Short Research Article

The Prevalence of Food Insecurity and the Principal Determinants in Tubah Health District, North West Cameron

.

ABSTRACT

Aims: Determine the prevalence of food insecurity and identify the principal determinants of household food security in Tubah Health District.
Study design: The study was a descriptive, cross-sectional survey conducted in 6 communities in Bambui Health Area of Tubah Health District.
Place and Duration of Study: Bambui health area in Tubah Health District of the North West region of Cameroon. The study lasted 6 months, from February to June 2022.
Methodology: One hundred and eighty one (181) households were included in the survey. In each household the female head of the household was interviewed with the aid of a questionnaire, to gather subjective information about feeding practices in the household. A structured face to face questionnaire was used to collect information on 7-day dietary intake and 24-hour food recall. Food security was assessed using the Food Consumption Score (FCS) and Household Dietary Diversity Score (HDDS) as proxy indicators. Anthropometric measurements comprising weight, height and Mid upper arm circumference were obtained for infants under five years.
Results: Food insecurity was found to be 65.2% when the Food Consumption Score (FCS) was used as a proxy indicator and 64.6% when Household Dietary Diversity Score (HDDS) was used as a proxy indicator. Household income was a significant predictor of FCS and HDDS, P =.05 and P =.001 respectively. Factors that negatively impacted the ability of households to meet their food needs were mainly high food prices (66.9%), insecurity (65.7%) and sickness related expenses (55.8%). The prevalence of stunting was 30.7%. There was a statistically significant association between stunting and food insecurity, $\chi 2$ (1, N = 101) = 8.8 and P =.05.
Conclusion: Household food insecurity prevalence rate was high in this community and this could be related to the conflict which has led to many households losing their livelihoods and the reduced agricultural productivity.

Keywords: *Food insecurity, stunting, Food consumption Score (FCS), Household Dietary Diversity Score (HDDS).*

1. INTRODUCTION

Food security includes the ready availability of nutritionally adequate and safe foods and an assured ability to acquire acceptable foods in socially acceptable ways (without resorting to emergency food supplies, scavenging, stealing, or other coping strategies) [1]. National-level food adequacy does not ensure that all households are food secure. Household-level food security is determined by both physical access to food and adequate purchasing power. While access to adequate food at the household level is needed to ensure optimal nutrition levels

for all members of a household, optimal levels of nutrition depends on non-food factors such as satisfactory health and hygiene conditions and social practices. Thus, household food security is one but not the only necessary condition for achieving the overall nutritional well-being of individuals.

Drammeh *et al.,*[2] observed that household food insecurity is increasingly known to be a global health problem, especially in Sub-Saharan Africa. In light of the high burden of malnutrition and its consequences, the Sustainable Development Goals (SDGs) highlight food security as a human right that needs to be addressed with urgency. Despite this recognition, millions of people in low and low middle income countries suffer from extreme hunger and malnutrition. Household food insecurity is associated with poor nutritional health [2].

There is no one single indicator used to measure food security. A number of proxy indicators that focus on food security outcomes (food consumption, food access, nutrition) are used in order to assess the food security status of households.

Like many other developing countries, agriculture provides a lion's share of the economic activity. Tanankem and Fotio[3] reported food insecurity national prevalence rate of 33.8% and food security rate of 66.2% in rural households in Cameroon based on caloric intake data from the third Cameroonian Household Consumption Survey conducted from September to December 2007 by the National Institute of Statistic (NIS) of Cameroon. According to the FAO, today more than 900 million people are food insecure across the world despite the fact that the world food production has doubled during the past three decades [4]. Conflict continues to be the primary driver of acute food crises in Africa.

A diet lacking in proper substance – enough calories, protein, vitamins and minerals – will impede a child's growth and development from before they're born up until adolescence. A pregnant mother's malnutrition can lead to a higher risk of low birth-weight, infant mortality, preterm delivery and slow cognitive development for her baby. The stress alone of living without secure access to food can have a negative effect on the health of pregnant mothers. This then impacts their infants by affecting milk supply while breastfeeding. Because of its

problematic effects on health, household food insecurity places a big burden on health care systems. Adults in food-insecure households have higher rates of developing chronic diseases – mental health issues, arthritis, asthma, diabetes – and are more likely to die early.

