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### EXAMINATION OF ASSOCIATION BETWEEN FOOD SECURITY AND NUTRITIONAL STATUS OF CHILDREN AMONG SELECTED HOUSEHOLDS IN MAIDUGURI **METROPOLIS, BORNO STATE**

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#### Abstract

This paper examined the association between household food security and nutritional status of children among selected households in Maiduguri Metropolis. Primary source of data collection was employed and structured questionnaires were used to collect data from 400 randomly sampled households. Descriptive statistics, logit regression analysis, anthropometric measurement and Pearson Product Moment Correlation Coefficient (PPMCC) were used to analyze data obtained. Results on socioeconomic characteristics indicated that majority were males, married, have no formal education with 67.8%, 89.5% 60.5% respectively. Also, majority of the respondents were between the age of 31-50 years, farmers and have access to credit facilities with 77%, 47.7% and 60.5% respectively. The study revealed that 52.5% of the household were food insecure. Results on determinants of food security revealed that five (5) were positively significant (household access to credit facilities at 10%, farming experience at 1%, access to market at 10%, gender status at 10% and income at 10%) while household size was negatively significant at 1%. Considering weight for height/length, 83.3% of the children are not malnourished, 64% of the children were not underweight and results on height/length for age showed that 50.5% of the children are not stunted. The study observed a perfect positive correlation between food security and nutritional status of children with probability values greater than the alpha value  $(P > \alpha)$  at 1% and 5% levels of significance. The study, therefore, recommended that low level of education among households be addressed through adult education and training, basic skill acquisition programs on increasing household income wage-earning ability and investigating revenue diversification alternative. Also, access to better family planning practices in the study area is germane.

**Keywords:** Food Security Nutrition Status Children Maiduguri Anthropometric and Person Product Correlation Coefficient

JEL Classification: Q180, I120, J13, C5



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#### 1. Introduction

Food is one of the basic necessities of life. The life-cycle of man may not be fulfilled without food. Thus, an adequate food intake in terms of quality and quantity is regarded as key component of health and productive life (Omonona & Agoi, 2007). World Health Organization (2012), therefore, defined food security as existing when "all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". The main goal of food security, is for individuals or household to obtain the adequate food needed at all times and utilize the food to meet the body's needs. The World Food Summit Report (2013) identified four pillars underpinning food security: these are food availability, food accessibility, food utilization and food stability. However, it has been suggested that sustainability be added as a fifth dimension to encompass the long-term time dimension. Sustainability involves indicators at a supra-national/regional level of ecology, biodiversity and climate change, as well as sociocultural and economic factors (Berry et al., 2015). This implies that a country whose food production level cannot meet up with these criteria is food insecure. There are ultimatums that can easily cause food insecurity and these include; natural disasters, war, civil disorder, human pressure on arable land, demographic explosion, environmental pollution, climate change as well as nutritional status which could possibly affect agricultural output (FAO, 2012). Ruel (2013) also buttressed that the causes of food insecurity and nutrition insecurity are interconnected and are rooted in poverty, and are affected by cultural factors and social, economic and political structures that differ by context. Asadullah et al, 2020 observed that malnutrition in children remains one of the most important public health and development problem in the developing world, mainly affecting the poor and under privileged and displaced. Malnutrition, or the risk of it is a universal human problem. While some people's diets lack sufficient nutrients for an active and healthy life (that is, undernutrition and micro nutrient deficiencies), others consume excess food energy (over nutrition) and this also leads to negative health consequences. A person may consume energy in excess of requirement and be overweight, while also suffering from micro nutrient deficiencies.

Children are most vulnerable to malnutrition in developing countries because of low dietary intakes, lack of appropriate feeding practices, and inequitable distribution of food with households (Yelew, 2014). Reducing malnutrition among children under the age of five remains a huge challenge in developing countries of the world. An estimated 230 million children under the age of five are believed to be malnourished chronically in developing countries (Asadullah, et al., 2020). Although food security is essential to ensure adequate nutrition and prevent hunger, the concept of food security, optimal nutrition and lack of hunger and under nutrition are interlinked (Balogun et al. 2015; Ghattas, 2014). Therefore, household food insecurity is a critical variable for understanding the nutritional status of children in countries affected with insurgency that led to displacement. Consequently, households' low income with associated poor diet, poor child health, and ultimately, food insecurity.

Globally, between the year 2000 and 2020 most children with malnutrition live in Africa and Asia, more than half of all children under five years affected by stunting lived in Asia and two out of five lived in Africa. Also, more than two thirds of all children under five years affected by wasting lived in Asia while more than one quarter lived in African. Almost half of all children under five years affected by overweight lived in Asia while more than one quarter lived in African (UNICEF *et al.*, 2021). Under nutrition is often considered as one of the most important indicator of household's living

standard and also an important determinant of child survival (WHO, 2012). Nigeria has the third highest absolute number of children who are malnourish globally (Wegbom *et al.*, 2019).

