ISRG Journal of Arts, Humanities and Social Sciences (ISRGJAHSS)

ISRG PUBLISHERS
Abbreviated Key Title: ISRG J Arts Humanit Soc Sci
ISSN: 2583-7672 (Online)
Journal homepage: https://isrgpublishers.com/isrgjahss
Volume – II Issue-I (January- February) 2024
Frequency: Bimonthly

A cross-sectional assessment of the impact of contemporary disasters on food security in Adamawa State, Northeastern Nigeria

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| **Received:** 15.01.2024 | **Accepted:** 18.01.2024 | **Published:** 20.01.2024

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Abstract

This study assessed the impact of contemporary disasters such as insurgency, banditry, kidnappings, herdsmen attacks herein grouped under insecurity and covid-19 pandemic on food security in Adamawa State. The household was used as the unit of sampling in each of the 21 local government areas of Adamawa State. A stratified sampling technique was adopted in administration of the semi-structured questionnaires. A total of three (3) local government areas from each of the three regions of Adamawa state were selected for this study. For convenience sake, only 50 households in each of the 9 local government headquarters selected for this study were randomly administered with questionnaire. Thus, a sample size of 450 households participated in this study. Descriptive and inferential statistics using the Microsoft Excel and SPSS software were used in analyzing the data from the field. A composite index of food security, along with COVID-19 stringency index, and Insecurity Perception Index for each of the local government area under study were developed and used in the analysis. Regression analysis highlights the significant role of both insecurity perceptions and stringent COVID-19 measures in predicting the Food Security Index. Notably, stringent pandemic responses correlate with higher food security scores. The Composite Food Security Index emphasizes the need for context-specific interventions, considering the diverse challenges faced by different localities.

Keywords: *Food security, Contemporary disasters, Insecurity perception, Stringency index Adamawa State*

Introduction

Disasters, ranging from conflicts to contagious pandemics, have historically exerted significant repercussions on global food security (FAO, 2002; Bora et al., 2011). Such crises disrupt food production, transportation networks, and agricultural assets,

DOI: 10.5281/zenodo.10539158

leading to far-reaching implications for food security. Of particular concern are the cumulative effects of contemporary disasters, including insurgency, banditry, kidnappings, herdsmen attacks, and the COVID-19 pandemic. These disruptive events are known to undermine various aspects of human life, including agriculture, and subsequently impact food security.

In response to these challenges, food security has been defined as the sustained availability of sufficient, safe, and nutritious food that aligns with dietary needs and preferences for a healthy life (FAO, 2002; Bora et al., 2011). The ability to attain food security is intricately tied to agricultural productivity, which can be severely hampered by disasters. Insurgency, for example, disrupts essential agro-based livelihoods, leading to internal and external displacements of rural populations (Bora et al., 2011).

Recent research delves into the impact of insurgency on food security in conflict-affected regions. The Boko Haram insurgency, a longstanding and violent conflict, has resulted in not only loss of life and displacement but also severe disruptions to agricultural activities, leading to diminished food production and availability in the affected regions. Dunn's study (2018) reveals how the Boko Haram insurgency in Northeast Nigeria led to childhood wasting. Agofure et al. (2022) and Ezeokana et al. (2022) highlight how residents of conflict-affected areas have experienced acute food insecurity, marked by depleted staple foods, deteriorating nutritional status, and soaring food prices. Furthermore, the work of Titus (2023) explores the nexus between food security and the Boko Haram insurgency. This disruption to agricultural activities has been further intensified by the inability of communities to access their farmlands and engage in daily agricultural routines, as emphasized by participants in Otovwe et al.'s (2022) study. The impact of such conflicts extends to farm capital destruction, rendering food production difficult, if not impossible, in affected areas.

