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Nutritional Vulnerability of Displaced Persons: A Study of Food Security and Access in Kumba Municipality, Cameroon

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Abstract: Concerns about global food insecurity have been growing, particularly in low- and middle-income countries. This study aimed to assess the determinants of food security among internally displaced persons (IDPs)—people who have been forced to flee their homes due to conflict, natural disasters, or other crises—and their children under five, as well as the influence on their nutritional status. Using random sampling, the caregivers of IDPs and children under five in households were included in the study. The caregivers were interviewed using a validated structured questionnaire, while nutritional assessments of both children and adults were conducted through anthropometric and clinical evaluation methods. The findings revealed a high prevalence of food insecurity, with 97.6% of IDP households experiencing some degree of insecurity. Additionally, 28.3% of the surveyed households had high dietary diversity. Among the children, 50.6% were stunted, over a third were underweight, and 15.8% were wasted, indicating severe nutritional deficiencies. Among adults, 28.4% were overweight or obese, while a significant number were underweight. Multiple linear regression analysis showed that the caregivers' monthly salary and the average amount spent on food were associated with a decrease in food insecurity. Conversely, large household sizes and coping strategies employed to mitigate food insecurity were linked to increased food insecurity. In conclusion, the study highlights a high prevalence of food insecurity among IDP households, forcing families to adopt coping strategies, mainly through dietary modifications. This, in turn, contributes to low dietary diversity and poor nutritional status, with children suffering from underweight, wasting, and stunting. These findings underscore the urgent need for comprehensive interventions, including the distribution of food vouchers, cash transfers, food banks, and support for home gardening and small-scale farming, as well as education on meal rationing, meal planning, and family planning services. Addressing the root causes of food insecurity—namely low household income and large family sizes—can improve access to nutritious food and ensure the health and well-being of IDPs. Furthermore, addressing food insecurity within this vulnerable group is critical to the broader goals of planetary health, as it highlights the intersection of human health, social equity, and environmental sustainability. By promoting sustainable food systems and supporting vulnerable populations, these interventions can contribute to the resilience of both communities and eco-systems in the face of ongoing global challenges.

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1. Introduction

Concerns about global food insecurity have been on the rise in recent years [1,2]. In 2015 and 2016, the recorded prevalence of global food insecurity was seen to rise from 797 million to 815 million (10.8% and 11.0% of the global population), respectively. Of the number recorded, 70 million individuals were internally displaced [3]. A study carried out by the World Food Programme revealed that acute food insecurity has been on the rise, experiencing a surge since 2019 from 135 million to 345 million individuals [4]. As stated by the Food and Agricultural Organization of the United Nations (FAO), "food security exists when people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [3]. Therefore, a lack of physical and economic access to wholesome food, preventing optimal activity and bodily functioning, renders a person food insecure. For food security to be guaranteed, there must be a stable supply of food that is economically accessible and can also be utilized by the individuals in the population [5]. Poverty is directly linked to food insecurity, and a community's level of development and industrialization can significantly impact its food security status [6].

Internally displaced persons (IDPs), as defined by the UN refugee agency, are individuals who flee their homes due to conflict, violence, persecution, or disasters but remain within their nation's boundaries [7,8]. Globally, IDPs are regarded as a vulnerable demographic group who have been forced to escape their homes due to conflict, natural disaster, or other humanitarian crises. While natural disasters have been known to be a major player in global internal displacement, it is crucial to recognize that human action, or lack thereof, often plays a significant role in causing starvation and famine. In the case of civil conflicts, which often result in internal displacement, this is observed through processes such as siege warfare, destruction of farmlands, restricted movement, and destruction of infrastructure. Here, food is used as a weapon of war so that communities cannot feed themselves [9]. The concept behind starving an opponent is to disrupt livelihoods and food supply and cause disorders that further increase the vulnerability of the affected populations and disturb economies in such regions [9]. This displacement of populations significantly hinders their access to important resources, including healthy, diverse meals; this goes a long way to negatively impact their nutritional status and overall health and well-being [10]. Even in the presence of seemingly available nutritious foods, IDPs most often lack economic access to foods rich in essential nutrients due to high levels of poverty, as they have been forced to abandon all sources of livelihood in search of safety [6]. Food accessibility relies on factors such as individual food choices, food prices, environmental safety, and physical availability of food. Ensuring a substantial balance between food production, distribution, allocation, and economic factors to guarantee sufficient nutrition is a longstanding critical problem that does not only affect crisis-struck regions and remains a global challenge, even in the present day [11].

Lack of money, limited variety in diets, and poor access to nutritious foods all cause food insecurity among IDPs. These problems, rooted in systemic inequalities, harm human well-being and weaken community strength [12]

Food insecurity calls for sustainable solutions that balance people's nutritional needs with protecting the environment. Poor dietary variety and reliance on low-nutrition foods worsen malnutrition and harm ecosystems through unsustainable food production. Poor

dietary variety limits the intake of essential vitamins and minerals required for growth, immunity, and overall well-being, leaving populations more vulnerable to disease and poor health outcomes [13,14]. At the same time, producing such low-nutrient foods often involves unsustainable agricultural practices, including monocropping, overuse of chemical fertilizers, and deforestation [15]. These methods degrade soil quality, reduce biodiversity, and contribute to resource depletion, such as freshwater scarcity. Over time, this dual impact creates a vicious cycle where compromised health and damaged ecosystems exacerbate each other, threatening long-term sustainability and planetary health [16].

The study aligns with the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being). It calls for systems that ensure fair access to good nutrition while supporting a healthy environment. These solutions aim to reduce ecological harm while building sustainability for future generations.

Developed countries have achieved considerable advancements towards achieving the Sustainable Development Goal (SDG) 2 of ending hunger by 2030. However, developing countries like Cameroon have consistently found it challenging to meet this crucial target.

The ongoing Anglophone crises in the northwest and southwest regions of Cameroon, which began in October of 2016, have increasingly deterred food security intervention in the country. A large proportion of individuals experiencing food insecurity are IDPs. The crisis has ensured that most of these individuals are left destitute. This has also led to reduced workforce capacity as many adults struggle to engage in economic activities due to their displacement [10].

