low socioeconomic status was observed in most of the sampled households which may have reduced purchasing power for food expenditure. While anthropometric indices showed no major problem with the children's nutritional status, the quality of their diet as deduced from nutrient adequacy analysis revealed high micronutrient inadequacy in Vitamin A (82%), Vitamin C (80%), Folate (44%), Potassium (91%), Zinc (91%), and Iron (74%). This study shows that even though households may be above the severe hunger status, the quality of the diet may be insufficient to provide needed nutrition for health security of household members especially under-5 children.

Keywords: *Food security, nutrient adequacy, children, micronutrients, Diet quality*

INTRODUCTION

Food still remains a basic necessity of life. It is important at household level since it is a basic means of sustenance and is a critical human need (Olayemi, 1996). The presence or absence of food for consumption usually predicts human capacity development of a whole population. This shows why at national levels, food supply is of economic and political significance especially in issues relating to peace and stability among the populace. Food security exists when a household can reliably gain access to food in sufficient quantity and quality for all household members to enjoy a healthy and active life (FAO, 2019). Globally, the occurrence of moderate and severe food insecurity is still a challenge and is currently affecting a little over a quarter of the world's population which equals about 2 billion people (FAO, 2010; 2019). Regional prevalence for Africa shows that about 277 million people are experiencing severe forms of food insecurity. The impact of this challenge is reflected also in the high levels of undernourishment in most (and -surprisingly obesity in some) contexts of the world (FAO, 2019). In Nigeria, estimates show that food insecurity is a persistent problem (FAO, 2019). Despite being blessed with numerous natural and human resources, Nigeria is still having a high incidence of socially deprived and food insecure households (Akinyele, 2009; Sanusi *et al*., 2019).

Lack of food or insufficient access to food can have various impact by disrupting eating pattern which in turn reduces diet quality and compromises adequate nutritional status and well-being on the long term. Good nutrition is necessary to achieve a healthy and active lives, optimize education performance and enhance productivity. The nutritional status of under-5 children at household level has been widely used to gauge well-being of the whole population mainly because of their vulnerability to environmental and dietary changes. Moreover, food security at the national and household levels, good care practice and access to adequate basic health services have been established as essential

prerequisites for reduced under-five mortality. Although current trends reveal a co-existence of undernourishment and obesity in developing countries, the most common nutritional problems are those of macro- and micro- deficiencies (de Onis, 2010; Popkin, 2012; FAO, 2019). Anthropometric indices of children, mainly derived from weight and height, are common indicators of malnutrition (WFP, 2005). Chronic protein energy malnutrition (PEM) is measured as stunting. This index reveals a long-term deprivation of adequate nutrition and is also affected by recurrent or chronic illness. Wasting which results from a more recent acute shortage of food and/or severe disease is used as a measure of acute undernutrition. Underweight which is defined as a low weight for age is a metric that combines the presence of stunting and wasting in children and by extension in the overall population. These indices have often reflected poor health status in Nigerian children especially those within the cluster of insufficient access to food. An assessment of nutrient intake and adequacy is a further step of understanding the impact of food insecurity on nutritional status of under-5 children within the household. From literature, it is an already established fact that the insufficient access to food restricts dietary diversity which impacts diet quality negatively (Cristofar and Basiotis, 1992; Rose and Oliveira, 1997; Dixon *et al.*, 2001; Kirkpatrick *et al.*, 2015). In a study of Sri Lankan children, household food insecurity was strongly associated with the occurrence of child undernutrition and anemia (Kandeepan *et al.*, 2016).

Currently, there is paucity of information on links between household food insecurity and the nutritional status of under-5 children in Nigeria especially their dietary and nutrient intake. A study conducted by Ajao *et al.*, (2010) in a southwestern town of Nigeria revealed an inverse influence of family size, household food security status, and childcare practices on the nutritional status of under – five children in Ile-Ife, southwestern Nigeria. A recent study also established that children from food insecure households were more likely to be consuming very low dietary diversity (Samuel *et al.*, 2020). The existing gap in knowledge is the unreported link between food insecurity on not only anthropometric indices but also nutrient adequacy status of under-5 children in households. This study aimed at identifying the level of food insecurity among selected households and the nutritional status (the anthropometric indices and nutrient adequacy status) of under-5 children living in those households. The study location was chosen since it is the largest city in the Southwestern part of Nigeria and hosts a wide range of ethnicities. Three Local Government Areas (Akinyele, Ibadan South East and Oluyole) were randomly selected among the eleven urban and peri urban local governments in Oyo State, Nigeria.

