Evaluating the Influence of Climate Change on Food Security and Nutritional Status among People in Monguno Local Government Area of Borno State, Northeast Nigeria

Abdulrahman Ahmed RN, MSc.N, MPH in View[1] , Fatima Abacha Ali RN, MPH in View[2] , Dr. Hadiza Yahaya RN, Ph. D[3] , Dr. Abba Jidda RN, Ph. D[4] , Mairo Bukar Nbahi, RN, RNT, MSc.N[5]

[1]Ahmadu Bello University, Zaria Kaduna Nigeria

[2]National Open University of Nigeria, Borno State Nigeria

[3]Collage of Nursing and Midwifery, Maiduguri Borno State Nigeria

[4]Maryam Abacha American University of Niger, Maradi Republic of Niger

[5]College of Nursing University of Maiduguri Teaching Hospital, Nigeria

ABTRACT

One aspect that poses a threat to the health and wellbeing of human race today is climate change. The impacts of climate change can never be over emphasized, climate change and health are fundamental elements that are surrounded by countless indicators. Climates change without doubt or fear of contradictions remain one of the determinants of health. The human body as a machine must be kept within a narrow physiological limit so also climate are indices that must be observed within an atmospherically friendly manner. This study on Evaluating the influence of climate change on food security and nutritional status among people in Monguno Local Government Area of Borno State, northeast Nigeria is a step to provide durable solutions to the ever-increasing negative influence of climate change on the continual survival of the people in Monguno local government area of Borno state northeast Nigeria. This study is explored to investigate the food security indicators of the people in Monguno local government, nutritional status of children under-five, climate change perceptions of the people in Monguno LGA and determination of regression analysis of predicting food insecurity respectively. The research was a mixed method research design. It was conducted in Monguno local government area of Borno state northeast Nigeria. The targeted population for the study is 125,000, emanating the population of people in Monguno LGA according to the United Nations office of humanitarian coordination (UNOCHA). A stratified random sampling method was used to determine the sample size. Sample size was obtained using Cochran's formula of sample size determination. And a total of 384 samples was arrived at. By defining the strata, the population (125,000) was divided into 2 distinct groups based on the key features they possessed. The first group being the farmers/Fishermen and the second group being the vulnerable groups largely residing within internally displaced person camps which includes women, children and elderly persons. About 25,000 farmers and fishermen while 100,000 is for the vulnerable group. The sample size for each group was obtained as 77 for farmers/fishermen while 307 for vulnerable group respectively. Random sampling within each stratum was done by creating a list of individuals and household in each stratum or sampling frame. Simple random sampling was employed to select participants, numbers were assigned to the individuals in the sampling frame and excel was utilized to select participants. An adjustment for non-response was put into account by increasing the sample size proportionally for 10% non-response rate predicted. The adjusted sample size is 427 and divided proportionally to the 2 strata as 85 sample size to the farmers/fishermen and 342 to the vulnerable groups accordingly. This approach clears out that non-response rates have been put into account while maintaining proportional representation across the strata. For clear data analysis, food security, household hunger scale (HHS) food consumption score (FCS), and coping strategies index (CSI) will be calculated. These will aid in having baseline data to determine frequency of hunger, the diversity and frequency of food groups and strategies used to manage food shortages. a discussion of the