The influx of IDPs into the Kumba Municipality is primarily due to the more severe forms of armed conflicts in the surrounding rural areas. Kumba, being an urban town, presents unique challenges compared to the original rural settlements of these individuals as they often experience increased competition over resources, limited access to livelihood opportunities, and a higher cost of living [10]. All of these contribute to exacerbating their vulnerability to food insecurity. Food insecurity might influence the nutritional status of affected individuals. However, the nutritional status of IDPs has been linked to various socio-economic factors, such as poverty, unemployment, and marginalization, all of which only further increases their susceptibility to food insecurity [8]. Studies have revealed concerning findings on the nutritional status of IDPs in urban areas. They indicate that populations often exhibit poor nutritional outcomes, such as micronutrient deficiencies, stunting and wasting among children, and a high rate of anemia among vulnerable groups [6]. The compromised nutritional status among IDPs is a result of the disruption of livelihoods and lack of access to adequate foods, leading to compromised dietary diversity and quality. Reduced dietary diversity contributes to the deficiency of essential nutrients that are necessary for growth, development, and overall health [8].

The World Food Programmme's Emergency Food Security Assessment (EFSA), a descriptive cross-sectional study conducted in 2019, indicated that almost half (49%) of IDPs residing in the southwest region of Cameroon were food insecure. This assessment, however, was conducted shortly after the declaration of an emergency response and before the implementation of interventions aimed at facilitating the food security needs of vulnerable displaced populations [17]. While various food aid efforts have been implemented to mitigate food insecurity among IDPs, the situation in this study area remains precarious, with many individuals still struggling to meet their basic nutritional needs. The study aimed to assess the impact of the emergency response and interventions carried out to address the food security in the study area by exploring the prevalence and determinants of food insecurity among IDP adults and children under five years and the influence on nutritional status.

2. Materials and Methods

2.1. Study Design, Setting, and Variables

This descriptive cross-sectional, community-based study investigated food insecurity among IDPs residing in the Kumba Municipality, Cameroon. The cross-sectional design was chosen due to its suitability for collecting relevant data within a limited timeframe (December 2022 to May 2023) and its alignment with the study's objectives. The study targeted IDPs living in Kumba I, II, and III districts. Kumba was chosen due to its proximity to areas experiencing greater social and political instability, leading to the influx of IDPs seeking refuge in a relatively safer environment. This physical manifestation of food insecurity challenges faced by the forced displaced individuals made Kumba an ideal location for the study. This study focused on households with IDPs in Kumba Municipality. Participants included consenting adults over 18 years old and children under 5 years old residing within these households.

A minimum of 230 participants were required for the study. This employed the use of the formula $n = Z^2 \times P(1 - P)/d^2 \times k$, where n = minimum sample size, Z = confidence value = 1.96 for a conf. level of 95%, P = estimated prevalence of key indicator (food insecurity among IDPs) from a study carried out in the northwest region of Cameroon (91.6%) [18], e = error margin (0.05), and K = design effect (2) and 10% adjustment for attrition added.

Firstly, seven (7) streets were randomly selected from the three different districts in Kumba. A proportionate sampling method was used to select participants from the various selected streets (Calculated for each street's proportion contribution to the total study population. Then, the sample size required from each health area was determined based on the proportion. Participants were randomly selected from each street until the predetermined sample size from each street was accomplished). Secondly, purposive sampling was used to select IDP households. Data collection occurred from March to May 2023 (3 months). The participants were identified with the help of the community members who helped identify IDP households and conducted the fieldwork. Before recruitment, consultations were held with community leaders to ensure cultural sensitivity and ethical approval. Within the selected streets, IDP households with children under 5 years old were purposefully sampled. In addition, only one child was randomly selected in households where there was more than one child under 5 years. An adult caregiver responsible for food preparation (mostly female) were sampled in each household.

2.2. Data Collection Tool and Procedures

Data were collected using an interviewer-led questionnaire conducted by the principal investigator. It was divided into five sections: sociodemographic characteristics, anthropometric characteristics, dietary diversity, the Household Food Insecurity Access Scale (HFIAS), and Coping Strategies Indices (CSI). The dietary diversity section comprised 17 food groups, which were later recategorized into 9 broader groups for analysis: starchy staples, green leafy vegetables, vitamin A-rich fruits/vegetables, other fruits/vegetables, organ meats, meat/poultry/fish, eggs, legumes/nuts/seeds, and milk/milk products. The 9 food groups were considered by putting more emphasis on micronutrient intake and on economic access to food [19]. The questionnaire used in this study was adapted from that used in a previous study carried out in the northwest region [17].

Household food security was evaluated using the HFIAS 9-item questionnaire designed according to FAO and USAID's Food and Nutrition Technical Assistance (FANTA) project suggestions [20], which asks specific questions associated with the experience of food insecurity that occurred during the previous 30 days. The questionnaire commences with question regarding anxiety of not having enough food, then proceeds to indicators of

food insufficiency: these included a decrease in the quality and variety of food, reduction in the quantity of food per meal, and lastly, skipping meals and spending part of or the whole day being hungry. Based on the HFIAS questionnaire scores, the scores ranged from 0 to 27. The higher the score, the more food insecure the household. The households were finally grouped into four categories of food access insecurity: secure (0–1), mildly food insecure (2–7), moderately food insecure (8–14), and severely food insecure (15–27).