MATERIALS AND METHODS

Study Design: This study was a descriptive cross-sectional study in which a semi-structured questionnaire was used to elicit information about households. Measurements of weight and height were taken to determine the nutritional status of under-five children aged 6–59 months in the selected households. A multi-pass 24-hr recall method was also used to assess dietary intake among a proportion of the children.

Sampling Approach: A multi-stage sampling approach was used to select respondents from Ibadan-the most populous city in southwestern Nigeria. The respondents were chosen from different local government areas in a four-stage sampling procedure:

1. Selection of the three local government areas in Ibadan was the first stage. One local government area was selected from each of the three senatorial districts in the state by a balloting system.
2. The second stage was the selection of the wards from each local government area. Simple random sampling was used to pick the wards. One third of the wards from each local government area were chosen.
3. The third stage was the selection of communities were chosen randomly from the wards.
4. The fourth stage was the selection of households. The households were systematically selected in the streets of different communities.

Study Population: The primary respondents were mothers in selected households who had at least one under-5 child.

Sampling Size determination
The following assumptions were made;
Food insecurity prevalence in the households = 74.1% (Sanusi *et al.*, 2006)
p = 0.741, q= 1-p
Confidence interval (CI) = 95%, which means α is set at 0.05 and Z= 1.96 (value of Z at $\alpha_{0.05}$ or critical value for normal distribution at 95% CI).
The formula used for calculation of the minimum sample size:

$$\frac{Z^2 \ X \ p \ X \ q}{\alpha^2}$$

The obtained minimum sample size from calculation was 294.

Data collection Instrument: A semi-structured interviewer administered questionnaire was designed to elicit information and it contained the following sections:
a. Socio-demographic and Socio-economic questions
b. Household Food Insecurity Access Scale (HFIAS) Measurement Tool which consists of 9 items developed by the Food and Nutrition Technical Assistance (FANTA) project (Coates *et al.*, 2007).
c. Anthropometric measurements of the under-five children (Height of the children under-2 years was measured using measuring board while those older were measured standing. Weight was measured using an electronic weighing scale).
d. Dietary intake assessment section which contained a form for a 24-hour dietary recall of the children.

Ethical Consideration: Ethical clearance was obtained from the University of Ibadan/University College Hospital ethical review committee of the College of Medicine, University of Ibadan, Ibadan, Nigeria. Informed consent was obtained from each study participant (mother of under-5 child). All the interviews were conducted with sufficient privacy after getting informed consent from the respondents.

Data Analysis: The collected data was entered into SPSS version 17 for analysis. The World Health Organization Anthro software version 3.2.2, 2007, was used to convert the anthropometric data into *Z*-scores for HAZ, WHZ, and WAZ indices. Dietary data was processed using an adapted Total Dietary Assessment Software to generate nutrient intake results which were then exported to SPSS. Nutrient adequacy was calculated by comparing nutrient intake results with recommended references (IOM, 2001). The HFIAS responses were used to classify the households into four categories: Food secure, Food insecure without mild hunger, Food insecure with moderate hunger and Food insecure with severe hunger. Descriptive statistical techniques were used to describe the data on socio-economic and demographic information, anthropometric indicators, nutrient intake by generating frequencies and percentages.

RESULTS

Sociodemographic/Socioeconomic Characteristics of Respondents: The demographic distribution of the respondents presented in Table 1 shows that most of the respondents were Yoruba and they accounted for 82.3% of all respondents, 1.5% were of the Igbo ethnic group while 5.9% were Hausa. The educational level of household heads was observed as follows; 54.2% had secondary education, primary education (27.3%), Tertiary education (11.3%), few have no formal education (7.2%). Majority of the household heads were traders (38.6%) and artisans (37.2%) while others were either engaged in farming or were employed in civil service. The estimated monthly income of the sampled households mainly ranged from ₦5,000 to ₦ 50,000. The study revealed majority of the households (64.1%) relied on a well as their primary source of water for domestic use in the household, about 34% used bore-holes as their primary source of water while 0.6% used rain water. The predominant type of toilet was the pit latrine

Household Food Security: The frequency distribution of household food security is presented in Table 2. Only 36% of the households were food secure and 55 (7.8%) of the households were severely food insecure in terms of access to food and experiencing hunger. About a third of respondents (31.4%) were experiencing mild hunger while 24.8% experienced a moderate form of hunger.

