



# Determinants of Mild, Moderate and Severe Food Insecurity in Gombe State, Nigeria

<sup>1</sup> Aisha Adamu Hassan1, <sup>2</sup> Farida Bello, & <sup>3</sup> Zakari Yau Abba

<sup>1-2</sup> Department of Economics, Faculty of Arts & Social Sciences Gombe State University, Gombe – Nigeria <sup>3</sup> Cooperative Economics & Management Department, Federal College of Horticulture Dadin Kowa Gombe State – Nigeria

Corresponding Author's; E - mail: aishaadamu1043@yahoo.com

#### Abstract

This paper assesses the factors that determine mild, moderate and severe food insecurity among selected households in Gombe metropolis, Gombe state, Nigeria. The study utilizes primary data collection instruments, specifically questionnaire administered from a sample of 420 households. However, out of the 420 questionnaires administered, only 390 responses were filled, returned and valid. Data collected was analyzed using descriptive statistics and binary logistic regression estimator. The study establishes that about 83.59% of the households are food insecured. In addition, among the food insecure households, it is found that 10.51%, 23.08% and 50.00% are mildly, moderately and severely food insecured respectively. The logistic regression results revealed that food prices and income is positively significant at 10% and 5% in determining the household probability to be severely food insecured respectively. The findings also discovered that, educational level of the households and ownership of assets determines the level of mildly food insecure at 1% level of significance. For moderately food insecure household, education and food farmed are the major determinants at 1% and 5% levels of significance respectively. It is recommended that government and non-governmental organizations (NGOs) should introduce policies and programmes geared towards enhancing the income level of people in order to reduce the magnitude of food insecurity in the study area. It is also recommended that government, at all levels, should design policies geared at reducing the prices of food stuffs so that people will have access to it at affordable prices.

**Keywords:** Food Insecurity, Logistic Regression, Descriptive Statistics, Gombe Metropolis **JEL Classification:** 

#### 1.0 Introduction

Today, achieving high level of food security remains one of the major global concerns particularly faced by under-developed countries like Nigeria. Food insecurity is a problem mostly found in developing countries especially in Asia and Africa; where more than 92% of the world's undernourished people live (Oguniyi et.al, 2021). The number of acutely food-insecure people has increased due to considerable number of factors such as insecurity, large-scale displacement in conflict affected countries, economic shocks and extreme climate change in some countries as well as Covid-19-related impacts. Unfortunately, with the 149 million children still stunted, the pace of progress is too low to meet Sustainable Development Goal number 2 (SDG2). This goal (SDG2) seeks to alleviate hunger and food insecurity to the extent that by 2030 there should be no person or child whether in developed or developing country that goes to bed on an empty stomach.



In Nigeria, food insecurity crisis is increasing day by day partly due some natural and artificial factors. Agriculture is the mainstay of the Nigerian economy prior to the discovery of crude oil in the country. The contribution of the agricultural sector to the economy of Nigeria includes; provision of food, employment, source of revenue to the government through agricultural commodity exports and many more. Despite this importance, the sector had suffered neglect since the discovery of crude oil in the 1960s and had failed to contribute significantly to achieving a sustainable food security in the country. The most affected regions in Nigeria in terms of food insecurity are the North-east and the North-west zones partly due to high level of poverty or absolute poverty where by majority of the people are living on less than one dollar per day (World Bank, 2024).

Furthermore, the Nigeria's food insecurity situation is not limited to lack of food availability only. Instead, factors such as lack of purchasing power or income, limited rural development, weak infrastructural development, weak governments' policies, low agricultural technology adopted in the agricultural sector, climate change, corruption, natural disaster and low technology for processing and storage etc. All these contribute immensely towards the failure of achieving sustainable food security in Nigeria (Kassy, et.al, 2021).