The CSI was adopted from the coping strategies index field method's manual second edition by FAO, USAID, and CARE [18]. A total of 14 coping strategies were included in the CSI section. These 14 were divided into 4 sections, namely, dietary change, increase in short-term food supply, decrease in numbers of people, and rationing strategy. Participants were asked which coping strategy(ies) they had employed in the last 7 days and the number of times they had used the strategy(ies). The caregivers provided answers to the questions in the questionnaire. All anthropometric parameters of both the caregivers and children were measured by a nurse, along with the clinical observations for anemia. The children's weight and height/length were measured, recorded, and evaluated alongside their ages to observe wasting, stunting, and underweight. Their Mid-Upper Arm Circumference (MUAC) was also measured to investigate malnutrition rates in the children. The caregivers assisted in guiding the children so that accurate readings of the children's anthropometric measurements could be obtained. The caregivers' weight and height were measured and recorded to obtain their BMI, and their waist and hip circumference were also recorded to obtain the waist/hip ratio, which was used to assess body fat distribution. These were all measured using standard protocols [21]. Both the interviews and data collection were obtained and registered on the same day for each household. The questionnaire was validated prior to data collection to ensure clarity, thoroughness, and simplicity. The procedure started with the introduction to community leaders, known locally as quarter heads. The purpose of the research was explained to them, their permission was obtained to access the community, and a community mobilizer was assigned by the quarter-head of each street to help in the recruiting of IDPs for the study. Participants were also informed of the purpose of the study, and the consent of interested adult caregivers were obtained.

2.3. Data Management and Analysis

The data were manually checked for completeness and then coded. Subsequently, the data were entered into Epi info version 7.2.5 (Centers for Disease Control and Prevention, company, 2021) and exported to Microsoft Excel 2010 for cleaning, ensuring accuracy and consistency. The cleaned data were then imported into Statistical Package for Social Sciences (SPSS) version 27.0 for further analysis. Exploratory data analysis was conducted to identify missing values and outliers. Descriptive statistics, including frequencies, percentages, and minimum and maximum values, were presented in tables and figures to summarize the quantitative data. For dietary diversity, to create the dietary diversity score of study participants, all food types were categorized into 9 different food groups using Microsoft Excel. Households that consumed 6 or more food groups were considered to have high dietary diversity. Those that ate 4–5 food groups consumed a moderately diverse diet, while those that consumed 3 food groups or less were considered to have poor dietary diversity. The Household Food Insecurity Access Scale (HFIAS) responses were used to classify the households into four categories: food secure (0–1), food insecure with mild hunger (2–7), food insecure with moderate hunger (8–14), and food insecure with severe hunger (15–27). Analysis of the anthropometric parameters was carried out using the WHO Anthro 1.0.4. Z-scores were involved in the analysis of height-for-age, weight-for-height, and weight-for-age [22]. Children considered to be malnourished had a z-score < -2, and severe malnutrition was indicated at a z-score < -3 [22]. The National Centre for

Health Statistics (NCHS) table was used in analyzing arm circumferences. To identify factors significantly associated with household food insecurity, bivariate analyses were conducted using Pearson's Chi-square test, and for cells smaller than 5, Fischer's exact test was used. Independent variables with $p \leq 0.20$ at the bivariate analysis level or those scientifically proven to affect food security were entered into multiple linear regressions to control potential confounders. Variables with a p-value lower than 0.05 were considered to have a statistically significant association with food insecurity. The basic assumptions of regression analysis and multicollinearity of the data were checked before bivariate and multivariate analyses were carried out.

2.4. Ethical Considerations

Administrative clearance was obtained from the regional delegation of Public Health for the southwest region of Cameroon. Ethical clearance was obtained from the institutional review board of the University of Buea. Written consent was obtained from the caregivers of households that participated in the study, permitting participation of themselves and their children. Precautions to ensure anonymity and confidentiality were put in place.

3. Results

3.1. Sociodemographic Characteristics of Adult Participants

The study included 247 households, that is 247 caregiver–child under 5 years pairs. Most caregivers were female (70.0%), while 58.7% of the children were male. The sampled adult caregivers were between the ages of 18 and 70 years, and more than half (57.1%) of the children were between 25 and 59 months. The proportion of unemployed participants increased from 26% before displacement to 31.7% after displacement, with a noticeable drop in farm workers from 52.6% before displacement to 31.8% after. In addition, over 85.1% of the households earned less than FCFA 50,000 (USD 100) monthly, and 96.3% spent less than FCFA 50,000 (USD 100) on food monthly. Less than half (47.4%) of the adult sample population were married, and 69.2% of the households had a household size of 5 or more household members. The study also reported the duration of displacement, which spanned up to 6 years, with most of the participants (93.1%) reporting a decrease in food accessibility compared to their pre-displacement situations (Table 1).

Table 1. Sociodemographic characteristics of the study sample.

Variable Category	Frequency	Percentage
Adult's Sex		
Female	173	70.0
Male	74	30.0
Adult's Age (Years)		
18–34	123	49.8
35–54	107	43.3
55–70	17	6.9
Child's Sex		
Female	102	41.3
Male	145	58.7
Child's Age (Months)		
3–11	40	16.2
12–24	66	26.7
25–59	141	57.1
Nationality		
Cameroonian	237	96.0
Foreign nationals	10	4.0

Table 1. *Cont.*

Variable Category	Frequency	Percentage
Current Occupation		
Businessperson	21	8.5
Farmer	94	38.1
Public/Civil Servant	2	0.8
Work in the Private Sector	14	5.7
Unemployed	78	31.7
Other Occupation	38	15.2
Occupation before displacement		
Businessperson	17	6.9
Farmer	130	52.6
Public/Civil servant	7	2.8
Work in the Private Sector	21	8.5
Unemployed	64	26
Other Occupation	8	3.2
Monthly income		
USD 30–60	94	38.1
USD 61–100	116	47
USD 101–200	34	13.8
USD 201–300	3	1.2
Money spent on food monthly		
USD 20–60	213	86.2
USD 60–100	25	10.1
USD 101–620	9	3.6
Level of education		
FSLC	81	32.8
O-Level	39	15.8
A-Level	12	4.9
Bachelors	16	6.5
No Formal Education	48	19.4
Others	51	20.6
Marital status		
Single	78	31.6
Married	117	47.4
Divorce	1	0.4
Widowed	26	10.5
Cohabitation	25	10.1
Number of household members		
2–4 persons	76	30.8
5–7 persons	144	58.3
More than 7 persons	27	10.9
Duration of displacement		
Less than 1 year	58	23.5
1–4 years	130	52.6
5–6 years	59	23.9
Consider food to be more accessible now		
Yes	17	6.9
No	230	93.1

3.2. Household Food Insecurity

Food insecurity was assessed using the HFIAS, and the findings revealed that 97.6% of respondents were food insecure and 2.4% were food secure. Of the food insecure participants, 13.4% were mildly food insecure, 36.0% were moderately food insecure, and 48.2% were severely food insecure (Figure 1).