anthropometric measurements emanating prevalence of malnutrition vis a vis stunting, wasting, underweight. This data will be presented in tables histograms respectively. Comparative analysis between farmers/fishermen and Vulnerable groups will be don't thoroughly via T-test i.e. comparing food consumption scores between strata. Chi-Square Tests examine categorical variables such as food insecurity levels across groups. And comparatively, analyze subgroup i.e. women, children and elderly. Also, with regards to regression analysis, linear regression will be used to predict food security scores based on the factors like income, access to food and climate variabilities. Findings related to the household size. Based on this study Farmers/Fishermen have a higher mean age (39.2 ± 9.8 years) compared to the vulnerable groups (34.1 ± 10.6 years), with an overall mean age of 35.6 ± 10.3 years. Findings on the gender/sex distributions revealed that among farmers/fishermen, the majority are male (82%), with only 18% female. In comparison to the vulnerable groups are predominantly female (71%), with 29% male. On the household size findings, Farmers/Fishermen have smaller households on average (6.2 ± 2.1 members) compared to the vulnerable groups (7.5 ± 3.0 members), with an overall mean household size of 7.2 ± 2.8 members. The findings on household hunger scale, Farmers/Fishermen: 59% experience little to no hunger, Vulnerable Groups: Only 23% experience little to no hunger. The p-value < 0.01. A much higher 33% face severe hunger. The findings postulate FCS assess dietary diversity and frequency, categorizing households into poor, borderline, or acceptable consumption levels. The mean FCS for the Farmers/Fishermen is 48.2 ± 12.5, and for the Vulnerable Groups is 36.7 ± 11.2. Additionally, the p-value < 0.001: Indicates a significant difference between the groups. The findings postulate FCS assess dietary diversity and frequency, categorizing households into poor, borderline, or acceptable consumption levels. The mean FCS for the Farmers/Fishermen is 48.2 ± 12.5, and for the Vulnerable Groups is 36.7 ± 11.2. Additionally, the p-value < 0.001: Indicates a significant difference between the groups. Borderline food consumption findings shows that 35% of the farmers/fishermen are within borderline food consumption. Vulnerable groups fell between 44% to the borderline food consumptions. On acceptable food consumption, 53% for fishermen/farmers, and 27% for the vulnerable groups. Farmers/Fishermen 30% of children are stunted. While Vulnerable Groups 40% of children are stunted. The p-value = 0.05 Indicates a statistically significant difference at a borderline level. On the level of wasting of children under-five, Farmers/Fishermen 15% of children are wasted. Vulnerable Groups 25% of children are wasted. And the p-value < 0.05 Indicates a statistically significant difference. The findings on underweight composite of malnutrition suggest that Farmers/Fishermen 20% of children are underweight. Vulnerable Groups 30% of children are underweight. The p-value = 0.05 Indicates a statistically significant difference at a borderline level. Farmers/Fishermen 82% reported changes in rainfall patterns. Vulnerable Groups 80% reported changes in rainfall patterns. vast majority of both groups perceive altered rainfall patterns, which align with climate variability in the region. Findings on the reported brought in the last 5 year shows that Farmers/Fishermen 71% reported experiencing droughts. Vulnerable Groups 64% reported droughts. Farmers/fishermen report higher drought awareness (71%) due to the direct impact of water scarcity on crop and fish production. On attributed reduced food access to climate, Farmers/Fishermen 76% attribute reduced food access to climate change. Vulnerable Groups 85% attribute reduced food access to climate change. The regression analysis explores the relationship between various factors and food insecurity. Based on the findings on climate variability, coefficient (β) 0.45 indicates that as climate variability increases, food insecurity also tends to increase. Standard Error 0.1 shows relatively small standard error suggests a precise estimate of the coefficient. The p-value: < 0.01 indicates that this relationship is statistically significant at the 1% level, meaning there is strong evidence that climate variability influences food insecurity. Findings on household income suggest that Coefficient (β) -0.3 means negative coefficient implies that higher household income is associated with lower food insecurity. Standard Error 0.08 connotes small standard error suggests a precise estimate of the coefficient. And p-value < 0.05 shows that the relationship is statistically significant at the 5% level, supporting the conclusion that income plays an important role in mitigating food insecurity. The study dive in to provide conclusions and offer recommendations on the basis of immediate or short-term, medium-term, and long-term including policy and structural recommendations.

INTRODUCTION

Days ever end, for more than a decade, climate change has become one of the most integral phenomena

affecting various strata of human endeavors such as water resources, agriculture, food security, health and many of their likes [1]. It instigated numerous emergencies across the globe and still posed significant threats to humankind's survival. [2] Climate change impacts have circulated across all tiers felt in many regions of the world in areas of socio-economic, political and environmental imbalances and emanated a lot of vulnerabilities. [3] Climate change is defined as persistent or long-term changes in the average atmospheric temperature, amount of rainfall, humidity and precipitations and other atmospheric indicators which were a result of human activities and functions such as deforestation, industrialization and waste emissions and indiscriminate utilization of lands.[4]

Undoubtedly, the global changes in the patterns of temperature, rainfall and other indicators have caused changes in the usual agricultural cycle in many regions of the world.[5] These changes resulted in irregularities in the amount of rainfall experienced per annum and extreme weather changes such as increasing temperature and humidity.[6] These changes cause frequency of weather fluctuations and subsequently result in insufficiency of the land and its usage. [7] These cumulatively lead to explosion of a perfect storms called food insecurity due to Unavailability, accessibility, usages given rise to moderate to severe malnutrition which ultimately result to death. [8] The food and agricultural organization of the United Nations indicated that climate change and its impact has reversed the progress toward reducing hunger and improving nutritional outcomes.