United Nations World Food program (2021) has expressed concern over the increasing hunger in Nigeria and other parts of West and Central African regions. The Cadre Harmonize National Analysis (2020) reported that Nigeria alone accounted for 42% of the region's total number of acutely food-insecure people. Also, Food and Agricultural Organization (2019) reported that more than 14 percent (approximately 28 million people) in Nigeria are undernourished. The situation may be worsening considering the trend of abject poverty in the country as majority of the population earns less than one Dollar a day. For instance, the Nigerian National Bureau of Statistics (NBS, 2020) reported that in 2020 about 40 percent or 83 million Nigerians live in abject poverty, nearly half of the total population in the country.

According to FAO (2023), Nigeria is experiencing high levels of food insecurity especially in North-Eastern Nigeria, where Gombe State is located. However, identifying the factors affecting different categories of food insecurity is paramount in this era of food crises. In addition, majority of the empirical studies reviewed on food insecurity in this study, particularly studies done on Nigeria, dwells on the overall determinants of food insecurity without focusing on the factors affecting the three categories of food insecurity. In light of the above, this paper attempts to examine the factors that affect mild, moderate, and severe food insecurity in Gombe metropolis, Gombe state, Nigeria.

The paper is organized as follows; Sections 1 and 2 contains the introduction and review of related literature respectively. Section 3 and 4 presents methodology and data analysis respectively. Finally, section 5 concludes the paper and provides recommendations based on the research findings.

### 2.0 Literature Review

### 2.1 Conceptual Review



World Bank (1986) defined food insecurity as the lack of capability to produce food and enable all people access to enough food at all times for an active and healthy life. To Bickel (2000), food insecurity refers to limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire food in socially acceptable ways. In Beaumier and Ford (2010), food insecurity happens when food systems are stressed so that food is not accessible, available or sufficient in supply. Fawole, Ilbasmis and Ozkan (2015) defined food insecurity as "a lack of sustainable physical or economic access for people to enough safe, nutritious, and socially acceptable food for their healthy and productive life." They argue that, the root cause of food insecurity is poverty resulting in the inability of people to gain access to food. Furthermore, food insecurity has been described as "a condition in which people lack basic food intake to provide them with the energy and nutrients for full productive lives" (Frongillo, 2001). The World Food Summit (1996) explained that food insecurity exists when people lack secure access to sufficient amount of safe and nutritious food for normal growth and development and an active and healthy life.

### **Categories of Food Insecurity**

Coates, Swindale and Bilinsky, (2007) identified three categories of food insecurity as mild, moderate and severe.

**Mild Food Insecurity**: a situation when household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely.

**Moderate Food Insecurity**: this refers to a circumstance when household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes.

**Severe Food Insecurity**: in this type, a household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating). In other words, any household that experiences one of these three conditions even once in the last four weeks falls under severe food insecure household

### 2.2 Theoretical Review

The theory found to be relevant in this paper is that of "Entitlement Approach" propounded by Amartya Sen in 1960. Sen observed that in every society or country, each individual is entitled to bundles of commodities including food; and that hunger and starvation only occur as a result of the failure to be entitled to any bundle with enough food (Sen, 1981: 434). Entitlements depend on two elements: (1) personal endowments, which are the resources a person legally owns, such as house, livestock, land and non-tangible goods (Osmani, 1995); (2) the set of commodities a person has access to through trade and production, i.e. the 'exchange entitlement'. The entitlement approach has contributed to re-addressing the problem of hunger and famine by diminishing the role of aggregate food supply and giving



more relevance to socio-economic conditions of people. Starvation is a matter of some people not having enough food to eat and not a matter of there being not enough food to eat (Sen, 1981). The Amartya Sen's Entitlement Approach contributed to challenging the Malthusian view of famine and hunger, and shifted the focus from national food availability to people's access to food. This approach has been primarily proposed and tested for farming analysis. Thus, Sen's work is visible in two important definitions of food security 'All people at all times have both'. The reason for adopting "Entitlement Approach" as the theoretical underpinning of this paper is because of its advantages over other theories as it considers both short term and long term probability of being food insecurity. In Sen's approach, the inclusion of assets and income provide more information on long-run and short-run vulnerability to food insecurity respectively. As such, it comprises of the four pillars of food security; food availability, accessibility, utilization and sustainability.