The conflict in the English-speaking region of Cameroon has led to the displacement of thousand internally and refugees in Nigeria. The displacement has led to families loosing of their livelihoods. According to the OCHA [5] report there are 574.000 internally displaced and 69.000 refugees in neighboring Nigeria.

Through time, poor and hungry populations become more vulnerable to stress and disasters as they rely a great deal on the natural environment and lack the capacity and the resources required to recover from disasters.[6]

In Cameroon, the seriousness of the food shortage problem varies from one area to another, depending on the state of the natural resources, security and weather conditions. In the face of the armed conflict in the North West and South West Regions that has led to displacements, many persons displaced do not have access to farm lands and crop production has drop with less access to farm land. This calls for a closer look at the determinants of food security in order to better inform public opinion and redirect humanitarian food relief efforts. The measurement of food insecurity and its causes and consequences is a critical aspect in addressing the problem because it allows for the estimation of prevalence, the identification of causes, a better targeting of high-risk population groups, and the establishment of reliable monitoring and evaluation systems of national food programs.

This study will determine the prevalence of food insecurity and identify the principal determinants of household food security in Tubah Health District. This study will elucidate the determinants most associated with household food security in Tubah Health District and will hence help orientate government and humanitarian agencies seeking to improve on food Access, Availability, utilization and sustainability to households both in Tubah and other localities affected by the conflict in Cameroon.

2. MATERIAL AND METHODS

2.1 Study design

The study design was a descriptive, cross-sectional survey conducted in 6 communities in Bambui Health Area of Tubah Health District. Communities were purposively selected, taking into consideration the state of security, after consultation with District and Health Area officials and local community key informants.

2.2 Setting

Tubah Health District is made up of 11 Health Areas and is one of the 20 Health Districts of the North West Region of Cameroon. It has 16 Health Facilities: 1 district hospital, 2 Subdivisional hospitals, 1 Private Clinic, 12 Health Centres and a District Health Service, and an estimayed population of 61,076 inhabitants. The study lasted for a period of 6 months from February to June 2022 during which data collection ran from April to May 2022.

2.3 Study population.

Bambui is an emerging township in North Western Cameroon, with a population of about 17,000 inhabitants. Administratively, Bambui is the headquarters of Tubah Sub-Division in the North West Region of Cameroon. Bambui is located at the cross-roads that lead to some of the North West Region's major towns of Bamenda, Ndop, Kumbo, Fundong and Nkambe.

2.4 Sampling techniques

In this study the households were the basic sampling unit. Three-stage sampling techniques were used to generate the required primary data. One hundred and sixty five (165) households were systematically recruited from each of these communities. The minimum number of households included in the study was determined using the modified Fisher's formula for sample size calculation as reported by Charan and Biswas.[6]

$n = \frac{(N \times X)}{(X+(N-1))}$, where, $X = Z_{\alpha/2}^2 * p * (1-p)/M^2$, $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ (for a confidence level of 95%, α is 0.05 and the critical value is 1.96), M is the Margin Of Error, *p* is the sample proportion, and N is the population size.

The proportion in the target population estimated to have a particular characteristic is considered the proportion of households in the North West which are food insecure is 23.6% as reported by Tanankem and Fotio.[3]

Applying a 10% non-response rate gives a minimum sample size of 165 households.

2.5 Data collection

Data was collected with the goal of gathering information on food availability, access, utilization and sustainability. The questionnaire devised for the purpose was divided into 4 parts. The first part comprised demographic variables such as age, gender, education, household size, occupation of Household head (HHH). The second part sought information on dietary patterns and food frequency. This part contained a 7-days and 24-hour dietary intake recall following the FAO guidelines for measuring household and individual dietary diversity.[8] Respondents were asked about 12 food groups they consumed in a 24-hour recall period the day or night prior the interviewing. In using the 24-hour recall method, we first determined whether the previous 24-hour period was "usual" or "normal" for the household. If there was a special occasion, such as a funeral or feast, or if most household members were absent, another day was selected for the interview. If this was not possible, another household was selected to replace it.[8] The respondent was the person who was responsible for meal preparation for the household the previous day. The respondent was asked about all foods eaten inside the home during the previous day and night, by any member of the household. In administering the questionnaire, the interviewer probed for: snacks eaten between main meals, special foods given to children or lactating/pregnant women and added foods such as sugar in tea, oil in mixed dishes or fried foods.