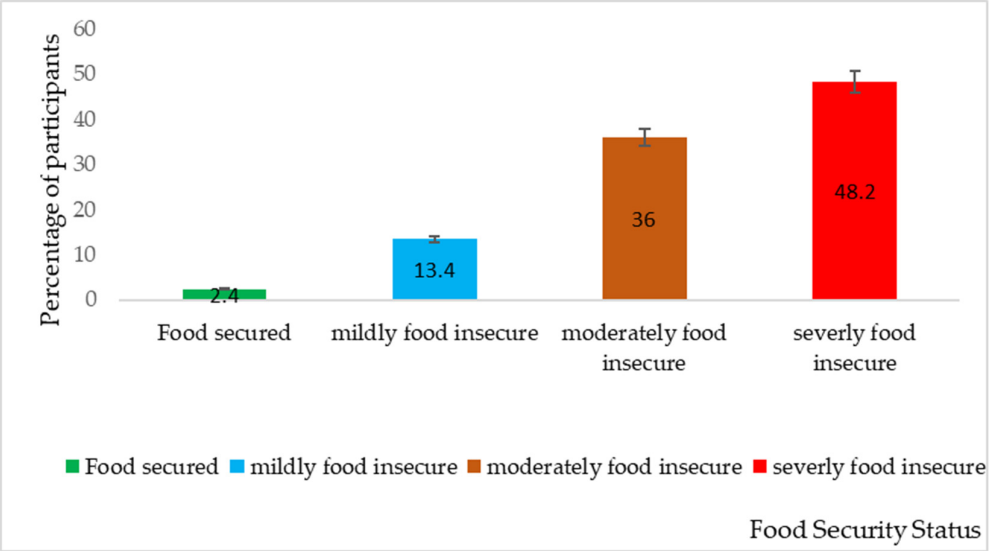

Figure 1. Household food security of surveyed IDP households in the Kumba Municipality (*n* = 270).

3.3. Coping Strategies Among IDPs

The most used coping strategies were dietary changes, with 98.4% of the households consuming less variety of foods and 97.5% relying on less preferred, less expensive foods. The least utilized coping strategies were sending household members to beg (8.9%) and not feeding and non-working members of the household (4.8%) (Table 2). On average, 97.9% of the households used dietary changes, rationing strategies (52.2%), strategies to increase the short-term supply of food (34.1%), and decreased the number of people in the household (28.2%).

Table 2. Coping strategies used by households in Kumba Municipality, Cameroon (*n* = 270).

Coping Strategy	Frequency	Percentage
Dietary change		
Rely on less preferred and less expensive foods	241	97.5
Consume less variety of food	243	98.4
Increase short-term household food availability		
Borrow food from a friend or relative	37	15.0
Purchase food on credit	140	56.7
Depend on aid from outside the household	119	48.2
Gather wild food, hunt, or harvest immature crops	48	19.4
Consume seed stock held for next season	77	31.2
Decrease number of people		
Send household members to beg	22	8.9
Send household members to eat elsewhere	117	47.4
Rationing strategy		
Limit portion size at mealtimes	219	88.7
Restrict consumption by adults for small children to eat	201	81.4
Feed working members of HH at the expense of non-working members	12	4.8
Ration the money you have and buy prepared food	182	73.7
Spend an entire day without eating	31	12.5

3.4. Household Dietary Diversity

Cereals emerge as the most consumed group (85.4%), with a significant portion of the household reporting to have eaten a type of cereal in the last 24 h. This was followed by non-vitamin A-rich vegetables (76.5%), then red palm products (64.8%). The least consumed

food groups were milk and milk products (10.1%), organ meat (7.3%), and vitamin A-rich vegetables and tubers (5.3%).

These food groups were then recategorized into nine broader groups for analysis: starchy staples, green leafy vegetables, vitamin A-rich fruits/vegetables, other fruits/vegetables, organ meats, meat/poultry/fish, eggs, legumes/nuts/seeds, and milk/milk products. The HDDS findings revealed that 28.3% of participants consumed 6 or more food groups, 50.6% consumed 4–5 food groups, and 21.1% consumed only 1–3 food groups.

3.5. Nutritional Status of IDP Adults

The nutritional status of caregivers was assessed among adults; less than half (49.8%) had normal BMI, 21.9% were underweight, 23.9% were overweight, and 4.5% were obese. Additionally, the assessment of waist circumference of the caregivers indicated that 37.2% of caregivers were overweight/obese and 62.8% were normal. The waist/hip ratio showed that 48.6% were at moderate to high risk of obesity, while 51.4% had normal waist/hip ratios. One-quarter (25.1%) of caregivers had clinical signs of anemia (Table 3).

Table 3. Nutritional status of caregivers in Kumba Municipality (n = 247).

Nutritional Status	Frequency	Percentage
Adult BMI		
Underweight	54	21.9
Normal	123	49.8
Overweight	59	23.9
Obese	11	4.5
Total	247	100
Waist Circumference		
Normal	155	62.8
Overweight	53	21.5
Obese	39	15.8
Total	247	100
Waist/Hip ratio		
Low risk	127	51.4
Moderate	56	22.7
High risk	64	25.9
Total	247	100
Anemia		
No	185	74.9
Yes	62	25.1
Total	247	100

3.6. Nutritional Status of IDP Children

Nutritional assessment of the children revealed that 37.7% suffered from moderate acute malnutrition and 3.2% were living with severe acute malnutrition. Height-for-age assessment disclosed that a quarter (25.5%) of the children were moderately stunted, and an almost equal number (25.1%) were severely stunted. Also, it was seen that 12.2% of the children were severely undernourished for their age, 5.5% were underweight from their weight-for-age, and 1.2% were possibly overweight. Regarding wasting prevalence, the analysis showed that 2.8% of the children suffered from severe wasting and 12.9% were wasted, indicating severe nutritional deficiencies. It also suggested that 5.3% were overweight and 2.8% were obese (Table 4).