Similarly, in Maiduguri, Borno state there is a persistent prevalence of malnutrition due to insurgency is of particular concern that requires urgent attention. To address the problem adequately, it is important that the context specific risk factors for malnutrition are identified, appropriate interventions implemented which are basic causes (social, economic and political context which lead to lack of capital: financial, human, physical, social and natural), underlying causes (income poverty: employment, self-employment, dwelling, assets, remittances, pensions, transfers which led to inadequate care, household food insecurity, unhealthy household environment and lack of health services) and the immediate cause (Disease and inadequate dietary intake which led to maternal and child undernutrition). The risk factors of malnutrition are multifaceted and complex, and the relative importance which is the underlying causes is likely to vary between settings. Food insecurity is one of the of determinant factors malnutrition in developing countries, but its role remains unclear.

In particular, it is not known whether all children suffered from household food insecurity, political context impact that led to displacement, homelessness and beside those who are originally homeless to what extent have they increased the rate of dependency on relations, which led to food insecurity problem in urban areas and at what extreme levels. Some studies have shown that in times of food insecurity, mothers are likely to reduce their own intakes to secure those of infants and small children (Kuku *et al.*, 2011).

Child undernutrition continued to be a major public health problem in developing countries. Though it differs from one region to another, from one household to another. Still the normal nutritional status is managed by balanced food consumption and normal utilization of nutrients. Though, there are reported cases of household food insecurity in Maiduguri and other states in Nigeria (Ahmed (2015), Oyekale, *et al.*, (2017), Victoria *et al.* (2016), Folake, *et al.*, (2020)) but its contribution to child malnutrition remains unclear. It is on this basis that this study intends to examine the association between food security and nutritional status of children and also measure the association between nutritional status of children and households' income among selected households in Maiduguri Metropolis.

#### 2. Methodology

The study was conducted in Maiduguri Metropolis, in Borno State. Maiduguri which is the largest city in the North-eastern region of Nigeria is located between latitudes 11°.04'N and 11°.44'N; and between longitudes 13°.04'E and 13°.44'E. It covers a total land area of 543 km<sup>2</sup>, with an annual growth rate of about 3.2%, the projected population in 2020 was approximately 843,964. Maiduguri city now extends to four (4) Local Government Areas: Maiduguri Metropolitan, Jere, Konduga and to a smaller part of Mafa.

The study employed both primary and secondary data. A structured questionnaire was employed to collect primary data from selected households using online survey tool (Kobo Toolbox) through mobile phones, and stored online. Data on the socio-economic characteristics of the respondents and nutritional status of children from selected households such as sex, age of the child, weight, height, Mid Upper Arm circumference (MUAC) and Odema were collected.

A Multistage sampling techniques was employed for this study. The first stage involved purposive selection of Maiduguri Metropolis area out of the 27 Local Government Areas of the State. This is because Maiduguri Metropolis area is relatively secured from insurgency and the most populous among affected local government areas in Borno state. In the second stage, four major districts in Maiduguri Metropolis based on the population density residential areas. These districts in the study area are Bolori, Gwange. Maisandari and Shehuri North. In the third stage, simple random sampling technique was employed to select 400 households from the four major districts in Maiduguri Metropolis based on the population density of residential areas. Households with at least one under five years' child were employed for this study, meanwhile household with more than one eligible respondent were randomly selected as per not more than one mother child pair is required for the study.

Descriptive statistics, food security index, Logit regression analysis, Person Product Moment Correlation (PPC) analysis and anthropometric index were used to analyze data obtained in this study. Descriptive Statistics such as frequencies, means and percentages were used to analyze the data obtained.

#### 2.1 Model Specification of Food Security Index Measurement

Food security index (Fi) as used by Oyebanjo, Ambali, and Akerele (2013), Ahmed 2015 and Oyekale, Ayegbokiki, and Adebayo (2017) was employed. Food security is measured using household's food demand and consumption expenditure as an indicator by comparing the per capita expenditure of the household with the weighted two-third of the mean per capita expenditure of the household under study. This was achieved by dividing the per capita food expenditure of the *ith* household by that of twothird of the mean per capita food expenditure of all households. Thus, households based on the food security line. The formula is given as;

$$fi = \frac{\text{Per capita food expenditure for ith household}}{\frac{2}{3} \text{ mean per capita expenditure of all households}}$$

where, Fi = Food Security index,  $Fi \ge 1 = food$ secured *ith* households, Fi < 1 = Food insecure *ith* households.

According to Omonona and Agoi, (2007) a food secured household is that whose per capita monthly food expenditure fall above or is equal to two-third of the mean per capita food expenditure of all households in the study sample. On the other hand, a food insecure household is that whose per capita food expenditure falls below two-third of the mean monthly per capita food expenditure. Therefore, the proportion of households that were food secured (Fi) will computed as: Fi=m/N where, m is the number of foods secured households, N is sample population. When this is multiplied by 100, it gives the percentage of households that were food secured (Omonona and Agoi, 2007).

#### 2.2 Logit Regression Model

Logit regression model was used to examine the determinants of households' food security. The logit is a binary choice model in which a dichotomous response variable is considered as the dependent variable (Oyenbanjo, Ambali, and Akerele, 2013). Thus, this tool was used to address the socioeconomic determinants of households' food security in the study area.

#### 2.3 Model Specification of Logit Regression

Based on the results from the food security index (fi), the logit model will be used to identify the socio-economic determinants of household's food security of the respondents as used by Ahungwa, Umeh, and Muktar (2013). The research model can be specified as;

$$Fi = \beta Xi.... + \mu_i$$

where Fi is the observed response for the *ith* observation (i.e. the binary variable, Fi = 1 for food secured household and Fi = 0 for food insecure household). Xi = vector of the

explanatory variables.  $\beta$  = vectors of the parameter estimate and  $\mu_i$  = error term.