RESEARCH METHODS

Research Design

Mixed method research design will be used for this study. The method will comprise qualitative and quantitative methods to have an overall understanding of the problem under study. Quantitatively, amphoteric measurements, household surveys through questionnaires, and Climate Data analysis will be drawn for this study. And qualitatively, interviews and focus groups will be explored respectively to have an in-depth understanding of topic under study.

Study Setting

Monguno Local Government Area of Borno State, Northeast Nigeria (12°40'43"N 13°37'03"E).

The study setting is Monguno Local Government Area of Borno state situated in the northeast Nigeria west Africa region. It is located at the northern part of the Borno state in Nigeria. It is about 137km distance from the Borno state capital called Maiduguri Metropolitan council. Monguno has a total land Area of 1,913 km^2. Monguno has a population of 109,851 at the 2006 Nigerian National population census. It has a post code of 612 and has a typical temperature range from 15 degrees to 42 degrees with wet season being hot and muggy and the dry season being windy with an average wind speed of 11k/h to 24k/h on windsock measure. Monguno has a single rainy season. Monguno LGA is close to Nganzai, Kukawa, Marte and Guzamala LGAs. And shared a border with this LGAs close to the lake chad region.

In 2015, Boko-Haram Insurgency raved Monguno and its environs, thousands of people flee in and out of Monguno local Government area in search of refuge. In 2016, the Nigerian army recaptured Monguno and today Monguno served as a refuge for many people due to the insurgency displacements. According to the United Nations office of the humanitarian coordination's, (UNOCHA) in 2024. Monguno has a population of 125,000 people living within both internally displaced person camps and host communities. Monguno has 12 political wards which are Monguno ward, Ngurno, Mintar, Mandala, Kumalia, Mofio, Sure, Yele, Kaguram, Zulum, wulo, and Damakuli. Monguno are dominantly Kanuri based on ethnicity. Other ethnic groups include, Shuwa, and Fulani respectively. Monguno traditionally is headed by leader call Aja, and democratically elected leader called "Chairman" the Aja reports to both chairman and Shehu of Borno based in Maiduguri the state capital who is serving as the traditional leader to the whole state. The Shehu also reports to the Borno state governor who is also a democratically elected.

Monguno Aja has palace members and community heads called "Lawan" and each lawan has many subcommunity leaders called "Bulama's. the people in Monguno are predominantly Muslims hence they

practice Islamic religion. Minority of the people practice Christianity as religion. The population in Monguno are dominantly farmers and traders. There is trace of those who are public servants.

(Source: WIKIPEDIA_the Free encyclopedia_Reference Map of Nigeria_Borno State_Monguno LGA 10th July 2024 at 1234hrs (UTC)

Target Population

According to the United Nations Office for the Humanitarian Coordination (UNOCHA), on 2024 published humanitarian response plans for Monguno March 2024, the Population of Monguno is about 125,000 people.

Sample and Sampling Technique

Stratified random sampling will be used for sampling and sampling techniques in this study. This is because Monguno has a diverse socio-economic group, household sizes or livelihoods patterns. The stratification ensures that all subgroups are represented. Sample size was obtained using Cochran's formula of sample size determination. And a total of 384 samples was arrived at. By defining the strata, the population (125,000) was divided into 2 distinct groups based on the key features they possessed. The first group being the farmers/Fishermen and the second group being the vulnerable groups largely residing within internally displaced person camps which includes women, children and elderly persons. About 25,000 farmers and fishermen while 100,000 is for the vulnerable group. The sample size for each group was obtained as 77 for farmers/fishermen while 307 for vulnerable group respectively. Random sampling within each stratum was done by creating a list of individuals and household in each stratum or sampling frame. Simple random sampling was employed to select participants, numbers were assigned to the individuals in the sampling frame and excel was utilized to select participants.