# 2.3 Empirical Review

There is vast and growing literature on the factors that affect the level of food insecurity across the globe. Most of these studies are conducted in African countries. For example, Aboaba, Fadiji, and Hussayn, (2020) estimated the extent of food security and its determinants among rural households in Nigeria. Data for this study was obtained from 180 rural households consisting of 1260 members through the use of a structured questionnaire. The data collected was analyzed using descriptive techniques and a less restrictive multinomial logistic regression model. The results from the descriptive statistics indicate that majority of the rural households were food insecure. The study equally found that femaleheaded married households were more food secure than male-headed households. Additionally, an increase in age of household heads and credit access make it more likely to be food secure.

Cordero-Ahiman, et.al (2020) analyzed the factors that determine food insecurity in households in the rural area of the Paute River Basin, Azuay Province, Ecuador. Stratified sampling was used as the sampling method. The study employed binomial logit models and ordered logit model to identify the main determinants of household food insecurity. The results show that housing size and access to food security information are the most important determinants of food insecurity in the three predictive models applied in this research.

Sisha, (2020) assessed the prevalence and determinants of food insecurity at the national level in Ethiopia using a longitudinal data of 5000 households. The data was analyzed using logit model. The result of logistic regression revealed that average years of schooling of members of the household, proximity to service centers, assets and availability of credit services positively affect household food security, whereas dependency ratio and shocks increase the odds of a household to be food insecure.

Kassy, et.al (2021) examined the level of food security status and factors affecting it among households in Enugu state, Nigeria using a descriptive cross-sectional study of Eight Hundred (800). The findings shows that about 61.1% of households in Enugu State were found to be



food-insecure. The factors influencing food security status were wealth index, belonging to a cooperative society, lack of money to buy food items, and the number of accessible market places.

Diallo et.al (2021), identified the determinants of households' food insecurity in rural areas in Mali. The study used data from the national food security and nutritional survey in March 2016. The econometric logit results revealed that regional location, age of household head, household size, level of education of the household head, welfare index and incomes' diversification sources are the main determinants of households' food insecurity in a rural area in Mali. The analysis shows that age of household head, size of household and practice of recession cropping affect positively food insecurity while the educational level of household head, welfare index and incomes diversification negatively affects food insecurity.

Shahzad, (2021), examined the impact of the COVID-19 pandemic on food insecurity and investigates the determinants of food security and coping strategies in the Punjab province of Pakistan. Data was collected through the internet and received responses from 370 respondents. The household food insecurity access scale (HFIAS) model was applied to examine food insecurity, and a logit regression model was used to analyze its determining factors. The results illustrated that food insecurity substantially increased during the COVID-19 pandemic. Households' demographics and socioeconomic factors have influence on food insecurity. Households with a large family size and people in quarantine found more food insecurity during the COVID-19 pandemic, while financial assistance played a role in a decline in food insecurity. The study recommends that stakeholders and responsible institutes provide financial assistance to support low-income families in order to enhance food security

Militao, et.al (2023) investigated the prevalence of food insecurity and its associated factors in southern Mozambique. Data from 1842 household heads in Maputo City were analyzed in a cross-sectional design. The study found that, 79% of the households were food insecure. Out of the food insecure households, 16.6%, 28.1% and 34.4% were mildly, moderately and severely food insecure. The study equally revealed that low-income households, those with less educated heads, and those engaged in informal work were significantly more prone to food insecurity.

Sholeye et.al (2024) assessed food insecurity and its associated factors among adolescents in Sagamu, Ogun State, Nigeria. A sample of 1300 in-school adolescents in Sagamu Township was selected via multi-stage sampling. A semi-structured, self-administered questionnaire was used for data collection. The findings indicated that the prevalence of food insecurity was 45%, of which 34.6% had mild food insecurity, 34.7% had moderate food insecurity, while the remaining experienced the severe form of food insecurity. Also, gender, age, maternal occupation, maternal education, living arrangement, low sense of self-worth, alcohol intake and cigarette smoking were associated (p < 0.05) with food insecurity. Predictors of food insecurity were: age, maternal education, living arrangement and some behavioral factors.