Hence, the explicit form of the model:

# $$\begin{split} Fi &= \beta_0 + \beta_1 HHA + \beta_2 HHEQ + \beta_3 HHSZ + \beta_4 \\ &_4 HHSX + \beta_5 HHI + \beta_6 HHFE + \beta_7 HHAD + \beta_8 \\ &_8 HHATCF + \beta_9 HHDR + \mu_i \quad 3 \end{split}$$

Where Fi = the dependent variable defines as household food security.  $B_0 = Constant$  and intercept of the equation or slope of the individual predictor or the explanatory. HHA = Household head age measured in years; HHE = Household head educational qualification measured by number of years spent in formal school; HHSZ = Household size measured by number of persons living under the same roof and shared same source of food; HHSX = Household Gender status. Dummy 1 if male, 0 otherwise. HHI = Household income measured in Naira ( $\mathbf{N}$ ); HHFE = Household Farming experience measured in Years; HHAD = Household accessibility to market by distance. Dummy 1 if market is easily accessible, 0 otherwise; HHATCF = Household access to credit facilities. Dummy 1 if credit is easily access, 0 otherwise; HHDR = Household dependency (ratio number) and  $\mu_i$ , the error term.

#### 2.3 Correlation Analysis

Pearson Product Moment Correlation (PPMC) was used to measure the association between nutritional status of children and household income, correlation between food security and nutritional status of children were examined in the study area. This measure of correlation is preferred to the spearman's rho since the data for both variables could be obtained in metric scale. Pearson bivariable correlation was used to measure the degree to which nutritional status of children with household income and food security of household with nutritional status of children are strongly positively correlated. This

was achieved because of the suitability of the data on both variables which are metric continuous.

#### 2.4 Anthropometric Measurement

Anthropometric Measurement were used to measure the nutritional status of children from selected households, which involved the use of a weight machine to measure weight in kilograms, a length board to measure the height and the birth certificate or immunization card to get the age of the child. The data collected on children were used to compute three most common indices used for children, which are: Weight for Height (W/H), Weight for Age (W/A), and Height for Age (H/A). Each of this index provided different information growth about and body composition, which were used to assess the nutritional status. The results of the anthropometric indices regarding children were described in terms of Z-scores, percentages and percent of the median.

In this study, only Z-scores for W/A, W/H and H/A were used as indicators of nutrition status. Standard deviations (SD) was used as a measure of variability of the indicator in analysis. analysis statistical The of anthropometric data from children was done using ENA software. The -2Z-score cut off would be used for this study for under nutrition implying children with a value of -2SD below the mean of the reference population will be recognized as undernourished. The formula is given as: Z-score or SD score is equal to observed value - median value of the reference population / standard deviation value of reference population.

#### 3. Results and Discussion

# Socio-economic Characteristics of the Respondents in Maiduguri Metropolis

This sub-section presents the descriptive results on the socio-economic characteristics of the households. Four hundred (400) copies of questionnaires were administered and all were retrieved, making 100% return rate. This was possible because the study made use of computer aided survey collection, which does not allow incomplete information to be recorded and also interviewers were well trained to ensure interviewees give appropriate information. The results were presented in Tables and discussed according to the research objectives.

#### Household Head Gender

Table 1.1a shows the result of gender of the 400 respondents out of which 67.8% were male, 32.2% were female. This result is not unconnected with the cultural and religious inclinations that confers household headship to males and most importantly the responsibility of sustaining the household economy. This result also corresponds with the findings of Abdallah *et al.*, (2017) that opined that households headed by males are more food secure than those headed by their female counterparts.

#### Household Head Marital Status

The result indicated that about 89.5% of the respondent were married while 7.8% were

window and 2.8% were divorced. This indicates that majority of the respondents are married and saddled with the responsibility of family welfare.

#### Household Head Age

About 77% of the respondents were between the age of 31-50 years while 16.5% were between the ages of 51 and above. The age of the household head could have influence on his labour supply for food production. It could also have effect on ability to seek and obtain off-farm jobs and income, which could increase household income and access to enough food. Ahmed (2015) observed that relatively, younger household heads are stronger and could cultivate larger-farm sizes which increase the probability of being food secured than older household heads that may be more prone to food insecurity due to diminishing physical strength and vitality needed to sustain household economy. However, older household heads are expected to have better access to land than younger heads, because younger men either have to wait for a land distribution/acquisition or have to share land with their families.

Variables	Frequency	Percentage (%)	Level of Education	ı	
Gender			No Formal	242	60.5
Male	271	67.8	education		
Female	129	32.2	Primary	48	12.0
Marital Status			Secondary	82	20.5
Married	358	89.5	Tertiary	28	7.0
Divorced	11	2.8	Household Size		
Widow	31	7.8	Less than 6	82	20.5
Age (vears)			6-10	268	67.0
21-30	27	6.8	11-15	45	11.3
31-40	152	38.0	16 and above	5	1.3
41-50	155	38.8			
51 and above	66	16.5	Total	400	100.0

Table 1.1a: Socio-economic Characteristics of the Respondents n = 400

Source: Field Survey, 2021.