The interviewer did not read out to the respondent the exact name of the food group during the interview but simply asked (for example) about fruits, vegetables or tubers if these groups were not previously indicated.

To determine the Household Dietary Diversity Score (HDDS), the sixteen food groups in the questionnaire were aggregated into twelve food groups. The HDDS was determined as the sum of the number of the twelve food groups consumed, with a maximum score of 12. The household was classified on the basis of HDDS as Severely food insecure if HDDS was 0 to 3, moderately food insecure if HDDS was 4 to 5 and Food secure/mildly food insecure if the HDDS was 6 to 12. Vhurumuku[10] observed that they could be referred to as low dietary diversity, medium dietary diversity and good dietary diversity respectively.

To determine the Food Consumption Score (FCS) foods items were grouped into the specified food groups (condiments and spices not included). All the consumption frequencies of food items within the same group were summed from the seven-day food frequency table. The value of each food group was multiplied by its weight and the weighted food group scores were summed to obtain FCS. The household's food consumption status was then determined based on the following thresholds: 0 to 28: Poor; 28.5 to 42: Borderline, and greater than 42: Acceptable. The score was on a possible maximum score of 112. This classification was used instead of the usual (0 to 21, 21.5 to 35 and greater than 35 respectively for Poor, Borderline and Acceptable) classification because of the high consumption of oil, as recommended by Vhurumuku.[10]

Formula for calculation of FCS:

$$FCS = (Starches \times 2) + (pulses \times 3) + vegetables + fruit + (meat \times 4) + (dairy \times 4) + (fats \times 0.5) + (sugar \times o.5)$$

Food consumption frequency was assessed on the basis of a World Food program recommendation advising a recall of 7 days to ensure both good time coverage and “reliability” of respondent’s memory.[10]

The questionnaire was pretested on a purposive sample of 5 households in Bambili to refine the questions and correct any ambiguity in the questions.

The Screening Tool for the Assessment of Malnutrition in Paediatrics (STAMP) was used to assess nutritional status of all children under five years resident in these households.[11] Weight, height and Mid Upper Arm Circumference (MUAC) were assessed. Also, oedema presence or absence was ascertained by clinical examination of the children.

2.6 Data analysis

Data was be entered and cleaned in an excel spread sheet designed for the purpose. Anthropometric data for children under five was entered and analysed with the help of the WHO Anthro software. Data was exported from excel to SPSS version 25 (IBM Corp, Atlanta, GA, USA) for analysis. Statistical significance was set at 5%. Pearson's correlation coefficient was used to determine the strength of relationship between indicators.

The T test and ANOVA were used to compare mean difference between continuous variables. Multiple linear regression was used to explain the relationship between one continuous dependent variable (HDDS, FCS and Nutritional Status) and two or more independent variables (income, Expenditure on food, Land ownership, Animal ownership and House tenure).

3. RESULTS AND DISCUSSION

3.1. Socio-demographic characteristics of participants

Two hundred households were included in the study from 6 quarters in Bambui. However only 181 households complete data sets were analyzed. Most (85.6%) of the respondents were females and 78(43.1%) of the household heads had at least some primary education. Table 1 outlines the details on marital status, education and occupation of the study participants. Average age of the respondents was 43.8±12.2(Mean ± SD) years.