Anthropometry Results of Under-five Children: About 15.5% of the children were moderately stunted and 11.9% severely stunted (Table 3). Weight-for-height results show that 50 (8.8%) of the respondents were wasted while 3.5% were moderately underweight.

Nutrient Adequacy of the Under-Five Children: Adequacy and inadequacy of nutrient intake among under-5 children sampled in the selected households is presented in Table 4. The carbohydrate intake adequacy was attained by 46% and 24% of the respondents were found to have excess intake, however, inadequacy of protein and fat intake was found in about half and in almost all (92%) of the children respectively.

Micronutrient intake adequacy was low for all nutrients considered in this study. The study revealed inadequacies in Vitamin A (82%), Vitamin C (80%), Folate (44%), Potassium (91%), Zinc (91%), and Iron (74%). Of all micronutrients, folate adequacy was highest of all (24%) while vitamin A intake was lowest with only 2% of the under-five children having adequate intake.

Table 1:
Sociodemographic/Socioeconomic characteristics of respondents (n=707)

Characteristics	Frequency	Percentage
Ethnicity		
Yoruba	582	82.3
Igbo	81	11.5
Hausa	44	6.2
Educational Level of Household head		
No formal education	16	2.3
Primary	88	12.5
Secondary	496	70.4
Tertiary	105	14.9
Primary source of water for domestic use		
Well	453	64.1
Borehole	239	33.8
River	11	1.6
Rain	4	0.6
Occupation of Household head		
Farming	38	5.4
Trading	273	38.6
Civil Servant	133	18.8
Artisan	263	37.2
Main type of Toilet		
Bush	46	6.5
Pit Latrine	610	86.5
Water Closet System	49	7.0
Estimated Household Monthly Income (in naira)		
<5000	113	16.0
5000 – 20000	386	54.8
20000 – 50000	166	23.5
50000 - 100000	40	5.7

Table 2:
Frequency distribution of household food security (n=707)

Categories	Frequency	Percentage
Food secure	255	36.0
Food insecure without mild hunger	222	31.4
Food insecure with moderate hunger	175	24.8
Food insecure with severe hunger	55	7.8

Table 3:
Frequency of Stunting, Underweight and Wasting of the under-five children

Variable	Category	Frequency	Percentage
Height-for-Age (Stunting n=679)	Severely stunted	81	11.9
	Moderately stunted	105	15.5
Weight-for-Age (Underweight n=687)	Moderately underweight	24	3.5
Weight-for-Height (Wasting n=681)	Severe Wasting	16	2.4
	Moderate Wasting	44	6.4

Table 4:
Nutrient Adequacy of the Under Five Children (n=242)

	*Recommended Nutrient Intake	Inadequate (<80% RNI) N (%)	Adequate (80-120% RNI) N (%)	Excessive (>120% RNI) N (%)
Energy (Kcal)	570 – 1742 Kcal	78(34)	115(48)	43(18)
Carbohydrate (g)	60-130g	68(30)	110(46)	58(24)
Protein (g)	9.1 – 19g	110(46)	88(30)	58(24)
Fat (g)	30-31g	214(92)	20(9)	-
Vitamin A (RAE)	300-500mg	193(82)	5(2)	38(16)
Vitamin C (mg)	15-50mg	188(80)	15(6)	33(14)
Folate (mcg)	65-150mcg	104(44)	57(24)	75(32)
Potassium (mg)	400-2000mg	214(91)	10(4)	12(5)
Zinc (Zn)	2-5mg	214(91)	20(9)	-
Iron (mg)	0.27-11mg	174(74)	40(17)	21(9)