#### Household Size

Table 1.1a shows that 67% of the respondents have 6-10 members of the household while 20.5% have less than 6 members in the household. Hence over half of the respondent were within the household size of 6-10. Household size is another factor which could influence household food security status. Increasing family size could exert more pressure on the level of consumption since food requirements tend to increase with the number of persons in the households and depends also on the composition of the household size. This result is in line with the study of Berry *et al.*, 2015 which emphasized the negative impact of household size on their nutritional status.

#### Household Level of Education

It was observed in Table 1.1a that 60.5% have no formal education while 20.5% and 12% have

secondary and primary education respectively. Educational level of respondents is an additional factor which is thought to influence the food security status of households. The awareness of food groups necessary for human growth and wellbeing may be dependent upon the level of education of the household head. The knowledge of these food groups will ultimately influence nutritional decisions that enhanced households' quality food intake. It is, however, observed that majority (60.5%) of the respondents have no formal education. This implies low level of awareness and consumption of food in the adequate quantity and quality in the study area. The study of Ahmed 2015 corroborates this result that indicated that households' food quality, especially diet diversity is a reflection of educational level of household's head.

Variables	Frequency	Percentage			
		(%)	Access to Credit Facilities		
Farming Experience (y	rears)		No	158	39.5
Non-Experience	59	14.8	Yes	242	60.5
1-3	228	57	Households' Estimated Monthly		
4-6	49	12.3	Income		
7-9	11	2.8	Less than <del>N</del> 40,000	320	80
10 and above	53	13.3	<del>N</del> 40,000 – 79,999	65	16.3
No dependent	72	18	<del>N</del> 80,000 – 119,999	12	3
1	144	36	№120,000 – 169,999	1	0.3
2	138	34.5	№170,000 - 209,999	2	0.5
3	34	8.5	Market Access		
4	9	2.3	Not Accessible	59	14.7
5	3	0.8	Accessible	341	85.3
Primary Occupation			Source: Field Survey, 2021.		
Civil Servant	29	7.3			
Private Sector Worker	49	12.3			
Farmers	191	47.7			
Entrepreneurs	73	18.3			
Not Employed	58	14.5			

Table 1.1b: Socio-economic Characteristics of the Respondents n = 400

#### Farming Experience:

Results in 1.1b revealed that 57% of the respondents have farming experience of between 1-3 years while 14.8% have no farming experience. Increase in farming experience may predispose respondents to acquisition of skills and better farming practices which may decrease food insecurity incidence. Farming experience is low among households which implied low involvement in crop production especially with insecurity incidence among other factors. The study of Zhou and Li (2022) in their investigation opined that farming experience is a precursor to quality output and income.

#### No of Dependents

About 36% and 35% of the respondents have one (1) and two (2) dependents respectively, however, 18% have no dependent. High child dependency could decrease the food security status of households. However, the income earned by the working members of the households must be taken into consideration since it is possible for all the members of a household to be working but their income altogether may be small to meet their food requirements. It is, however, noteworthy that though respondents have low child dependents, the family size is already large that could influence food security status of households in the study area.

#### **Primary Occupation**

About 48% of household heads are farmers, 18.3% are mainly entrepreneurs, 12.3% work with the private sector and 7.3% are civil servant. However, 14.5% were not employed. The occupational status of household heads is a determining factor to food access in adequate quality and quantity. Also, the earning capacity of working members of the households can predispose households to food insecurity especially with aged members and children who are not income earners. Ibok, *et al.*, (2014) also

opined that farming house have more access to food especially from owned cultivation and ability to convert farm outputs to sustainable incomes to meet households' welfare.

#### Households Access to Credit Facilities

The study revealed that 85.3% of household have access to credit facilities while 14.7% have no access to credit facilities. Households are exposed to different sources of loan acquisitions that facilitates such as from family and friends, government and governmental agencies etc. It is expected that the effect of loans in trading, domestic food production and other agroprocessing enterprises would enhance national food self-sufficiency, increase income, sustain household food security as well improve quality of life for households in Maiduguri Metropolis. Abu and Soom (2016) also opined that access to credit widens the scope of business activities leading to high probability of income generation and food security.

#### Households' Estimated Monthly Income

In Table 1.1b, 80% of household heads' estimated monthly income were less than 40,000 while 16.3% were between the range of 40,000-79,999%. Hence over half of the respondents are within the income of less than N40,000. It is expected that as the monthly incomes of households increase and households invest in more income generating activities, purchasing power of households improves and probability of households' food security would be high. However, results indicate that majority of the household heads earn less than N40,000 monthly, which is a reflection of their educational level, consequently their income earning capacity. Abu and Soom (2016) and Oyekale et al., (2017) corroborate this result.

#### Accessibility to Market

It was observed from results in Table 1.1b that 89.3% of the respondent have access to the market while 30.8% lacked access to the market. It is expected that market access boosts local production, increases incomes and strengthens food security. Market assess can contribute to reducing poverty and hunger for producing families and their communities. This result agreed with the findings of Zakari, *et al.*, (2014).

Table 1.1c: Socio-economic Characteristics of the Respondents

Variables	Frequency	Percentag
	*	e (%)
Household		
Heads' Assets		
Tricycles	47	3.8
Land	178	14.2
Bicycle	42	3.4
Radio/televisi	372	29.8
on set		
Handsets	348	27.9
Shops	21	1.7
Animals	197	15.8
Birds (Poultry)	44 144	3.5
Total	1249	100.0

\*Multiple Responses Existed Source: Field Survey, 2021.