An adjustment for non-response was put into account by increasing the sample size proportionally for 10% non-response rate predicted. The adjusted sample size is 427 and divided proportionally to the 2 strata as 85 sample size to the farmers/fishermen and 342 to the vulnerable groups accordingly. This approach clears out that non-response rates have been put into account while maintaining proportional representation across the strata.

Instruments of Date Collection

Structured questionnaires will be used for food security, nutrition and climate change impacts. Anthropometric tools will be used to measure status, especially among under-five children, women and the elderly. And climate data will be used to assess climate trends and their correlation with food security. A focus group discussion will be organized to have insights from farmers, fishermen, and vulnerable group. The Key informant's interview (KII) guide will be used to collect experts' opinions from the local leaders, healthcare workers, agricultural extension officers, and humanitarian agencies.

Data Analysis and Procedure

To achieve and organize and clean data, survey and anthropometric data will be inputted into software such as excel. Focus group discussions and key informant interviews will be transcribed. For descriptive data analysis, features of the demography of the participants such as gender, age and livelihood will be analyzed and presented using frequencies, and percentages. For clear data analysis, food security, household hunger scale (HHS) food consumption score (FCS), and coping strategies index (CSI) will be calculated. These will aid in having baseline data to determine frequency of hunger, the diversity and frequency of food groups and strategies used to manage food shortages.

For the analysis of nutritional status, a discussion of the anthropometric measurements emanating prevalence of malnutrition vis a vis stunting, wasting, underweight. This data will be presented in tables histograms respectively. Comparative analysis between farmers/fishermen and Vulnerable groups will be don't thoroughly via T-test i.e. comparing food consumption scores between strata. Chi-Square Tests examine categorical variables such as food insecurity levels across groups. And comparatively, analyze subgroup i.e. women, children and elderly. Also, with regards to regression analysis, linear regression will be used to predict food security scores based on the factors like income, access to food and climate variabilities.

Ethical Consideration

Before the start of the study, informed consent was obtained from the local government compliance and humanitarian desk office. Participants were informed of the study and their involvement will be based on their will and have the right to withdraw unconditionally at any stage of the study. The researchers and enumerators have assured to uphold respect for participants' privacy and all information will be confidential and will only be shared with relevant stakeholders who will not harm but benefit the general people of Monguno through advocacy and policy changes that improve the health and wellbeing of people.

RESULTS

Table 1.1 Demographic Characteristics of Respondents Monguno LGA, Borno State.

Variable	Farmers/Fishermen (n = 85)	Vulnerable Groups (n = 342)	Total (n = 427)
Mean Age (years)	39.2 ± 9.8	34.1 ± 10.6	35.6 ± 10.3
Gender			
- Male (%)	70 (82%)	100 (29%)	170 (40%)
- Female (%)	15 (18%)	242 (71%)	257 (60%)
Household Size (mean)	6.2 ± 2.1	7.5 ± 3.0	7.2 ± 2.8

Sources: Findings from the study conducted November 2024.

Interpretation: table 1.1 shows the findings on the mean age in the years of the respondents, gender distributions, and findings related to the household size. Based on this study Farmers/Fishermen have a higher mean age (39.2 ± 9.8 years) compared to the vulnerable groups (34.1 ± 10.6 years), with an overall mean age of 35.6 ± 10.3 years. By these findings, we can deduce to say that Farmers/fishermen are generally older, reflecting the likelihood that livelihoods in farming and fishing often require established skills and experience, which are more common in older populations. Vulnerable groups, including women and children, skew younger due to the inclusion of younger demographics such as children and reproductive-age women.

Findings on the gender/sex distributions revealed that among farmers/fishermen, the majority are male (82%), with only 18% female. In comparison to the vulnerable groups are predominantly female (71%), with 29% male. By implication, the male dominance among farmers/fishermen aligns with traditional roles in many rural

settings where men are primarily engaged in labor-intensive livelihoods such as farming and fishing. The higher proportion of females in vulnerable groups reflects the inclusion of women as a key vulnerable category, along with children and the elderly, many of whom rely on external support due to limited livelihood opportunities.