Likewise, the rampant menace of herdsmen banditry exacerbates food scarcity, particularly in the northwestern and southwestern Nigeria. The intricate relationship between banditry, kidnappings, and food scarcity is evident in studies by Beetseh et al. (2021) and Shankar (2022). Similarly, Olaoye and Ojo (2023) examine the impact of armed banditry on food security in Igangan, Ibarapa North of Oyo State. The surge in herdsmen, banditry, and kidnapping incidents has globally and locally affected food security by causing shortages and disrupting economic indicators like GDP and NDP. Crisis areas experience disruption in crop cultivation due to attacks, as herdsmen encroach on farmland, jeopardizing food production. This crisis threatens state security, hampers economic productivity, and exacerbates food shortages. The escalation of Fulani herdsmen conflict has been attributed to land access conflicts and religious motives. The study by Otekunrin and Adebowale (2021) thus, underscores the imperative of good governance to address the underlying causes of these conflicts, encompassing economic, political, and agricultural support for the affected communities. Shanka's study (2022) further reinforces this viewpoint by stressing the potential of a comprehensive governance approach, coupled with enhanced security measures, to foster the reactivation of large-scale farming and ultimately ensure food sufficiency.

Adding to these challenges, the advent of the COVID-19 pandemic has emerged as a global crisis with deep-seated impacts on food security especially in sub-Saharan Africa. The ability of this contagious pandemic measures to disrupt food security cannot be underestimated. The COVID-19 pandemic's influence on food security is a therefore a prevailing concern. Within Nigeria, studies highlight its impact on household food security and dietary diversity (Munonye et al., 2022; Ibukun & Adebayo, 2021; Bwala et al., 2023). The studies by Amare et al. (2020) and Ibukun and Adebayo (2020) reveal that the pandemic has disrupted livelihoods, led to income loss, and caused escalating food prices, consequently pushing households deeper into the realm of food insecurity. The repercussions of the pandemic are especially pronounced among vulnerable populations, such as households reliant on non-farm enterprises, those lacking adequate social support, and those residing in conflict-prone regions. Internationally, scholars investigate the pandemic's repercussions on global food systems (Balana et al., 2023; Amare et al., 2020). Stringent measures such as social distancing and lockdowns, adopted to contain the spread of the virus, adversely affect agricultural activities and supply chains (Bruck & dErrico, 2019). With a global history marred by similar events, conflicts and pandemics manifest as complex challenges to the sustainability of food production and access.

Adamawa State, situated in Nigeria's northeast region, stands as a case study representative of these issues. Since 2014, insurgency has plagued the state's northern districts, and the subsequent spillover of banditry, kidnappings, and herdsmen attacks has affected other local governments. To compound these challenges, the COVID-19 pandemic emerged in 2020, exacerbating an already fragile situation. Given the increasing recognition of contemporary disasters' impacts on food security and the scarcity of studies addressing these issues in the region, this investigation seeks to illuminate their consequences in Adamawa State.

By delving into the intricate relationship between insurgency, banditry, kidnappings, herdsmen attacks, the COVID-19 pandemic, and food security, this study aims to shed light on the multifaceted dynamics that shape these interrelated phenomena. The study, therefore, addresses the overarching question: How do contemporary disasters, namely insecurity (occasioned by insurgency, Fulani herdsmen banditry), and the COVID-19 pandemic stringency, impact food security in Adamawa State? Through systematic investigation and analysis, this study endeavors to contribute critical insights for informed policy formulation and decision-making to alleviate food insecurity in the state.

Materials and Methods

The Study Area

The study focuses on Adamawa State located on Latitude, 9° 12' 12.59"N; Longitude, 12° 29' 43.40"E (Figure 1), in the northeastern region of Nigeria. Adamawa State has 21 local government areas, comprising Madagali, Michika, Mubi-North, Mubi-South, Maiha, Hong, Gombi, Song, Girei, Yola-North, Yola-South, Fufore, Toungo, Ganye, Jada, Mayo-Belwa, Demsa, Numan, Lamurde, Guyuk, and Shelleng. Adamawa state is the 13th least populous state in Nigeria, with a population of 3,168,273 million as of 2006 (National Population Commission, 2006). However, the National Bureau of Statistics (NBS) estimates that the population of Adamawa State as of 2023 is 5.4 million. This estimate is based on various demographic factors, including birth rates, death rates, and migration patterns. The population is predominantly young, with over 50% being under the age of 15 (National Population Commission, 2006).