Table 1: Characteristics of the study population

Variable	Category	Frequency	Percent frequency
Marital Status	Divorced	1	1.7%
	Married	124	68.5%
	Separated	3	1.7%
	Single	16	8.8%
	Widow/widower	35	19.3%
Education	No formal education	10	5.5%
	Primary	78	43.1%
	Secondary	58	32.0%
	High school	24	13.3%
	Degree	11	6.1%
Occupation of Household Head	Builder	28	15.5%
	Farmer	64	35.4%
	Teacher	12	6.6%
	Trader	15	8.3%
	Retired	10	5.5%
	Biker	9	5.0%
	Carpenter	6	3.3%
	Driver	5	2.8%
	Electrician	4	2.2%
	Labourer	7	3.9%
	Other	17	9.4%

3.2 Dietary diversity and food consumption of households

Results from this study shows that the mean of household Food Consumption Score (mean±SD) was 38.2±9.8. Over half of the households (53.6%) had borderline food

consumption scores hence moderately food insecure, and 11.6% were classified as having a poor FCS and hence severely food insecure as shown in figure 1 below.

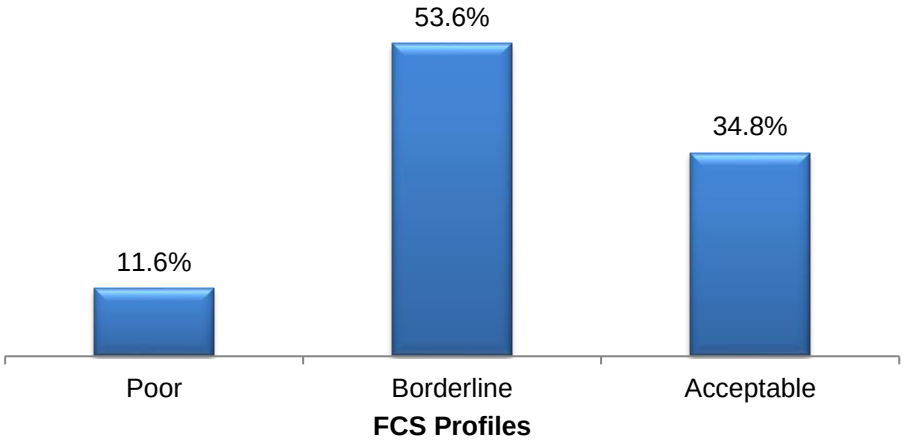

Figure 1: FCS classification

Household dietary diversity score assessment showed that over half of the households were medium dietary diversity with 5% of them having low dietary diversity as show in figure 2. Mean HDDS (mean±SD) was 4.91±1.16.

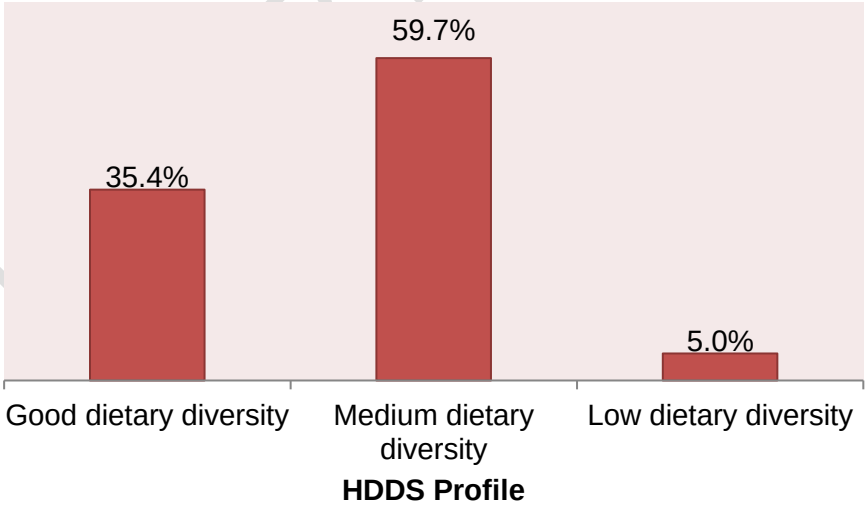

Figure 2: HDDS classification

Tanankem and Fotio found that the prevalence of food insecurity in rural Cameroon was about 33.8% using the household caloric acquisition method of estimating food security status.[3] Kamgaing and Fotio found a 52% prevalence rate of food insecurity using FCS profiles as a proxy measure.[11] The prevalence rate obtained in this study may be explained by the conflict in the North west and South West regions that has led to population displacement towards semi urban and urban settings considered to be more safe but also leading to the strain on the moderately food secure population living in these areas and hence food shortages and high food prices associated with shortages and the loss of livelihoods for some displaced persons.