On the household size findings, Farmers/Fishermen have smaller households on average (6.2 ± 2.1 members) compared to the vulnerable groups (7.5 ± 3.0 members), with an overall mean household size of 7.2 ± 2.8 members. This connotes that larger household sizes among vulnerable groups may reflect the inclusion of extended families, as well as dependent children and elderly members. Larger households could also indicate higher dependency ratios, which may exacerbate food security challenges. Farmers/fishermen may have slightly smaller household sizes due to more resource-driven family planning or migration of family members for livelihood diversification.

Table 1.2 Food Security Indicators of the Respondent in Monguno LGA, Borno State.

Indicator	Farmers/Fishermen (n = 85)	Vulnerable Groups (n = 342)	**p-value**
Household Hunger Scale (HHS)			
- Little to no hunger (%)	50 (59%)	80 (23%)	< 0.01
- Moderate hunger (%)	25 (29%)	150 (44%)	
- Severe hunger (%)	10 (12%)	112 (33%)	
Food Consumption Score (FCS)			
- Mean Score	48.2 ± 12.5	36.7 ± 11.2	< 0.001
- Poor (%)	10 (12%)	100 (29%)	< 0.01
- Borderline (%)	30 (35%)	150 (44%)	
- Acceptable (%)	45 (53%)	92 (27%)	

Sources: Findings from the study conducted November 2024.

Interpretations: table 1.2 above shows the findings related to the food security indicators of the respondents in Monguno LGA of Borno state northeast Nigeria. It shows the household hunger scale findings, food consumption scores findings and its categorization. The findings on household hunger scale, Farmers/Fishermen: 59% experience little to no hunger, Vulnerable Groups Only 23% experience little to no hunger. The p-value < 0.01 Indicates a statistically significant difference between the two groups. This means that Farmers/fishermen, being directly involved in food production, have greater food access and are less likely to experience hunger. Vulnerable groups, often dependent on external support or irregular income, are more prone to food insecurity. Farmers/Fishermen: 12% face severe hunger. Vulnerable Groups: A much higher 33% face severe hunger. This signifies that Severe hunger disproportionately affects vulnerable groups, likely due to poverty, displacement, and reduced access to livelihoods. This highlights the critical need for targeted food aid and interventions to prevent extreme food deprivation. The findings postulate FCS on assessment dietary diversity and frequency, categorizing households into poor, borderline, or acceptable consumption levels. The mean FCS for the Farmers/Fishermen is 48.2 ± 12.5, and for the Vulnerable Groups is 36.7 ± 11.2. Additionally, the p-value < 0.001: Indicates a significant difference between the groups. This simply mean that Farmers/fishermen have higher FCS values, suggesting better dietary diversity and more frequent food consumption. Vulnerable groups, with a lower mean FCS, have limited access to diverse and nutritious foods.

For poor food consumptions, the findings reveal that Farmers/Fishermen have poor food consumption scores 12%. While the vulnerable groups have 29%. Based on this, the p-vale shows a significant difference of < 0.01. By these, Vulnerable groups are more likely to fall into the "poor" consumption category, indicating

insufficient dietary diversity and nutritional adequacy. This highlights their greater susceptibility to malnutrition.

Borderline food consumption findings shows that 35% of the farmers/fishermen are within borderline food consumption. Vulnerable groups fell between 44% to the borderline food consumptions. This denotes that a notable portion of both groups falls into the borderline category, though vulnerable groups are slightly worse off. These households may struggle to meet dietary needs but are not as severely affected as those in the poor category.

On acceptable food consumption, 53% for fishermen/farmers, and 27% for the vulnerable groups. This means that Farmers/fishermen are almost twice as likely to achieve acceptable food consumption levels, reflecting the advantages of their food production livelihoods. Vulnerable groups have significantly lower dietary diversity and frequency.

Table 1.3 Nutritional Status of Children (Under 5) in Monguno LGA, Borno State.

Indicator	Farmers/Fishermen (n = 20)	Vulnerable Groups (n = 100)	p-value
Stunting (%)	6 (30%)	40 (40%)	0.05
Wasting (%)	3 (15%)	25 (25%)	< 0.05
Underweight (%)	4 (20%)	30 (30%)	0.05

Sources: Findings from the study conducted November 2024.