It can be observed from the above empirical studies that majority of them examined the factors affecting food insecurity in general without identifying the factors that affect mild, moderate and severe food insecurity. In view of this, this paper attempts to examine the factors or the determinants of the three (3) different categories of food insecurity as it was neglected by the previous studies with special attention to Gombe metropolis, Gombe state, Nigeria.

# 3.0 Research Methodology

# 3.1 Study Area

Gombe metropolis is in the centre of Gombe state and shares boundaries with Kwami LGA to the North and also surrounded by Akko LGA to the East, West and South. It has a land area of 52km2 (Gombe State Ministry of Land and Survey, 2003). On the other hand, Gombe state is among the 36 states of Nigeria, it is located in North-eastern part of Nigeria, and its capital is Gombe. The state shares boundaries with Yobe State to the north, Borno State to the east, Adamawa and Taraba State to the south and Bauchi State to the west. However, Gombe metropolis is the seat of the State capital and the Headquarter of Gombe Local Government which is one of the eleven local government areas of the state. The entire population in terms of individuals of Gombe Local Government as at 2006 was 266,844 (National Population Commission, 2023).

# 3.2 Population of the Study and Sample Size Determination

The general population of this study consists of all the households in Gombe metropolis, Gombe State. According to National Population Commission (2022), Gombe metropolis has a total population of households of 695,909. Thus, the target population of the study is 695,909 households.

The use of sample size is paramount when dealing with household studies, because it allows the researcher to focus only on a sub-set of the target population to represent the entire population. The formula that is found to be statistically useful in drawing the sample size of the population based on the empirical investigation is Yamane (1972) formula. The sample size for this research is drawn using "Yamane" Formula for sampling a finite population. The formula provides a good medium for sampling a manageable size of the population. The formula is given as in equation (3.1):

$$n = \frac{N}{1 + N(e)^2}.$$
3.1

Where = the sample size

= the finite population

= level of significance (limit of tolerable error)

= a constant (unity)



Note: for this study = 0.05 or 5%

Given the total population of 695,909 the sample size is obtained as;

 $n = 695909/(1+695909(0.05)^2)$ 

n = 399.77022 ≈400

### 3.3 Method of Data Collection and Sampling Technique

The method used in collecting data was questionnaire supplemented by an interview. The questions were adapted and modified from Household Food Insecurity Access Scale (HFIAS) developed by United State Agency for International Developments (USAIDS) of Food and Nutrition Technical Assistance (FANTA) project by taking into consideration the areas to be covered. The reason for the adaptation was that it has been proven to be of global standard. This paper applied convenient sampling technique to select the target household head by going to the study areas and administering the questionnaires to whom so ever the researcher meets.

### 3.4 Model Specification

In trying to assess the factors affecting mild, moderate and severe food insecurity across the globe, binary logit regression model has been widely used in several studies by different researchers (see Agidew & Singh, 2018; Cordero-Ahiman, et al., 2020; Aboaba et al, 2020; Pakravan-Charvadeh et al 2021; Diallo, Savadogo, et al., 2021). Discrete choice binomial logit regression model has two categories, coded 0 and 1 (Green, 2003; Gujarati 2003). In this modeling approach, the dependent variable is coded 0 or 1; where 1 represents food insecurity and 0 for otherwise. The logistic binary specification is suitable for models when endogenous variables are dichotomous (Zakari, Ying & Song, 2014).

To achieve the objective of the paper Model 3.2, Model 3.3 and Model 3.4 were specified to examine the factors that affect severe, mild and moderate of food insecurity among households in Gombe metropolis.