#### Household Head Assets

Results on households' assets in Table 1.1c indicated that 29.8% and 27.9% owned radio/television set and handsets respectively. Also, 15.8% and 14.2% possessed animal husbandry and lands respectively in the study area. The significance of ownership of assets hinges on the fact that households who have assets could convert them into money during emergencies (poor harvest, sickness, natural disasters, etc). Household assets, therefore, become a critical factor in combating such emergencies. Assets can also increase the stability of household food consumption against

seasonality or other temporary shortages and further create more avenues for income generation. It is, therefore, plausible that food security would significantly increase in households as their assets increase. This corresponds with the finding of Ahmed (2015) which showed that ownership of assets significantly boosts households level of food security.

Table 2: Household	Food S	Security	Status
Mean Variable		-	

inicality and			
Food	Food	Food	All
Security	Secur	Insecur	Categorie
Status	e	e	S
Percentage	47.5	52.5	100
of			
household			
S			
Number of	190	210	400
household			
S			
Head	0.475	0.525	
count ratio			
(H)			
G E' 11	a <b>a</b> a		

Source: Field Survey, 2021.

Table 2 shows that 52.5% of the households were food insecure, while 47.5% of the households were food secure. This implies that majority of the households in Maiduguri Metropolis were found food insecure. Studies {Folake et al., (2020); Charles et al., (2020) Irohibe and Agwu (2014); Adeniyi and Ojo (2013); Ahungwa, et al., (2013)} observed that most households are food insecure in Nigeria. In Table 1.1a, it was observed that 80% of households sampled in the study area earned less than N40,000 monthly. This income level can predispose households to inappropriate consumption patterns and inadequate food in the right quality and quantity due to their economic capacity. Crop production which has majorly been affected by Boko Haram insurgency predispose households to heavy reliance on food

purchased from the market which does not adequately meet the food needs of urban inhabitants. Also, food access in urban depends on its availability and at prevailing high market prices hence food insecurity. Furthermore, very few households have home gardens which may likely reduce household cost on mainly vegetables. Naturally, cost of living tends to be higher in the urban settlements as opined by Ahmed (2015) due to its cosmopolitan nature, thus increasing households' susceptibility to food insecurity. Table 3: Model Diagnostics Test onSocioeconomic Determinants of Households'Food Security

Diagnostics	Values
Unrestricted log likelihood	-276.75866
Restricted log likelihood	-233.17744
LR chi <sup>2</sup> (16)	87.16***
McFaden R <sup>2</sup>	0.1575

Table 3 shows the Chi-statistic indicates that the households' socio-economic characteristics were significantly related to food security in the study area. The log likelihood was used to determine the fitness of the model, the result obtained shows that the unrestricted log likelihood generated values closer to zero which shows improvement as against the restricted log likelihood. The McFaden  $R^2 = 0.2$  which indicates very good model and the value of  $R^2$  suggests that the model explains 87% variations of the influence the socioeconomic variables on food security that can be used for prediction in the study area as presented in Table 4.

Determinants of Households'	Food Securit	y in Maiduguri	<b>Metropolis</b>

Table 4: Summary of Logit Regression Analysis on the Socioeconomic Determinants of Households' Food Security

FS_S	Coefficient	Odds	Std. Error	Z	P>Z	[95% conf	f. interval]
HHA							
31-40	0.3209	1.3784	0.2866	1.12	0.263	-0.2409	0.8827
41-50	0.4870	1.6275	0.2938	1.66	0.097	-0.0888	1.0630
51 and							
above	0.4290	1.5358	0.3278	1.31	0.191	-0.2134	1.0716
HHEQ							
Primary	-0.1645	0.8482	0.2155	-0.76	0.445	-0.5869	0.2578
Secondary	-0.1436	0.8661	0.1750	-0.82	0.412	-0.4867	0.1994
Tertiary	0.3963	1.4863	0.2863	1.38	0.166	-0.1648	0.9575
HHSZ	-0.1602	0.8519	0.0288	-5.55	0.000	-0.2168	-0.1036
HHSX							
Female	0.3578	1.4301	0.1554	2.3	0.021	0.0531	0.6624
HHI	1.09E-05	1.0000	3.91E-06	2.8	0.005	3.28E-06	1.86E-05

HHFE								
1-3	0.2996	1.3494	0.2143	1.4	0.162	-0.1205	0.7198	
4-6	0.8888	2.4322	0.2797	3.18	0.001	0.3404	1.4371	
7-9	1.5259	4.5997	0.5361	2.85	0.004	0.4750	2.5769	
10 and	1							
above	0.5694	1.7672	0.2800	2.03	0.042	0.0205	1.1183	
HHAD								
Yes	0.2904	1.3370	0.1647	1.76	0.078	-0.0324	0.6134	
HHATCF								
Yes	0.2949	1.3430	0.1525	1.93	0.053	-0.0041	0.5939	
HHDR	0.0423	1.0432	0.0716	0.59	0.555	-0.0981	0.1827	
Constant	-0.4321	0.6491	0.3910	-1.11	0.269	-1.1985	0.3342	

Note: \*\*\*significant at 1% level, \*\* significant at 5% level and \* significant at 10% level.