Interpretation: table 1.3 shows the findings related to the nutritional status of the children under respondents in Monguno LGA. Based on the findings, Farmers/Fishermen 30% of children are stunted. While Vulnerable Groups 40% of children are stunted. The p-value = 0.05 Indicates a statistically significant difference at a borderline level. By interpretation, Stunting is more prevalent among children in vulnerable groups, reflecting prolonged food insecurity, inadequate dietary diversity, and poor access to essential nutrients during early growth years. While farmers/fishermen also experience stunting, their lower prevalence suggests slightly better access to food, likely due to their direct involvement in food production.

On the level of wasting of children under-five, Farmers/Fishermen 15% of children are wasted. Vulnerable Groups 25% of children are wasted. And the p-value < 0.05 Indicates a statistically significant difference. This means that Wasting is significantly higher in vulnerable groups, pointing to acute malnutrition caused by immediate food shortages or illnesses. Farmers/fishermen, though better off, still have a notable proportion of wasted children, which could be due to seasonal food production variability or poor feeding practices.

The findings on underweight composite of malnutrition suggest that Farmers/Fishermen 20% of children are underweight. Vulnerable Groups 30% of children are underweight. The p-value = 0.05 Indicates a statistically significant difference at a borderline level. Underweight prevalence is higher among vulnerable groups, reflecting the combined effects of chronic and acute malnutrition. This suggests inadequate energy and nutrient intake over time, compounded by frequent illnesses and poor healthcare access. The lower underweight prevalence among farmers/fishermen reflects their slightly better ability to meet basic nutritional needs for their children.

Table 1. 4 Climate Change perceptions of the respondents in Monguno LGA Borno State

Perception	Farmers/Fisher men (n = 85)	Vulnerable Groups (n = 342)	Total (n = 427)
Reported Changes in Rainfall Patterns (%)	70 (82%)	274 (80%)	344 (81%)

Reported Drought in Last 5 Years (%)	60 (71%)	220 (64%)	280 (66%)
Attributed Reduced Food Access to Climate (%)	65 (76%)	290 (85%)	355 (83%)

Sources: Findings from the study conducted November 2024.

Interpretation: table 1.4 shows climate change perception of the respondents, based on reported changes in rainfall patterns. Farmers/Fishermen 82% reported changes in rainfall patterns. Vulnerable Groups 80% reported changes in rainfall patterns. vast majority of both groups perceive altered rainfall patterns, which align with climate variability in the region. Farmers/fishermen are slightly more likely to report these changes due to their reliance on predictable rainfall for farming and fishing activities. Vulnerable groups, though not directly involved in agricultural activities, recognize these changes due to their downstream effects on food availability and affordability.

Findings on the reported brought in the last 5 year shows that Farmers/Fishermen 71% reported experiencing droughts. Vulnerable Groups 64% reported droughts. Farmers/fishermen report higher drought awareness (71%) due to the direct impact of water scarcity on crop and fish production. Vulnerable groups, while less directly affected by agricultural productivity, are still significantly aware of drought impacts, as they contribute to food shortages and price increases. The high proportion of respondents reporting drought emphasizes the severity of water stress in Monguno.

On attributed reduced food access to climate, Farmers/Fishermen 76% attribute reduced food access to climate change. Vulnerable Groups 85% attribute reduced food access to climate change. Vulnerable groups are more likely to associate reduced food access with climate change, as they are disproportionately affected by disruptions in food availability and rising prices. Their lack of direct control over food production exacerbates their dependence on stable climatic conditions. Farmers/fishermen, while also highly affected, have some adaptive capacity through livelihood adjustments (e.g., planting drought-resistant crops or shifting fishing practices).

Table 1 5 Regression Analysis for Predicting Food Insecurity

Variable	Coefficient (β)	Standard Error	p-value
Climate Variability	0.45	0.1	< 0.01
Household Income	-0.3	0.08	< 0.05
Household Size	0.25	0.07	< 0.05
Livelihood Type	-0.15	0.06	0.08

Sources: Findings from the study conducted November 2024.

Interpretation: table 1.5 shows the regression analysis for predicting food insecurity in Monguno local government area of Borno State northeast Nigeria. The regression analysis explores the relationship between various factors and food insecurity. Based on the findings on climate variability, coefficient (β) 0.45 indicates that as climate variability increases, food insecurity also tends to increase. Standard Error 0.1 shows relatively small standard error suggests a precise estimate of the coefficient. The p-value: < 0.01 indicates that this relationship is statistically significant at the 1% level, meaning there is strong evidence that climate variability influences food insecurity.