 $log \left[\frac{Pr(SFI)}{1-Pr(SFI)}\right]_{i} = \alpha_{i} + \beta_{1}AG_{i} + \beta_{2}GD_{i} + \beta_{3}SZ_{i} + \beta_{4}ED_{i} + \beta_{5}FP_{i} + \beta_{6}FM_{i} + \beta_{7}IN_{i} + \beta_{8}AS_{i} + \beta_{9}ES_{i} + \mu_{i} \quad ... (3.2)$ Where  $log \left[\frac{Pr(SFI)}{1-Pr(SFI)}\right]_{i}$  is the probability of household being severely food insecure taking values 0 and 1 (1= severe food insecurity and 0 otherwise).

Model 3.3 is the model that identify the factors affecting the level of mild food insecurity among households.

$$\log \left[\frac{Pr(MIF)}{1-Pr(MIF)}\right]_{i} = \alpha_{i} + \beta_{1}AG_{i} + \beta_{2}GD_{i} + \beta_{3}SZ_{i} + \beta_{4}ED_{i} + \beta_{5}FP_{i} + \beta_{6}FM_{i} + \beta_{7}IN_{i} + \beta_{8}AS_{i} + \beta_{9}ES_{i} + \mu_{i} \dots (3.3)$$
  
Where  $\log \left[\frac{Pr(MIF)}{1-Pr(MIF)}\right]_{i}$  is the probability of households being mildly food insecure taking

values 0 and 1 (1 = mild food insecurity and 0 otherwise).

Model 3.4 is the model that estimates the factors affecting the level of moderate food insecurity among households.



 $log \left[\frac{Pr(MOF)}{1-Pr(MOF)}\right]_{i} = \alpha_{i} + \beta_{1}AG_{i} + \beta_{2}GD_{i} + \beta_{3}SZ_{i} + \beta_{4}ED_{i} + \beta_{5}FP_{i} + \beta_{6}FM_{i} + \beta_{7}IN_{i} + \beta_{8}AS_{i} + \beta_{9}ES_{i} + \mu_{i} \quad ... (3.4)$ Where  $log \left[\frac{Pr(MOF)}{1-Pr(MOF)}\right]_{i}$  is the probability of the households being moderately food insecure taking values 0 and 1 (1= moderate food insecurity and 0 otherwise). The abbreviated variables used in the logistic regression models are explained below:

AG = Household age, GD = Household gender, SZ = Household size, ED = Households education, FP = Food Prices, FM= Farming, IN = Household income, AS = Household asset ownership, ES = source of energy for cooking.

### 4.0 Data Presentation and Analysis

For this study. 390 valid copies were returned out of the 420 questionnaires administered, representing 92.86 per cent of the sample size.

Table 1 contains the results of summary statistics for the period under study. The table suggests that the households, on average, are severely food insecure since the mean value of Household Food Insecurity Access scale (HFIAS) is approximately 11. Given that the standard deviation of HFIAS is close to the mean value, the deviation could be said to be high, suggesting that majority are food insecure, only very few are food secure. On average, majority of the households are 41.5 years old; the youngest is 22 years and the oldest is 75 years old. The standard deviation of about 11 years is modest, showing moderate variability in the household age.

Variable	Mean	Std. dev.	Min	Max	Skewness	Kurtosis
HFIAS	10.946	7.980675	0	27	0.308	2.120
Age	41.478	10.924	22	75	0.637	2.780
Male	0.836	0.371	0	1	-1.814	4.290
Household Size	4.367	2.830	1	18	1.810	7.135
Educational. Level	2.341	0.910	1	4	0.081	2.261
Food Price Rise	1.692	0.875	1	4	1.293	4.013
Food Duration	2.261	0.859	1	4	0.137	2.436
Household Income	61662.5	56530.52	3400	350000	2.518	10.101
Asset ownership	0.895	0.307	0	1	-2.575	7.630
Water Access	1.696	0.726	1	3	0.533	2.046

Table 1: Summary Statistics of the Variables

Source: Researcher's Computation (2023)

For household size, the results indicate that most of the households have, on average, 4 members, while dispersion indicated by high standard deviation of 3. This is validated by a wide range, as certain households have as few as 1 member; while other households have as many as 18 members. With respect to the income level, on average, most of the households have income levels of  $\Re 61,662.5$  and the results of the standard deviation depict high



variability in terms of incomes among the household heads. This means there is high income inequality among the households in the study area.