Table 4 shows that household head age (HHA), household educational qualification (HHEQ) and household dependency ratio (HHDR) were not significantly related to food security at 10% level. This is because their probability values are greater than the alpha value ( $P>\alpha$ ). This means that household head age (HHA), household educational qualification (HHEQ) and household dependency ratio (HHDR) have no significant influence on food security in Maiduguri Metropolis.

Table 4 also, shows a significant influence of household gender (HHSX), household size (HHSZ), household income (HHI), household farming experience (HHFE), household accessibility to market by distance (HHAD) and household access to credit facilities (HHATCF) on food security in Maiduguri Metropolis. This is because the probability values of these independent variables were less than the alpha value ( $P < \alpha$ ).

#### Head of Household Gender status (HHSX)

The coefficient has a positive coefficient that was significantly related to food security at 10% level. This positive coefficient value implies that households headed by woman tend to be more food secure than households headed by man, by the odds of 1.4301.

#### Household income (HHI)

The coefficient of household income was positive and significantly related to food security at 10% level. This implies that a naira increase in households' head income will increase the odds of the family food security by 1.0000.

#### Household access to credit facilities (HHATCF)

As expected, the coefficient of household access to credit facilities was positive and significantly related to food security at 10% level suggesting that households that have access to credit facility tend to be more food secured than households that have no access to credit facility. On average households that have access to credit facilities increases the odds of household food security by 1.343. This implies that household that has access to credit facilities have 1.343 odds more than those that do not have credit facilities.

#### Household size (HHSZ)

The coefficient was significant at 1% level and negatively related to food security. The negative coefficient implies that large households are likely to be food insecure relative to small households. A unit increase in the number of households' members has a likelihood of decreasing food security by odds of 0.8519.

#### Household Farming experience (HHFE)

It has a positive coefficient and significantly related to food security at 1%. This positive coefficient means that households headed by persons with more farming experience tend to be more food secured than households headed by persons with no or tittle farming experience. A unit increase in the year of farming experience has the likelihood of increasing households' food security by odds of 1.3494, 2.4322, 4.5997 and 1.7672 in the study area.

## Household accessibility to market by distance (HHAD)

It has a positive coefficient and significantly related to food security at 10%. This positive coefficient means that household that have access to the market have 1.3370 odds of being food secured than household that have no access to market.

Z-scores	Weight for Height/Length	Weight for Age	Height/Length for Age
-2.0 < z-score	293 (73.3%)	256 (64%)	202 (50.5%)
-3.0 < z-score < -2.0	86 (21.5%)	108 (27%)	101 (25.3%)
z-score <-3z	21 (5.3%)	36 (9.0%)	97 (24.3%)
Total	400 (100.0%)	400 (100)	400 (100.0%)

### Measurement of Nutritional Status of Children in the study area

Source: Field Survey, 2021.

Absence of acute protein-energy malnutrition, or normal nutrition status, is defined as having a weigh-for-height z-score of -2.0 or greater. Table 5 shows the nutrition status of the children in Maiduguri Metropolis. Considering weightfor-height/length, 73.3% of the children indicates absence of acute malnutrition. However, 21.3% have moderate acute proteinenergy malnutrition and 5.3% suffer from severe malnutrition (that acute is. severely malnourished). Looking at weight for age, 64% of the children are not underweight while 27% were suffering from moderate underweight and 9.0% are suffering from severe underweight. Considering height/length for age, 50.5% of the children are not stunted while 25.3% are suffering from moderate stunting and 24.3% are suffering from severe stunting. It is noteworthy that in Table 2, about 53% of the selected

households are food insecure. However, the results in Table 4 showing absence of acute malnutrition in about 73% of children, 64% of the children are not underweight 50.5% of the children are not stunted. Studies (Kuku et al 2011, Ahmed 2015, Chinedu, 2018, Sadar 2018) have shown that in times of food insecurity, mothers are likely to reduce their own intakes to secure those of infants and small children. Also, priority is placed on food for young household members by introducing readily available local and nutritious substitutes that are less expensive. Furthermore, as observed in Table 1.1c, households' possession of assets such as animals and birds can provide direct access to a large number of nutritionally richer foods of animal origin (milk, eggs, meat) and a more varied diets highly needed for growth and development for children in the age group considered.

AGE	Boys		Gir	·ls	Total		Ratio
(months)	no.	%	no.	%	no.	%	Boy:girl
6-17	34	8.5	32	8.0	66	16.5	1.1
18-29	60	15	54	13.5	114	28.5	1.1
30-41	30	7.5	43	10.8	73	18.3	0.7
42-53	44	11	46	11.5	90	22.5	1.0
54-59	33	8.3	24	6.0	57	14.3	1.4
Total	201	50.3	199	49.8	400	100.0	1.0

 Table 6: Distribution of Age and Sex of Children in the Study Area

Source: Field Survey, 2021

In Table 6, results show that about 29% of children are within the age bracket of 18-29 months of which 60 are boy while 54 are girls. Likewise, about 23% of the children are within age bracket 42-53 months of which 44 are boys and 46 are girls. The difference between the age and sex distribution of children from selected households in the study area is very slim except for ages 30-41 months and 54-59 months. According to Encyclopedia Britannia (2023), an important structural aspect of populations is the relative numbers of males and females who compose it. Generally, slightly more males are born than females (a typical ratio would be 105 or 106 males for every 100 females). However, it is quite common for males to experience

higher mortality at virtually all ages after birth. This difference is apparently of biological origin. For example, in India, the mortality of females may be higher than that of males in childhood and at the ages of childbearing because of unequal allocation of resources within the family and the poor quality of maternal health care. The general rules that more males are born but that females experience lower mortality mean that during childhood males outnumber females of the same age, the difference decreases as the age increases, at some point in the adult life span the numbers of males and females become equal, and as higher ages are reached the number of females becomes disproportionately large.