Table 4. Nutritional status of internally displaced persons' children in Kumba Municipality (n = 270).

Nutritional Status	Frequency	Percentage
Child's MUAC		
Severe acute malnutrition	8	3.2
Moderate acute malnutrition	93	37.7
Normal	146	59.1
Height-for-Age (Stunting)		
Normal	122	49.4
Moderately stunted	63	25.5
Severely stunted	62	25.1
Weight-for-Age (Underweight)		
Severely undernourished for age	30	12.2
Underweight for age	63	25.5
Normal	151	61.1
Possibly overweight	3	1.2
Weight-for-height (Wasting)		
Severe acute malnutrition	7	2.8
Moderate acute malnutrition	32	12.9
Normal	188	76.1
Overweight	13	5.3
Obese	7	2.8

Sociodemographic factors associated with food insecurity were determined using Pearson's Chi-square test. The findings showed that current occupation (X^2 = 17.187, $p \leq 0.001$), occupation before displacement, (X^2 = 17.190, p = 0.004), monthly income (X^2 = 69.96, p = 0.001), money spent on food monthly (X^2 = 112.737, p = 0.0001), level of education (X^2 = 37.390, p = 0.001), and persons who considered food less available at the time of the study (X^2 = 56.080, p = 0.001) were all significantly associated with food insecurity (Table 5).

Table 5. Sociodemographic determinants of food insecurity among households of internally displaced households.

Socio-Demographic Characteristics	Total Number	Food Security			
		Food Secure	Food Insecure	Chi-Square	p-Value
		n (%)	n (%)		
Sex					
Female	173	4 (1.6)	169 (68.4)	0.033	0.855
Male	74	2 (0.8)	72 (29.2)		
Age (Years)					
18–34	123	2 (0.8)	121 (49.0)	2.750	0.600
35–54	107	4 (1.6)	103 (41.7)		
55–70	17	0 (0)	17 (6.9)		
Child's Sex					
Female	102	3 (1.2)	99 (40.1)	0.192	0.661
Male	145	3 (1.2)	142 (57.5)		
Child's Age (Months)					
3–11	40	1 (0.4)	39 (15.8)	0.332	0.847
12–24	66	1 (0.4)	65 (26.3)		
25–29	141	4 (1.6)	137 (55.5)		

Table 5. *Cont.*

Socio-Demographic Characteristics	Total Number	Food Security			
		Food Secure	Food Insecure	Chi-Square	*p*-Value
		n (%)	*n* (%)		
Nationality					
Cameroonian	237	6 (2.4)	231 (93.5)	0.259	0.610
Foreigner	10	0 (0.0)	10 (4.0)		
Current Occupation					
Businessperson	21	2 (0.8)	19 (7.7)	17.187	<0.001
Farmer	94	0 (0.0)	94 (38.1)		
Public/Civil Servant	2	0 (0.0)	2 (0.8)		
Work in the Private Sector	14	2 (0.8)	12 (4.9)		
Unemployed	64	0 (0.0)	78 (31.7)		
Other Occupation	52	2 (0.8)	36 (14.4)		
Occupation before displacement					
Businessperson	17	1 (0.4)	16 (6.5)	17.190	0.004
Farmer	130	0 (0.0)	130 (52.6)		
Public/Civil Servant	7	0 (0.0)	7 (2.8)		
Work in the Private Sector	21	4 (1.6)	17 (6.9)		
Unemployed	64	1 (0.4)	63 (25.5)		
Other Occupation	8	0 (0.0)	8 (3.2)		
Monthly Income (FCFA)					
15,000–30,000	94	0 (0.0)	94 (38.1)	69.960	<0.001
30,001–50,000	116	0 (0.0)	116 (46.9)		
50,001–100,000	34	4 (1.6)	30 (12.1)		
100.000+	3	2 (0.8)	1 (0.4)		
Money Spent on Food Monthly (FCFA)					
10,000–30,000	213	0 (0.0)	213 (86.2)	112.737	<0.001
30,001–50,000	24	1 (0.2)	24 (9.7)		
50,001+	9	5 (2.0)	4 (1.6)		
Level of Education					
No Formal Education	48	0 (0.0)	48 (19.4)	37.390	<0.001
FSLC	80	1 (0.4)	80 (3.2)		
O-Level	39	0 (0.0)	39 (15.7)		
A-Level	12	0 (0.0)	12 (4.9)		
Bachelors	16	4 (2.4)	12 (4.9)		
Others	51	1 (0.4)	50 (20.2)		
Marital Status					
Single	78	0 (0.0)	78 (31.6)	5.469	0.240
Married	117	3 (1.2)	114 (46.1)		
Divorce	1	0 (0.0)	1 (0.4)		
Widowed	26	1 (0.4)	25 (10.1)		
Cohabitation	25	2 (0.8)	23 (9.3)		
Number of Household Members					
2–4 persons	76	2 (0.8)	74 (29.9)	0.271	0.870
5–7 persons	144	3 (1.2)	141 (57.1)		
More than 7 persons	27	1 (0.4)	26 (10.5)		
Duration of Displacement					
Less than 1 year	58	1 (0.4)	57 (23.1)	2.692	0.260
1–4 years	130	5 (2.0)	125 (50.6)		
5–6 years	59	0 (0.0)	59 (23.9)		
Consider food to be more available now					
Yes	17	5 (2.0)	12 (4.9)	56.080	<0.001
No	230	1 (0.4)	229 (92.7)		
Total	247	6 (2.4)	241 (97.6)		

For cells smaller than 5, Fischer's exact test was used.

3.7. Nutritional Status and Food Insecurity

The association between nutritional status/dietary diversity and food insecurity among IDPs in the Kumba municipality is shown in Table 6. The study found a statistically significant relationship between food insecurity and the following anthropometric parameters: Adult BMI (X = 20.635, $p \leq 0.0001$), Child's WAZ (X = 15.327, $p = 0.002$), and also the Dietary Diversity Score (X = 15.549, $p \leq 0.0001$).