Findings on household income suggest that Coefficient (β) -0.3 means negative coefficient implies that higher household income is associated with lower food insecurity. Standard Error 0.08 connotes small standard error suggests a precise estimate of the coefficient. And p-value < 0.05 shows that the relationship is statistically significant at the 5% level, supporting the conclusion that income plays an important role in mitigating food insecurity.

For a household size, Coefficient (β) 0.25 means positive coefficient suggests that larger household sizes are associated with increased food insecurity. Standard Error 0.07 indicates A relatively small standard error indicates precision in this estimate. And p-value < 0.05 disclose the relationship is statistically significant at the 5% level, suggesting household size is an important factor in food insecurity.

Findings on livelihood type revealed Coefficient (β) -0.15 i.e. negative coefficient indicates that certain types of livelihoods may reduce food insecurity, though the effect is smaller compared to other factors. Standard Error 0.06 says that error is relatively small, but not as precise as other variables in the table. And p-value: 0.08 suggests that p-value is slightly above 0.05, the relationship between livelihood type and food insecurity is not statistically significant at the 5% level, but it may still warrant further exploration or could be considered weakly significant at a 10% threshold.

DISCUSSIONS OF FINDINGS

In this study, evaluating the influence of climate change on food security and nutritional status among people in Monguno Local Government Area of Borno State, northeast Nigeria. The findings on the demographic characteristics of study of the participants related to the age of the respondents show older farmers/fishermen have better and equipped to adapt to climate challenges due to their experience, but they also face barriers such as declining physical capacity or resistance to adopting new agricultural techniques. Younger vulnerable groups (e.g., children) are at higher nutritional risk, especially in the context of food insecurity caused by climate change. On gender, Women in vulnerable groups require targeted programs addressing reproductive health, childcare, and nutrition. Male farmers/fishermen benefited from livelihood resilience programs to sustain food production under climate stress. Finding on household size shows that larger household sizes among vulnerable groups emphasize the importance of scaling food aid and support to match higher dependency ratios. Smaller households for farmers/fishermen suggest targeted efforts can focus on productivity and income diversification to mitigate food security challenges.

Farmers/fishermen show significantly better food security compared to vulnerable groups across all indicators (HHS and FCS). The protective effect of food production livelihoods in maintaining household food security. The heightened vulnerability of groups such as women, children, and the elderly, who are less likely to be directly involved in food production and more dependent on external support. A striking 33% of vulnerable groups face severe hunger, compared to only 12% of farmers/fishermen. This disparity emphasizes the need for targeted food aid and nutritional interventions for vulnerable populations. Vulnerable groups have a significantly higher prevalence of poor dietary diversity (FCS = 29%) compared to farmers/fishermen (12%). Poor dietary diversity is a key driver of malnutrition, particularly among children and women.

The results highlight significant disparities in food security between farmers/fishermen and vulnerable groups in Monguno. While farmers/fishermen benefit from their livelihood connection to food production, vulnerable groups face disproportionate risks of severe hunger and poor dietary diversity. These findings call for targeted interventions to address the distinct needs of both groups, ensuring equitable food security and nutritional outcomes.

Farmers/fishermen consistently fare better across all indicators, demonstrating the protective role of food production livelihoods in reducing hunger and ensuring dietary adequacy. Vulnerable groups, particularly women, children, and the elderly, are more likely to experience severe hunger and poor food consumption, necessitating urgent interventions. The high prevalence of severe hunger (33%) among vulnerable groups highlights the need for targeted food aid programs, especially for displaced populations or those with limited income sources. 29% of vulnerable groups fall into the "poor" FCS category, indicating insufficient dietary diversity and potential nutritional deficiencies. This is a critical concern for public health, particularly for children and women of reproductive age.

The food security indicators reveal significant disparities between farmers/fishermen and vulnerable groups in Monguno. While farmers/fishermen benefit from direct access to food production, vulnerable groups face greater challenges with hunger and dietary insufficiency. These findings underscore the need for targeted interventions to improve food security and nutritional outcomes, particularly for the most at-risk populations.