DOI: 10.5281/zenodo.10539158

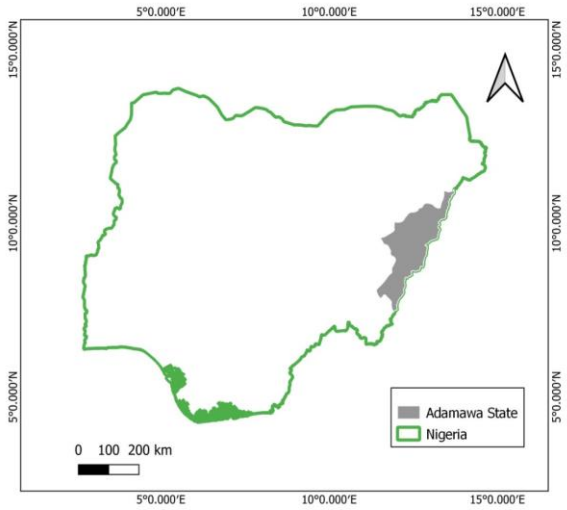

Figure 1: Nigeria showing Adamwa

Adamawa state's economy is largely dependent on agriculture, with approximately 80% of the population engaged in farming and livestock rearing (Oladele et al., 2022). Major crops cultivated include rice, beans, groundnuts, maize, and cassava, while livestock rearing focuses on cattle, goats, and sheep (Adamawa State Planning Commission, 2023). Trade plays a vital role in the state's economy, with Yola serving as a major commercial center for the region. The city is a hub for both local and international trade, with goods from neighboring countries like Cameroon and Chad being transported through Yola (Britannica, 2023).

Despite its abundant natural resources and diverse economic activities, Adamawa state faces several challenges that hinder its economic development. These include:

1. Conflict: The Boko Haram insurgency has significantly impacted the state's economy, displacing people, disrupting agricultural activities, and damaging infrastructure (Emergency Food Security Assessment, 2019).
2. COVID-19 Pandemic: The pandemic had a significant impact on the state's economy, leading to job losses, reduced income, and disruption of supply chains (World Bank, 2022). The pandemic also exacerbated food insecurity in the state, as disruptions in agricultural production and market access led to higher food prices (World Food Programme, 2020).
3. Climate Change: Increasing droughts and unpredictable rainfall patterns have negatively affected agricultural production and food security in the state (Emergency Food Security Assessment, 2019).
4. Limited Infrastructure: Poor road networks and inadequate electricity supply hinder the development of industries and trade in the state (Public Finance Database, 2023).

Despite these challenges, Adamawa state has the potential for significant economic growth. The state's fertile land, abundant water resources, and strategic location present promising opportunities for development in agriculture, agro-processing, and tourism. Addressing the security and infrastructure challenges, along with investing in climate-smart agriculture and pandemic preparedness, will be crucial for attracting investments and unlocking the state's economic potential.

Selection of Study Sites

The study area was divided into three regions: Northern Adamawa comprising Madagali, Michika, Mubi-North, Mubi-South, and Maiha; Central Adamawa Comprising Hong, Gombi, Song, Girei, Yola-North, Yola-South, and Fufore; and Southern Adamawa comprising Toungo, Ganye, Jada, Mayo-Belwa, Demsa, Numan, Lamurde, Guyuk, and Shelleng. Three (3) local government areas were selected from each of the regions accordingly: Madagali, Michika, and Mubi-North in Northern Adamawa; Gombi, Yola-North, and Yola-South in Central Adamawa; and Mayo-Belwa, Numan and Guyuk in Southern Adamawa. These areas were selected due to their significance in representing various socio-economic and geographical characteristics that influence food security.