		WAZ	HAZ	WHZ	FS_S
WAZ	Pearson Correlation	1	$0.560^{**}$	0.699**	$0.105^{*}$
	P-value		0.000	0.000	0.036
	Ν	400	400	400	400
HAZ	Pearson Correlation	$0.560^{**}$	1	-0.153**	0.060
	P-value	0.000		0.002	0.234
	Ν	400	400	400	400
WHZ	Pearson Correlation	0.699**	-0.153**	1	0.074
	P-value	0.000	0.002		0.141
	Ν	400	400	400	400

Association between Food Security and Nutritional Status of Children in Maiduguri Metropolis Table 7: Summary of Pearson Product Moment Correlation Coefficient on the association

FS_S	Pearson Correlation	$0.105^{*}$	0.060	0.075	1
	P-value	0.036	0.234	0.141	
	Ν	400	400	400	400

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

Table 7 shows a significant association between food security and nutritional status of children in Maiduguri Metropolis (P> $\alpha$ ). It can be inferred that there was a significant association between food security and nutritional status of children in Maiduguri Metropolis (P> $\alpha$ ). This this because the probability values were greater than the alpha value (P> $\alpha$ ) at 1% and 5% levels of significance. This is in line with the findings of Sadar (2018), study the opined that, the inadequate or insecure access to adequate food due to financial constraints, which resulted to household food insecurity has a significant correlation to nutritional status of children under five years of age.

#### 4. Conclusion and Recommendations

The study concluded that there was a perfect positive correlation associated between household food security and nutritional status of among selected households children in Maiduguri metropolis. Results on socioeconomic characteristics of respondents indicated that majority were male, married and between the age of 31-50 years with 67.8%, 89.5% and 77% respectively. However, majority have no formal education, are farmers and have access to the market with 60.5%, 48% and 85.3% respectively. Despite the preceding characteristics, more than half of the selected households (about 53%) are food insecure. Results on determinants of food security revealed that six (6) out of nine (9) variables in the model were significant in explaining the variation in food security status of households in the study area. However, five (5) were positively significant (household access to credit facilities at 10%, farming experience at 1%, access to market at 10%. Gender status at 10% and income at 10%) while household size was significant at 1% but show a negative relationship on households' food security status. The study also revealed that majority (73%) of the children indicated absence of acute malnutrition, 64% are not underweight and about 51% are not stunted. The nutritional status of children is a reflection of households coping strategies that reduce the shock of food insecurity among children in the study area.

The study, therefore, recommended that low level of education be addressed through adult education and training. Educated households are more empowered economically, secure food in adequate quality and quantity and make conscious efforts to balance their diet. Awareness and access to better family planning practices that curtails family size is germane. Also, increasing wage earning ability and investigating revenue diversification alternatives are critical in improving household food security. This will entail a combination of enterprises and livelihood activities and also cash transfer program that can help households earn more money in order to meet their minimum food needs in the study area.

#### References

Abdallah, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2017). Factors Affecting Household Food Security in Rural Norther Hinterland of Pakistan. Journal of the Saudi Society of Agricultural Sciences. Retrieved on 22/05/2018. http://dx.doi.org/10.1016/j.jssas.2017.05.00 3.

- Abu, G. A., & Soom, A. (2016). Analysis of Factors Affecting Food Security in Rural and Urban Farming Households of Benue state, Nigeria. *International Journal of Food* and Agricultural Economics. 4(1): 55 – 68.
- Adeniyi, O. R. & Ojo, O. A. (2013). Food Security Status of Rural Farming Households in Iwo, Ayedire and Ayedaade Local Government Areas of Osun State, South-Western Nigeria. African journal of Food, Agriculture, Nutrition and Development. 13(5): 8209-8223.
- Ahmed, F. (2015). Food Security and its Determinants among Urban Housholds: A Case Study of Maiduguri and Jere Local Government Areas of Borno State, Nigeria. Advances in Social Sciences Research Journal 2(5):122-133.
- Ahungwa, G. T., Umeh, J. C & Muktar, B. G. (2013). Empirical Analysis of Food Security Status of Farming Households in Benue state, Nigeria. *IOSR Journal of Agriculture* and Veterinary Science. 6(1): 57 – 62.
- Ahungwa, G. T., Umeh, J. C & Muktar, B. G. (2013). Empirical Analysis of Food Security Status of Farming Households in Benue state, Nigeria. *IOSR Journal of Agriculture* and Veterinary Science. 6(1): 57 – 62.
- Asadullah, M. N., Savoia, A., & Sen, K. (2020). Will South Asia achieve the sustainable development goals by 2030? Learning from the MDGs experience. *Social Indicators Research*, 152, 165-189.
- Balogun, O.O; Dagvadorj, A; Anigo, Kola M; Ota, Erika; & Sasaki, S (2015). "Factors influencing breastfeeding exclusivity during first 6 months of life in developing countries: a quantitative and qualitative systematic review". *Maternal & Child Nutrition.* 11 (4): 433–451.
- Berry, E.M., Dernini, S., Burlingame, B., Meybeck, A., & Conforti, P., (2015). Food security and sustainability: can one exist without the other? Public Health Nutr. 18, 2293–2302.