Table 6. Association between nutritional status and food insecurity among internally displaced persons.

Nutritional Status	Total Number	Food Security		Chi-Square	*p*-Value
		Food Secure *n* (%)	Food Insecure *n* (%)		
BMI of caregivers					
Underweight	54	0 (0.0)	54 (21.9)	20.635	<0.001
Normal	123	0 (0.0)	123 (49.8)		
Overweight	59	4 (1.6)	55 (22.3)		
Obese	11	2 (0.8)	9 (3.6)		
Waist Circumference of caregivers					
Normal	155	1 (0.4)	154 (62.3)	7.044	0.030
Overweight	38	2 (0.8)	36 (20.6)		
Obese	54	3 (1.2)	51 (14.6)		
Waist/Hip ratio caregivers					
Low risk	127	2 (0.8)	125 (50.6)	5.727	0.060
Moderate	56	0 (0.0)	56 (22.7)		
High risk	64	4 (1.6)	60 (24.3)		
Anemia					
No	185	6 (2.4)	179 (72.5)	2.061	0.150
Yes	62	0 (0.0)	62 (25.1)		
Child's MUAC					
Severe acute malnutrition	8	0 (0.0)	8 (3.2)	4.254	0.120
Moderate acute malnutrition	93	0 (0.0)	93 (37.7)		
Normal	146	6 (2.4)	140 (56.7)		
Child's HAZ					
Severely stunted	62	0 (0.0)	119 (25.1)	3.088	0.214
Moderately stunted	63	3 (1.2)	63 (24.3)		
Normal	122	3 (1.2)	59 (28.5)		
Child's WHZ					
Severely Malnourished	7	0 (0.0)	7 (2.8)	5.489	0.241
Normal	188	5 (2.0)	215 (87.0)		
Overweight	13	0 (0.0)	13 (5.3)		
Obese	7	1 (0.4)	6 (2.4)		
Child's WAZ					
Severely undernourished	30	2 (0.8)	28 (11.3)	15.327	0.002
Underweight for age	63	1 (0.4)	62 (25.1)		
Normal	151	2 (0.8)	149 (60.3)		
Possible overweight	3	1 (0.4)	2 (0.8)		
DDS food group					
Low dietary diversity (≤3)	52	0 (0.0)	52 (21.1)	15.549	<0.001
Moderate dietary diversity (4–5)	125	0 (0.0)	125 (50.6)		
High dietary diversity (≥6)	68	6 (0.0)	64 (25.9)		

For cells smaller than 5, Fischer's exact test was used.

Multiple linear regression was computed to explore the determinants of food insecurity among IDP adults and children under five in the Kumba municipality. Three models were used, and each model was placed into an equation to estimate whether or not each category had an independent effect to food insecurity. Model 1: social demographic variables;

Model 2: nutrition diversities and coping strategies; Model 3: anthropometric variables. The estimates in the findings revealed that, for every one standard deviation increase in the monthly salary of caregivers, there is an associated 0.30 decrease in food insecurity ($\beta = -0.303$, $p < 0.001$); also, for every one standard deviation increase in monthly average money spent on food ($\beta = -0.443$, $p < 0.001$) and dietary diversity ($\beta = -0.342$, $p < 0.001$), there is an associated 0.44 and 0.34 decrease in food insecurity, respectively. Conversely, for every one standard deviation increase in the family size among households ($\beta = 0.186$, $p < 0.001$) and coping strategies employed to mitigate food security, mainly through dietary modification, ($\beta = -0.226$, $p < 0.001$), there is a 0.18 and 0.22 increase in food insecurity, respectively. The model explains the 55.7% variance in food insecurity (Table 7).

Table 7. Results of multiple linear regression on the determinants of food insecurity among IDPs in Kumba municipality ($n = 247$).

Variable	Std. Error	Standardized Coefficients	R^2	t	*p*-Value
Age of the caregivers (year)	0.023	0.016	0.491	0.343	0.732
Child age (months)	0.016	0.011		0.237	0.813
Monthly salary of the caregivers	0.000	−0.303		−3.906	<0.001
Monthly average money spends on food	0.000	−0.443		−5.640	<0.001
Family size	0.148	−0.186		3.885	<0.001
Duration of displacement (Years)	0.013	−0.051		−1.083	0.280
CSI group	0.041	0.382	0.348	6.993	<0.001
DDS Score 17	0.139	−0.342		−6.265	<0.001
BMI	0.170	−0.293	0.146	−2.385	0.400
Waist Circumference	0.844	−1.281		−0.843	0.417
HIP Circumference	1.854	0.851		0.813	0.451
Waist/hip ratio	80.480	0.548		0.754	0.673
MUAC	0.151	0.040		0.422	0.540
Head Circumference	0.080	−0.040		−0.614	0.868
MUAC child	0.335	−0.014		−0.166	0.167
Childs BMI	0.225	−0.151		−1.386	0.378
HAZ	2.080	0.645		0.883	0.465
WHZ	0.938	0.186		0.732	0.392
WAZ	3.191	−0.613		−0.858	0.395
BAZ	1.996	0.420		0.852	0.400

CSI = Coping strategy index, DDS = dietary diversity score.

4. Discussion

The study aimed to explore the determinants of food insecurity among IDP adults and children under five years and the influence on nutritional status. In the survey of IDPs in this conflict region of Cameroon, the findings revealed a high prevalence of food security, with 97.6% of IDP households experienced some degree of food insecurity. Additionally, 48.2% of the households experienced severe food insecurity. This could be explained by the fact most of the households earned less than FCFA 50,000 (USD 100) monthly, spent less than FCFA 30,000 (USD 60) on food monthly, and had high family sizes. The current finding also reveals that monthly income plays a crucial role in reducing food insecurity, with every 1 standard deviation increase in income resulting in a corresponding 30% decrease in food

insecurity. Higher salaries for the caregivers will allow for the allocation of more financial resources towards purchasing food and meeting other basic needs. Similar findings have revealed that a decrease in income leads to an increase in food insecurity, highlighting the direct relationship between income and food security [23]. Similarly, Swann showed that negative income shocks increase the probability of being food insecure [24]. The findings also revealed the fact that larger family sizes resulted in an associated increase in food insecurity. This is especially the case if there is no similar increase in income or food resources. The combination of low income and significant financial burden due to large family sizes is critical in understanding the severity of food insecurity faced by these households, as it emphasizes the lack of financial resilience needed to access adequate and nutritious food [25]. This low income and food access deprivation with relatively high family sizes causes financial strain and limited resources for purchasing adequate and diverse foods for the entire family. The findings of this current study are in line with a preceding study conducted in another conflict-affected region; the northwest region of Cameroon, which reported an overall prevalence of food insecurity among IDPs at 91.6% [17]. In addition, similar findings have been reported in another study carried out in Kenya on IDPs camps, indicating that most of the participants (71.7%) lived in food-insecure households [26].