Research design

A causal research approach was used in this study. The unit of assessment used is the household. For convenience sake, only households located in the local government headquarters were sampled to avoid data redundancy. The four dimension of food insecurity (Availability, Access, Utilization and Stability) were assessed based on the food security scales that include: Household Dietary Diversity Scale (HDDS), Household Coping Strategy Index (HCSI), Household Food Consumption Score (HFCS), and Household Hunger Scale (HHS). The two indicators of the impact of disasters, comprising insecurity and COVID-19 were measured in terms of a Household Perception of Security, and number days with no access to agro-based activities by households occasioned by the COVID-19 lockdowns respectively.

Data collection

A structured household survey was conducted to collect data on dietary diversity, food consumption patterns, and coping strategies. The instrument of data collection is a questionnaire designed to get responses on the variables used in this study. The survey instrument included questions related to the frequency and types of food consumed, household coping mechanisms during periods of food shortage, and perceptions of household members regarding food security.

Data analysis

Descriptive statistics comprising the frequency, and simple percentage were used. Furthermore, the regression analysis was also used to determine the impact of insecurity and COVID-19 pandemic on food security in the study area.

Indicators for the Food Security Composite Index

1. Household Dietary Diversity Score (HDDS): HDDS was calculated based on the variety and types of food consumed by households. A higher HDDS indicates greater dietary diversity, contributing positively to the food security composite index.
2. Household Food Consumption Score (HFCS): HFCS reflects the quantity and quality of food consumed by households. This indicator is crucial for understanding the nutritional aspects of food security.
3. Household Coping Strategy Score (HCSS): HCSS measures the extent to which households resort to coping strategies during periods of food shortage. It helps capture the adaptive capacity of households facing food insecurity.

Normalization and Weighting

Each indicator was normalized to bring them to a common scale between 0 and 1. It involved identifying the minimum and maximum index scores of each household for use in the

DOI: 10.5281/zenodo.10539158

normalization equation. The normalization equation is given by: Normalized Index = Index – min(index)/max(index) – min(index)

After normalization, weights were assigned to each indicator based on their relative importance. The weights were determined through consultation with experts, stakeholders, and a literature review.

Composite Index Calculation

The Composite Food Security Index (CFSI) was calculated by aggregating the normalized and weighted scores of HDDS, HFCS, and HCSS. The formula used was:

CFSI = (w1*HDDS) + (w2*HFCS) + (w3*HCSS)

where w1, w2, and w3, are the weights assigned to HDDS, HFCS, and HCSS, respectively. Weights were assigned to each category based on their relative importance, thus: HDDS is given 40% weight, HFCS 30%, and HCSS 30%. The results of the CFSI were interpreted based on a predefined scale, with higher scores indicating better food security.

Indicator of Insecurity, and COVID-19

COVID-19 as a disaster was measured in terms of the Stringency index: This composite measure quantifies the severity of government-imposed restrictions, such as lockdowns, mask mandates, and travel bans. The stringency index is a composite measure developed by the Oxford COVID-19 Government Response Tracker (OxCGRT) to quantify the strictness of government interventions implemented in response to the COVID-19 pandemic (Hale, et.al., 2021). It provides a snapshot of the overall severity of control measures in place at any given time. The index is based on nine individual indicators, each capturing a specific aspect of government policy response to COVID-19. These indicators include:

1. School closures: Full or partial closure of schools and universities.
2. Workplace closures: Full or partial closure of workplaces.
3. Public events: Cancellation or restriction of public events.
4. Gathering restrictions: Limitations on the size of public gatherings.
5. Stay-at-home orders: Mandatory restrictions on movement and travel.
6. Public transport closures: Closure or partial closure of public transport.
7. Internal border controls: Restrictions on internal movement between regions.
8. International travel controls: Restrictions on international travel.
9. Mask mandates: Mandatory wearing of masks in public spaces.