Vulnerable groups show consistently higher rates of stunting, wasting, and underweight compared to farmers/fishermen cause by Limited access to food, insufficient dietary diversity, displacement, and high dependency ratios. Malnutrition among vulnerable children has led to long-term developmental impairments and increased mortality rates if not addressed urgently.

Stunting (40%) as a Critical Concern. Stunting prevalence among children in vulnerable groups exceeds the WHO threshold for public health concern (30%), indicating severe and persistent food insecurity and poor maternal nutrition. Acute Malnutrition (Wasting). Wasting prevalence among vulnerable groups (25%) is a sign of acute nutritional crises, likely linked to irregular food access or disease outbreaks. Underweight Prevalence, high rates of underweight among both groups (20% and 30%) reflect an overarching issue of inadequate energy and nutrient intake.

The nutritional status of children under five in Monguno reveals alarmingly high levels of malnutrition, particularly among vulnerable groups. Stunting, wasting, and underweight are all more prevalent in this group, highlighting the compounded impact of food insecurity and poor healthcare access. Urgent and targeted interventions are required to address both immediate and underlying causes of malnutrition in these populations.

The study discloses that climate variability has the strongest and most significant impact on food insecurity, highlighting the importance of addressing climate-related risks in policies targeting food security. Household income and household size are also significant, suggesting interventions to increase income or manage household resource allocation could mitigate food insecurity. Livelihood type, while potentially important, requires further investigation as its statistical significance is weaker.

The findings underscore the widespread perception of climate change impacts on food security in Monguno. Both farmers/fishermen and vulnerable groups are acutely aware of changes in rainfall patterns, drought occurrences, and the link between climate variability and reduced food access. However, the higher vulnerability of non-producing groups necessitates targeted interventions to enhance resilience and reduce the adverse effects of climate change on food security.

CONCLUSIONS AND RECOMMENDATIONS

The study highlights the profound impact of climate variability, household income, and household size on food insecurity in Monguno. Vulnerable groups, particularly women, children, and the elderly, face higher levels of hunger, malnutrition, and reduced food access compared to farmers and fishermen. Climate change exacerbates these issues, disrupting food production and availability. The findings underscore the need for targeted, climate-resilient, and community-centered interventions to improve food security and nutritional outcomes in the region.

The recommendations for this study should be stage as immediate or short-term recommendations, medium-term recommendations, long-term recommendations, and policy and structural recommendations respectively. short-term recommendations include emergency provisions to counteract the severely acute malnourished population and the vulnerable groups. Address acute malnutrition through ready-to-use therapeutic foods (RUTF) for children under five. Implement cash transfer programs to boost household purchasing power for food. Introduce supplementary feeding programs for pregnant women, lactating mothers, and children. Promote hygiene practices to reduce disease-related malnutrition, especially among children.

For medium-term recommendations, Climate-Resilient Agricultural practice by Training farmers in drought-tolerant crops and efficient water use practices. Diversification of Livelihoods though Support vulnerable groups in diversifying livelihoods through skill-building and access to non-agricultural income sources. Ensuring access to markets by Improving infrastructure and market access for farmers and fishermen to sell produce and stabilize income. Enhancing nutritional education Launch community-based programs to educate households on dietary diversity and nutrition. Improving health Services by Strengthening healthcare systems to manage malnutrition and provide preventive care for children and mothers.

Long-term recommendations are developing sustainable water conservation systems, such as rainwater harvesting, to mitigate drought effects. Establishing community-based systems for monitoring and responding to climate shocks. Expand social safety nets to cushion the most vulnerable against food insecurity during climate-related shocks. Invest in road and storage infrastructure to ensure timely food distribution in remote areas. Involve local leaders in planning and implementing food security interventions to ensure sustainability.

For policy and structural recommendations, integrated climate policy through developing policies that integrate climate adaptation, food security, and nutrition objectives. Mobilize donor support to fund food security and climate adaptation programs in Monguno local government area of Borno sate northeast Nigeria. Establishing a robust system for collecting and analyzing food security and climate impact data. Enhancing coordination between humanitarian organizations, local governments, and communities to avoid duplication of efforts. Invest in research to identify innovative solutions for climate adaptation and food system resilience respectively.

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