Most of the participants have been displaced from their homes for one or more years. This might have also contributed to the extreme level of food insecurity recorded in this study. This prolonged period of displacement likely supports food insecurity as they experience continuous loss of access to stable income and agricultural activities that previously contributed to household food security. The IDPs left behind their sources of livelihood (more than half of them were farmers before displacement), and most of them lack access to nearby lands for farming. This therefore not only limits their financial access but also their reachability to foods, therefore hindering their overall access to sufficient food. Interestingly, the relationship between displacement and food insecurity is not unidirectional. Research shows that food insecurity can contribute to housing instability [27]. This creates a cycle where displacement leads to food insecurity, which in turn leads to further instability and displacement. Contrary to this study is a pre-COVID study carried out by the World Food Programme in 2019, which reported an overall prevalence of food insecurity among IDPs in the southwest region to be 49%, with 41% being mild and moderately food insecure and 8% severely food insecure [28]. This discrepancy could be explained by the fact that food prices had experienced a surge since 2022, while there has been no corresponding rise in monthly income, making it more difficult for households to acquire sufficient food. This is supported by the fact that the COVID-19 pandemic disrupted supply chains, making food limited, and hence more expensive. Also, more forced migration has been recorded in the last 6 years to this study, predisposing a larger number of people to the perils present in internal displacement. It is also worth noting that this present study was carried out at the peak of the lean season (data were collected between March and April). There is usually less food available during this season [15], further restricting the accessibility of these individuals to food, as opposed to the World Food Programme's study, which was carried out in January, when households still had food stores from the previous farming season [29]. This shows the importance of timing in assessing food insecurity. This seasonal variation in food availability further causes spikes in food prices and is a significant factor contributing to the observed differences in food insecurity levels across the studies.

Also, many households reported to make use of dietary changes to cope with food insecurity as opposed to using strategies that involved increasing the short-term supply of food and decreasing the number of household members, which were the least utilized, respectively. The reason for these coping strategy choices could be attributed to the fact that

they perceived dietary changes to be less severe when compared to the other strategies. A preceding study carried out in Nigeria revealed a similar result, with eating less expensive and less preferred food and reducing portion sizes being the most common strategies used in combating short-term food shortages [30]. The use of coping strategies, such as dietary changes, shows a psychological adaptation to chronic food insecurity, where households seek to maintain some level of normalcy despite the ongoing challenges they face. Additionally, some households resort to more extreme coping mechanisms, such as staying hungry the whole day, which could weaken their ability to recover from future problems related to food shortages or hunger [31]. These coping strategies involve not only changes in food consumption patterns but also emotional and behavioral responses to the ongoing challenge of securing adequate nutrition

The present finding showed that over 21.1% of the households consumed less than 3 food groups and were recorded to have a poorly diverse or inadequate diet. Half of the study population had a moderately diverse diet (consumed 4–5 food groups), and only 28.3% of these households consumed a good number of food groups considered sufficient to meet their daily needs ($\geq$6 food groups). Associations showed that low dietary diversity is more prevalent among food-insecure households compared to food-secure households, suggesting that food insecurity limits access to a variety of foods, leading to poor dietary diversity. The limited income of most of the sampled households restricts their access to a variety of nutritious foods, as individuals may prioritize cheaper, less diverse options to meet their basic needs. Financial constraints force the households to acquire low-cost, less nutritious foods, thereby influencing poor dietary habits and subsequent health issues. Moreover, a considerable proportion of the respondents (53.5%) had attained only primary or secondary education levels, which may impact their knowledge about nutrition and their ability to make informed dietary choices. Limited education significantly contributes to poor dietary diversity if individuals are not aware of the importance of consuming foods containing adequate nutrients [32].

The dietary diversity findings are in line with a study carried out in the northwest region of Cameroon, where only 48.4% of the participants consumed adequately diverse food groups [17]. This nutrition inadequacy among children due to inadequate consumption of diverse food may result in various defects, such as poor cognitive health and impaired physical growth, resulting in stunting, wasting, being underweight, or being overweight, as seen in a few cases in this study. The children may also experience reduced energy levels, poor concentration, and behavioral issues due to insufficient nutrient intake [33]. For the adults, this poor dietary diversity is also observed in their poor nutritional status, which indicated that over a quarter of the sampled adult population was anemic from clinical diagnoses. A significant number of them were also found to be malnourished (underweight, overweight, and a few obese). Food insecurity and poor dietary diversity have been linked to depression and other mental health stress in adults [34], thus, further increasing their inability to access nutritious meals.

Nutritional assessment of the adults revealed a high prevalence (28.4%) of overweight and obesity, with 21.9% also being underweight. This suggests a significant proportion of adults in the population are at increased risk of malnutrition-related health issues. Based on their waist circumference, over 37% of adults have either overweight or obese waist circumferences, indicating a high prevalence of central adiposity or abdominal obesity. Nearly half of the population fell into the moderate to high-risk categories for waist/hip ratio, suggesting a substantial proportion of individuals have central adiposity. Central adiposity, particularly the accumulation of visceral fat in the abdominal region, is a critical health concern due to its strong association with metabolic abnormalities and increased cardiovascular risks [35]. This type of fat distribution is closely linked to the development

of insulin resistance, type 2 diabetes mellitus, metabolic dysfunction, and cardiovascular disease [35]. Approximately a quarter of the population is affected by anemia. Anemia can have significant health implications, including fatigue, weakness, impaired cognitive function, and depression, particularly if left untreated or inadequately managed [36,37]. This restricts their physical ability to acquire nutritious foods. The high prevalence of malnutrition and poor nutritional status in this study is likely due to a combination of factors, including poverty and food insecurity. This conforms to a study carried out in Uganda, which showed that about 19.1% of the population were underweight and 4.3% were obese [38].