Ordinal scores: Each indicator is assigned an ordinal score ranging from 0 (no restrictions) to 100 (strictest restrictions). The specific score assigned depends on the severity and scope of the implemented measures.

Mean score: The stringency index at any given time is calculated as the mean score of the nine individual indicators. This provides a single, standardized measure that allows for comparisons across different contexts.

Smoothing: The OxCGRT also calculates a "smoothed" version of the stringency index, which uses a moving average to reduce noise and day-to-day fluctuations. This smoothed index is typically used for longer-term trend analysis.

Result and Discussion

Analysis of Contemporary Disasters and Composite Food Security Index

Table 1, titled "Food Security Assessment by Local Government Area" provides a comprehensive overview of the cross-sectional assessment of the impact of contemporary disasters on food security in Adamawa State. The Local Government Areas (LGAs) under consideration are Madagali, Michika, Mubi-North, Gombi, Yola-North, Yola-South, Mayo-Belwa, Numan, and Guyuk.

Table 1 shows that Madagali and Michika exhibit a High Insecurity Perception (HIP), indicating that residents perceive a heightened sense of insecurity. Despite this, the Stringency Index (SI), representing the COVID-19 measures, is relatively moderate at 23.9 and 25.1, respectively. The Food Security Index (FSI) for both areas is below 10, signifying challenges in food security, which may obviously be attributed to the perceived insecurity, leading to reduced farming activity, and thus food shortages at household levels.

Mubi-North and Gombi both have a Medium Insecurity Perception (MIP), suggesting a moderate level of insecurity perception among residents. The Stringency Index is slightly higher for Gombi (35.2) compared to Mubi-North (32.7), indicating relatively stringent COVID-19 measures. However, the FSIs for both areas hover around 9, implying a somewhat stable food security situation despite the perceived and actual insecurity.

Yola-North exhibits a Low Insecurity Perception (LIP), indicating a lower perceived insecurity among residents. However, it has the highest Stringency Index (67.6), reflecting very stringent COVID-19 measures. This stringent approach may contribute to the higher Food Security Index of 11.65, suggesting challenges in food security despite the lower perceived insecurity. Yola-South, with a similar Low Insecurity Perception, also faces challenges with a Food Security Index of 11.13.

Mayo-Belwa, Numan, and Guyuk share a Low Insecurity Perception, reflecting a lower perceived insecurity among residents. The Stringency Index varies moderately, with Mayo-Belwa at 35.8, Numan at 54.6, and Guyuk at 30.3. Despite the variations, the Food Security Index for all three areas hovers around 10, suggesting a relatively stable food security situation despite perceived insecurity and varying COVID-19 measures.

The results highlight the intricate interplay between perceived insecurity, COVID-19 measures, and food security. Stringent COVID-19 measures, as seen in Yola-North, might inadvertently impact food security, emphasizing the need for targeted interventions. The lower perceived insecurity in Mayo-Belwa, Numan, and Guyuk doesn't guarantee a trouble-free food security situation, indicating the multifaceted nature of challenges. The study underscores the necessity for a nuanced understanding of the factors affecting food security in diverse regions, considering both perceived and actual insecurities.