Furthermore, skewness measures the symmetry of variables distribution, whether they are normally/symmetrically or asymmetrically skewed. Given that, the skewness values of Households Food Insecurity Access Scale (HFIAS), household age, household educational level, food duration and water access fall between -1 and +1, the variables are said to be symmetrically skewed, meaning that they have normal distribution. However, household size and food price rise frequency are slightly and positively asymmetrical since their skewness values are greater than 1 but less than 2. Household income is substantially and positively asymmetrical since its skewness value is greater than 2. This suggests high income disparity/inequality among households. Again, data on male are slightly and negatively asymmetrical.

In addition, kurtosis measures whether distribution is too peaked or flat in relation to the normal distribution. As seen from Table 1, kurtosis values of all the variables suggest that their distributions are too peaked or leptokurtic since values are all greater than 2.

The socio-economic characteristics of the households are very crucial in determining different categories of household food insecurity. Table 2 presents the Results of the Logistic Regression on the factors affecting Severe Food Insecurity. According to Household Food Insecurity access Scale Measurement (HFIAS), severe food insecurity is coded 1 if Household Food Insecurity Access Scale (HFIAS) falls between 11 and 27 scores; otherwise it is coded zero. Table 2 depicts the factors affecting severe food insecurity.

VARIABLES	Logit Results	Odd Ratio
Age	0.0145	1.0146
	(0.0116)	
Male	0.3082	1.3609
	(0.3119)	
Household size	0.0204	1.0206
	(0.0463)	
Education	0.1372	1.1470
	(0.1461)	
Food prices	0.2521*	1.2868
-	(0.1532)	
Food Farmed	-0.1367	0.8722
	(0.1542)	
Income	-0.3209**	0.7255
	(0.1861)	
Asset ownership	0.5499	1.7333
	(0.4079)	
Source of energy used	-0.2453	0.7824

Table 2: Logistics Regression Results on the Factors Determining Severe Food Insecurity (Model 1)



	(0.1687)	
Constant	3.1353	0.1280
	(2.0592)	
Pseudo R2	0.0306	
Prob> chi2	(0.2732)	
Observations	382	

Robust Standard Error in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Sources**: Researcher's Computation (2023)

Out of 9 explanatory variables, only 2 were found to be statistically significant. For instance, the impact of high food prices on severed food insecurity was positive and significant at 10 percent. The implication is that, high food inflation leads to lower purchasing power for food items and ultimately affects food insecurity. Factors such as, inability of the domestic farmers to produce enough food for the teeming population (due to lack of mechanized farm inputs, poverty, high costs of fertilizers, climate change), government policy (especially boarder closure and Naira devaluation), insecurity are among the reasons for high food prices in Nigeria. The odd ratio in favour of food prices increases by a factor 1.2868. This implies that, severe food insecurity increases by approximately 1.27% as food prices increased by one unit.

Another determinant of severe food insecurity was household income. The relationship between severe food insecurity and household income was negative and significant at 5 percent. Severe food insecurity refers to a situation whereby members of the household go to bed hungry (absence of food in the house). According to the result, as household income increases, the chance of the household to become severely food insecure reduces. The odd ratio indicates that, all things being equal, the probability of the household to experience severe food insecurity reduces by 0.7255 percent. The remaining variables for model 2 were insignificant. Gustavo et.al (2011) also found similar findings in place of the study

	Mild Food Insecu	rity (Model 2)	Moderate Food Insecurity (Model 3)		
VARIABLES	Logit Results	Odd Ratio	Logit Results	Odd Ratio	
Age	-0.0391	0.9616	-0.0284	0.9720	
	(0.0258)		(0.0205)		
Male	-0.5494	0.5773	-0.8382	0.4325	
	(0.5972)		(0.5119)		
Household size	0.1077	1.1137	0 .0698	1.0723	
	(0.0983)		(0.0722)		
Education	-0.6022***	0.5476	-0.5262***	0.6925	
	(0.2808)		(0.2355)		