*RNI was adjusted for Age

DISCUSSION

This study assessed the sociodemographic and socioeconomic status, household food security and under-five children nutritional status in selected local Government areas of Ibadan, southwestern area of Nigeria. The ethnic composition of respondents in the study expectedly show a predominantly Yoruba populace but also reflects the urbanization effect which has attracted households from the other two major ethnic groups in the country. The socioeconomic indices of the respondents indicate that most of the households were within the low to middle income class of wealth strata earning less than ₦50000 naira (≈$140 @360 naira per dollar) in a month. Evidence from literature have established an association between low wealth status and household food insecurity (Uko-Auimoh, 2005; Sanusi *et al*., 2006; 2019; Hannum *et al*., 2012; Saaka *et al*., 2013; Chinnakali *et al*., 2014). While the household income presented in this study are estimates of the reality, they serve as a determinant factor of the occurrence of mild to moderate forms of hunger and poor access to food. The Food Agriculture Organization (FAO, 2010) advocates that households must have sufficient income to purchase the food they are unable to grow since insufficient money and poverty could reduce access to foods of adequate nutrient quality. Another observable factor associated with the low economic status of the sampled households is the educational status of the household heads. Muhammad and Sidique (2019) examined determinants of food insecurity and discovered the impact of increased years of education on the chances of securing higher income generating activities and having higher social capital for better quality of life. The impact of

not having additional years of education beyond secondary school may be a limiting factor to wealth creation which impacts on household food expenditure. The levels of stunted children were higher (27.4 %) than those in the wasting category (1.8 %). This is in accordance with the report from NDHS (2018) in which the level of stunted under-five children was higher than that of children that were wasted. The prevalence in this study was however lower than the reported prevalence for Oyo state which may imply that most of the children sampled in this study are not suffering from protein energy malnutrition. This is may be as a result of the study location which focused more on households in urban areas since evidence shows that child undernourishment is usually higher in rural areas compared to urban areas (Betebo *et al*., 2017). Results from this study show that household food security status is higher in comparison with a previous study of households within the same region by Sanusi *et al*. (2006) but similar to a more recent study of households in the same region carried out by Roberts *et al*. (2019). The pattern of food insecurity is however similar as found in previous studies which establishes that food insecure households with mild hunger usually have highest counts. The results presented in this study reflect a slight improvement in the food security status of households over a period of time but the implications for dietary intake and by extension nutrient adequacy still remain unexplained. The relationship between food insecurity and inadequate dietary intake was predicted by Sanusi *et al*. (2006) (but not explored) in a previous study of households within the region. This present study specifically considered the nutrient adequacy of key nutrients of public importance in the foods consumed by the most vulnerable members of the

selected household. The inadequacy of protein and fat intake as observed in this study implies that most of the foods contributing to energy intake in the children were rich in carbohydrate. A similar assertion was presented through a retrospective review of household characteristics in the United States (Jun, 2019) where mean adequacy ratio was directly related to household food security. Regarding the micronutrient intake of the respondents, inadequacy of intake is obvious for nutrients which contribute to key development indices of a growing child. This inadequacy points to a deficit in the diet quality of the children and the household in general. The immediate impact of such deficit is not evident but may be the reason for the stunted growth of about one-third of the sampled children. This similar deficit was strongly associated with high anemic levels in children sampled in a similar study (Kandeepan *et al*., 2016). Considering the possibility of low to middle income urban households preferring to rely on cheap sources of energy dense carbohydrate foods which usually have low nutrient density, it is inevitable that micronutrient intake adequacy will be low as found in this study. The prevalence of food insecurity in the sampled households even in its mild forms indicate that food expenditure is affected and food choices are limited to affordable options which may not be able to supply needed nutrient adequacy for wellbeing. This assertion has previously been confirmed in literature (Kirkpatrick and Tarasuk, 2008; Dave and Cullen 2012; Kirkpatrick *et al*., 2015; Jun, 2019).

In conclusion, the prevalence of food insecurity among households in the study area is high. Even though the observed poor food access is in its mildest forms, most households did experience hunger within the period of carrying out the study. Contributory factors to this prevalence could be the low socioeconomic status of most of the households which may have reduced household purchasing power for food related expenditure. While anthropometric indices did not reveal an emergency, a challenge with the children's nutritional status was the presence of chronic undernourishment. In addition, the quality of the diet as deduced from nutrient adequacy calculations was found inadequate. The occurrence of poor access to food and the presence of inadequacy of key nutrients from food consumed is shown in this study. Even though households may be able to survive above the severe hunger status, the findings of this study support that the quality of the diet may be insufficient to provide needed nutrition for health security. This should inform decisions to scale up food-based nutrition- sensitive or nutrition-specific strategies that can improve the food security and nutritional status of residents in Ibadan and by extension southwestern Nigeria and Nigeria as a whole.

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