Table 1

Food Security Assessment by Local Government Area

LGA	IPI	SI	FSI
Madagali	HIP	23.9	7.89

DOI: 10.5281/zenodo.10539158

Michika	HIP	25.1	8.53
Mubi-North	MIP	32.7	9.76
Gombi	MIP	35.2	9.28
Yola-North	LIP	67.6	11.65
Yola-South	LIP	50.5	11.13
Mayo-Belwa	LIP	35.8	9.77
Numan	MIP	54.6	10.75
Guyuk	LIP	30.3	10

Note: LGA = Local Government Area; IPI = Insecurity Perception Index; SI = Stringency Index; FSI = Food Security Index

Analysis of the Impact of Contemporary Disasters on Composite Food Security Index

Regression analysis was carried out to investigate the impact of contemporary disasters on food security in Adamawa state. The results of the regression analysis presented in Table 2, revealed that both the perceived security and the stringency of measures significantly influence the food security status. The model was highly significant ($F = 48.753$, $p < .001$), indicating that the predictors collectively contributed significantly to the variance in the Food Security Index, which explains a substantial proportion of the variance in food security (R Square = .942). The results suggest that when people perceive higher security and experience more stringent measures, the food security index tends to be higher. This implies that a sense of safety and strict adherence to measures can positively impact food security in the context of contemporary disasters in Adamawa state.

Table 2

Regression Coefficients of Stringency Index and Insecurity Perception Index on Food Security Index

			95%CI			
Variable	**Beta**	**SE**	**LL**	**UL**	**β**	**ρ**
Stringency Index	.06	.01	.18	1.02	.67	.001
Insecurity Perception Index	.59	.17	.03	.08	.41	.014
R^2	.94	.33				
Adjusted R^2	.92					

Note: CI = confidence interval; LL = lower limit; UL = upper limit; SE = Standard Error

Discussion of Findings

The first analysis revealed intricate relationships between perceived insecurity, COVID-19 measures, and food security across the nine (9) local government areas. The stark variations observed in the Insecurity Perception Index (IPI), Stringency Index (SI), and Food Security Index (FSI) underscore the need for tailored interventions. Madagali and Michika, with a High Insecurity Perception (HIP), exhibit challenges in food security despite moderate SI values. This suggests that actual security concerns might be overshadowed by the broader implications of COVID-19 measures on the availability and access to food. Similarly, areas with Medium Insecurity Perception (MIP) like Mubi-North and Gombi face relatively stable food security situations, showcasing the resilience of communities amidst perceived insecurities. Yola-North, despite a Low Insecurity Perception (LIP), grappled with the highest SI during the pandemic period in 2020, which could be have impacted on its FSI. This reinforces the idea that stringent COVID-19 measures, while essential for public health, can inadvertently exacerbate food security challenges in both the short and long run. Mayo-Belwa, Numan, and Guyuk, all with a Low Insecurity Perception, exhibit a stable food security situation, emphasizing the potential of communities to withstand challenges.

The second analysis delves into the specific impact of contemporary disasters, represented by the IPI and SI, on the Composite Food Security Index. The regression analysis reveals a highly significant model, suggesting that both the Insecurity Perception Index and Stringency Index significantly contribute to predicting the Food Security Index. The positive coefficient for the Stringency Index indicates that more stringent COVID-19 measures are associated with higher Food Security Index scores. This seemingly counterintuitive relationship could be explained by the fact that stringent measures, while impacting daily life, might contribute to a more controlled environment that ensures the availability and distribution of food resources. The coefficient for the Insecurity Perception Index is also positive, indicating that areas with higher perceived insecurity tend to have lower Food Security Index scores. This suggests that the perception of high insecurity might have promoted stress and anxiety leading to inability to access farms and limits the transportation goods to and from the hinterlands, that could be the cause of the lower food security index in these areas.

Conclusion

In conclusion, the study unravels the intricate dynamics between food security, and two contemporary disasters, comprising perceived insecurity, and COVID-19 measures, The findings highlight the need for targeted interventions that consider the multifaceted nature of challenges faced by different localities. As we navigate the complex landscape of disaster management and public health, a holistic approach that integrates security perceptions, pandemic response, and food security strategies is imperative for building resilience in communities. The study not only contributes to the empirical understanding of these dynamics in Adamawa State but also provides a basis for informed policy decisions aimed at enhancing overall societal well-being.

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