Table 3: Results of the Logistic Regression on the Factors Determining Mild and Moderate Food Insecurity (Model 2 and 3)



Food prices	-0.0889	0.9149	-0.5696	0.5658
	(0.2646)		(0.2639)	
Food Farmed	0.1519	1.1641	0.0567	1.0584
	(0.2696)		(0.2428)	
Income	0.2803	1.3234	-0.4913**	0.6118
	(0.3767)		(0.2720)	
Asset ownership	-1.6467***	0.1927	0.5499	0.7996
	(0.6405)		(0.7434)	
Source of Energy used	-1.6467	1.0468	0.1144	1.1212
	(0.3598)		(0.2808)	
Constant	-2.172615	0.11388	3.4785	32.41187
	(4.4265)		(2.9639)	
Pseudo R2	0.0888		0.0823	
Prob> chi2	(0.1271)		(0.0173)	
Observations	382		382	

Standard Error in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 Sources: Researcher's Computation (2023)

In Table 3, mild food insecurity is coded 1 if HFIAS falls between 5 and 7 scores; otherwise, it is coded zero. Moderate food insecurity is coded 1 if HFIAS falls between 8 and 10 scores; otherwise, it is coded zero. Table 3 reports the logistics regression results of the effects of explanatory variables on 2 dependent variables: mild food insecurity and moderate food insecurity. As seen from the table, factors affecting mild and moderate food insecurity were education, assets and income of the households.

In this study, households' education level means the highest level of education the household head attained. The coefficients of education for both model 3 and 4 (mild and moderate) was negative and found to be statistically significant at 1 percent. The odd ratio is negative for both the models (0.5476 and 0.6925). Household heads with higher education were more likely to get higher paid jobs. Their education also gives them knowledge and awareness on how to avoid mild and moderate food insecurity. Thus, the more educated the household heads is the less likely for them to be mildly and moderately food insecure.

In this study, households were asked about their assets. Ownership of consumer durable and productive assets affects food insecurity. The effect of assets on mild food insecurity was negative and significant at 1 percent. The negative relationship may indicate that in the study area, households who own productive assets like land, houses, automobile and many more have less chances of becoming mildly food insecure. The odd ratio for asset implies that the probability of being mildly food insecure decreases by 0.1927% as productive assets increases. In other words, household having assets were less mildly food insecure than non–assets holders.



Household income determines the level of moderate food insecurity. A household is categorized as moderately food insecure if its members eat twice or one time per day (less than three meals per day). As shown in Table 3, income of the household was found to be negative and statistically significant at 5%. This implies that, an increase in income reduces the likelihood of households to be moderately food insecure and vice-versa. The odd ratio for income was 0.6118 implying that the probability of household to be moderately food insecure reduces by approximation 0.61 percent. The remaining variables for Model 3 and 4 were not significant in explaining mild and moderate food insecurity in the study area. The above findings are congruent to those of Suvasish et.al (2022), Diallo, et.al (2021).

### 5.0 Conclusion and Policy Recommendations

This paper attempts to examine the factors affecting different categories of food insecurity among households in Gombe metropolis, Gombe state Nigeria. It is found that from the regression results of the models estimated that factors such as household education, household income, households' assets and food prices were the factors that majorly affect mild, moderate and severed food insecurity in the study area. This is because they are found to be statistically significant. Thus, the paper made the following recommendations based on the research findings:

- (i) It is recommended that government and non-governmental organizations (NGOs) should strategize policies and programmes geared toward enhancing the income level of the people in order to reduce the magnitude of poverty in Gombe Metropolis. This could be achieved through establishment of skills acquisition centres like vocational training or entrepreneurial education with equal opportunities.
- (ii) Government should design policies such as food subsidy so that people will have access to food at affordable prices.
- (iii) Government should improve the education level of the household. This could be achieved by investing huge fund in the educational sector so that people will be more educated and literate.

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