The significant association between adult BMI and food insecurity indicates that food insecurity affects their BMI. For mild and moderately food-insecure individuals, this association may be explained by limited access to nutritious foods among food-insecure individuals, leading to higher consumption of energy-dense, nutrient-poor foods, which can contribute to excessive weight gain, obesity, and related problems [39]. Severely food insecure people are more likely to remain hungry as very little food is available. This causes these individuals to most likely be underweight. Also, the findings suggest that food-insecurity influences their waist circumference measurements, indicating central adiposity or abdominal obesity. This association may reflect dietary patterns characterized by the consumption of high-calorie, low-nutrient foods, which can lead to excess fat accumulation around the waist. Overall, the significant variables linked to food insecurity show the complex relationship between food access, dietary patterns, and nutritional status. Food insecurity leads to inadequate access to nutritious foods, which in turn impacts weight status and contributes to the development of weight-related conditions such as central adiposity in adults.

The current study also revealed a high prevalence of malnutrition among the children surveyed, with 50.6% stunted, suggesting inadequate nutrient intake for proper growth. This high stunting rate among the children is alarming, as it indicates chronic undernutrition that can have long-term effects on cognitive development and physical health. This might influence children's well-being as it can result in delayed motor skills and a weak immune system [40]. Over one-third of the children were underweight; this could potentially expose the children to hazards such as decreased energy levels, poor thermoregulation, delayed wound healing, hypoglycaemia, and many more that may prove life life-threatening if not handled urgently. In addition, 15.8% were wasted, implying a rapid decline in their weight due to insufficient nutrient intake due to acute malnutrition or underlying medical conditions. Rapid weight loss can lead to muscle wasting, weakness, and fatigue, affecting overall physical health and well-being. The significant presence of wasting in the child population indicates acute malnutrition, which requires immediate attention to prevent further deterioration in health. According to the study carried out in Nigeria, the prevalence of wasting was 7.7% among IDP children, with moderate acute malnutrition at 7.2%. These figures emphasized the severity of the issue in displaced populations. Akombi et al. indicated high rates of wasting among children in some West African countries, such as Niger (18.0%) and Burkina Faso (15.50%) [41]. This is also the case in Uganda, as a study revealed stunting rates among IDP children to be at 52.4% and wasting at 6% [42]. A systemic review of the health issues faced by IDPs in Africa reported that malnutrition is a significant issue among IDPs, with stunting rates of 52% and wasting rates of 6% in African children [8].

The determinants of food insecurity among IDP adults and children under five in the Kumba municipality were the monthly salary of caregivers, monthly average money spent on food, family size among households, and coping strategies used by households to mitigate food security ($p < 0.05$). The study saw a statistical association between food

insecurity and adult BMI, signifying that food insecure individuals had a greater likelihood of having an abnormal BMI score. This aligns with the study carried out by Singh et al. in Kenya, which recorded that food insecure individuals had a greater likelihood of being underweight [26].

While there was no significant association between the nutritional status of both adults and children and food security status in this study, it is worth noting that all cases of severe acute malnutrition and moderate acute malnutrition are found among food-insecure children. This suggests a potential trend of malnutrition among food-insecure children. This interpretation is also true for the HAZ and WHZ. However, associations have been recorded in other studies, which suggest that food insecurity significantly influences stunting, wasting, and underweight in children [40]. These findings highlight the complex and multifaceted nutrition challenges faced by IDPs in the study, including both undernutrition and overnutrition within the same household. They underscore the adverse impact of chronic food insecurity, poor dietary diversity, and limited access to essential nutrients on children's nutritional status.

This study acknowledges some limitations that warrant careful consideration when interpreting the current studies. The reliance on self-reported information through surveys introduces potential biases. Participants might have overreported their circumstances to garner sympathy or underreported them due to social desirability. Difficulty in recalling specific details, especially over extended periods, could lead to inaccurate information. This study attempted to mitigate this by asking similar questions in different forms to corroborate responses. The study was done in one of the ten regions of Cameroon; this applicability of the findings might be restricted to similar groups in the southwest of Cameroon. Participants understanding of the nine items and hopes of imaginable support may have also influenced the findings, and participants could lean towards affirmative responses. Also, in the absence of a recognized gold standard for household food insecurity, it is difficult to discuss the external validity of the HFIAS. These limitations highlight the need for further research incorporating diverse data collection methods and potentially larger sample sizes for robust statistical analysis. The strength of this study included the fact that a large part of the questionnaire consisted of standardized questions formulated by world bodies. These questions had been tested and proven to be adequate to acquire the specific information for which they were formulated.

5. Conclusions

This study paints a picture of the combined challenges faced by Internally Displaced Persons (IDPs) in Kumba Municipality. The findings highlight an extremely high prevalence of food insecurity among IDP households, forcing households to adopt various coping strategies, mainly through dietary modifications. This, in turn, contributes to low dietary diversity and poor nutritional status, with children suffering from underweight, wasting, and stunted, and adults from anemia. These findings underscore the urgent need for comprehensive interventions, including the distribution of food vouchers, cash transfers, and food banks; support for home gardening and small-scale farming; and finally, provide education on meal rationing, meal planning, and family planning services. Addressing the root causes of food insecurity—namely low household monthly income and large household family sizes—can improve access to nutritious food and ensure the health and well-being of IDPs. Furthermore, addressing food insecurity within this vulnerable group is critical to the broader goals of planetary health, as it highlights the intersection of human health, social equity, and environmental sustainability. By promoting sustainable food systems and supporting vulnerable populations, these interventions can contribute to the resilience of both communities and ecosystems in the face of ongoing global challenges.

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