- Charles, S. R., Ismail, S., Ahmad, N., Lim, P. Y., & Abubakar N. I. (2020). Food security and hygiene practice among adolescent girls in Maiduguri metropolitan council, Borno state, Nigeria. *Foods*, 9(9): 1265.
- Chinedu, O. (2018). "Severe Malnutrition, Disturbance in the Nigerian Health Sector". Public Health Nigeria.

Encyclopedia Britannica, (2023). Population. Retrieved 12/04/2023 https://www.britannica.com/science/populat ion-biology-and-anthropology/Thedeveloping-countries-since- 1950. Retrieved 10/4/2023.

- Folake, O.S., Ifeoluwa, O.O, & Akinkunmi, P.O., (2020). Household Food Insecurity, Coping Strategies and Child Dietary Diversity (24-59months) in Ibadan Nigeria. *Journal of World Nutrition 2020;11(1):129-*144.
- Food Agriculture Organization (FAO), (2012). Sustainable Diets and Biodiversity. FAO, Rome. Available at: http://www.fao.org/docrep/016/i3004e/i300 4e.pdf.
- Ghattas, H. (2014). Food Security and Nutrition in the context of the Global Nutrition Transition. *Food and Agriculture Organization of the United Nation Rome*, 2014 http://www.fao.org/economic/ess/essfs/voices/en/)
- Irohibe, I. J. & Agwu (2014). Assessment of Food Security Situation among Farming Hoiuseholds in Rural Areas of Kano state, Nigeria. *Journal of Central European Agriculture*. 15(1): 94 – 107.
- Kuku, O., Gundersen, C., & Garasky, S., (2011). Differences in Food Insecurity Between Adults and Children in Zimbabwe. *Journal* of Food Policy. Pp.311-317
- Omonona, B. T. & Agoi, G. A. (2007). An Analysis of Food Security Situation Among Nigeria Urban Households: Evidence from Lagos State, Nigeria. *Journal of Central European Agriculture*. 8(3): 397-406.

- Oyekale, T. O., Ayegbokiki, A. O., & Adebayo, T. Y. (2017). Anal sis of Rural Households' Food Security Status in Ogun state, Nigeria. Journal of Agribusiness and Rural Development. 1(43): 163 – 174.
- Oyebanjo, O., Ambali, O. I. & Smith, R. J. (2013). Determinants of Food Security Status and Incidence of Food Security among Rural Farming Households in Ijebu Division of Ogun state, Nigeria. *Journal of Agricultural Science and Environment*. 20(13): 92 – 103.
- Ruel M. (2013) Food Security and Nutrition: Linkages and Complementarities. The Road to Good Nutrition: Basel, Karger; 2013.
- Sadar, G. (2018). Determination of Household Food Security and Its Impact on Nutritional Status of Mother and Children Under Five Years in Simalungun District North Sumatra Indonesia. *Journal of health sciences and research;* Efarina University, Department of Public Health, Faculty of Health, Simalungun, Indonesia 21162.
- United Nations International Children's Emergency Fund (UNICEF), World Health Organization (WHO), World Bank (2021). Levels and Trends in Child Malnutrition. UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates.
- Victora, GC; Bahl, R; Barros, JA; França, VG; Horton, S; Krasevec, J; Murch, S; Sankar, JM; Walker, N; Rollins, CN; & Lancet Breastfeeding Series, Group (2016). "Breastfeeding in 21<sup>st</sup> century: epidemiology, mechanisms, & lifelong effect". *The Lancet*. 387 (10017): 475–90. doi:10.1016/S0140-6736(15)01024-7.

- Wegbom, A. I., Essi, I. D., & Kiri, V. A. (2019). Survival analysis of under-five mortality and its associated determinants in Nigeria: Evidence from a survey data. *International Journal of Statistics and Applications*, 9(2): 59-66.
- World Food Summit, (2013). Rome Declaration on World Food Security. World Food Summit. Rome, Italy, 13<sup>th</sup> -17<sup>th</sup> November, 2013.
- World Health Organization (WHO) (2012). Trade, Foreign Policy, Diplomacy, and Health: Glossary of Globalization, Trade and Health Terms Geneva: WHO; 2012. Available from: http://www.who.int/trade/glossary/story028 /en/.
- Yalew, B. M. (2014). Prevalence of malnutrition and associated factors among children age 6–59 months at Lalibela Town Administration, North Wollo Zone, Anrs, Northern Ethiopia. J Nutr Disorders Ther, 4(132):2161-0509.
- Zakari, S., Ying, L., & Song, B. (2014). Factors Influencing Household Food Security in West Africa; the case of Southern Niger. *Sustainability*. (14): 1191 – 1202.
- Zhou, D. & Li, L. (2022). Farming experience, personal characteristics, and entrepreneurial decisions of urban residents: Empirical evidence from China. *Front. Psychol.* 13 – 2022.

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