This study found a positive correlation between the FCS and HDDS, r=.151, *P* =.05. Vaitla et al.,[12] found FCS and HDDS are strongly correlated, *r* =.592 and significant at *P* =.01, in a large multi-country dataset study in 2017. These results-though the strength of the correlation is not as strong as that of Vaitla et al., [12] was expected, given the similarity of their constituent questions. The small sample size of the households may explain the weak correlation strength.

There was a significant association between occupation and FCS, *P* =.05. No Significant association was found between FCS and, marital status and level of education. This was similar for HDDS as seen in table 2 below.

Table 2: Marital status, Education and Occupation of the study participants (n = 181)

		HDDS				FCS			
Marital Status	**%**	**Good DD**	**Medium DD**	**Low DD**	***P*-Value***	**Acceptable**	**Borderline**	**Poor**	***P*-Value***
Divorced	1.7%	1.1%	0.0%	0.6%		0.6%	1.1%	0.0%	
Married	68.5%	23.2%	43.1%	2.2%		36.5%	30.4%	1.7%	
Separated	1.7%	0.6%	1.1%	0.0%	.176	0.6%	1.1%	0.0%	.810
Single	8.8%	4.4%	3.9%	0.6%		6.1%	2.8%	0.0%	
Widow/widower	19.3%	6.1%	11.6%	1.7%		12.2%	7.2%	0.0%	
Education									
No formal education	5.5%	2.8%	2.2%	0.6%		2.2%	3.3%	0.0%	
Primary	43.1%	12.2%	27.1%	3.9%		19.3%	22.1%	1.7%	
Secondary	32.0%	11.0%	20.4%	0.6%	.209	21.0%	11.0%	0.0%	.140
High school	13.3%	6.6%	6.6%	0.0%		9.4%	3.9%	0.0%	
Degree	6.1%	2.8%	3.3%	0.0%		3.9%	2.2%	0.0%	
Occupation of Household head									
Biker	5.0%	2.3%	2.3%	0.6%		2.8%	1.7%	0.6%	
Builder	15.5%	4.5%	9.6%	1.7%		9.0%	6.8%	0.0%	
Carpenter	3.3%	0.6%	2.8%	0.0%		2.3%	0.6%	0.6%	
Driver	2.8%	1.7%	1.1%	0.0%		1.1%	1.7%	0.0%	
Electrician	2.2%	0.0%	2.3%	0.0%		0.6%	1.7%	0.0%	
Farmer	35.4%	11.9%	22.0%	2.3%	.744	22.0%	13.6%	0.6%	**.05**
Labourer	3.9%	1.7%	2.3%	0.0%		0.0%	4.0%	0.0%	
Retired	5.5%	1.1%	4.5%	0.0%		2.3%	3.4%	0.0%	
Teacher	6.6%	4.0%	2.8%	0.0%		5.6%	1.1%	0.0%	
Trader	8.3%	3.4%	5.1%	0.0%		4.5%	4.0%	0.0%	
Other	9.4%	3.4%	5.6%	0.6%		5.1%	4.5%	0.0%	

* P values are obtained from the χ^2 statistic

The average number of persons living in a household was 4.8 ± 2.3. Most household had less than 6 household members (70.2%). Seven (3.9%) households declared monthly income of Household head to be greater than 150,000FCFA while 118(65.2%) household heads had average monthly income less than 50.000FCFA. Most (61.3%) households had an average monthly expenditure on food purchase of less than 20.000FCFA.

Consumption of cereals, oils and fats, vegetables and spices is high with over 70% of HHs consuming foods from these groups 24 hours prior to the survey. On the other hand, cereals and oils are consumed at least 4 to 6 days a week respectively [4.4(60.9%) and 6.6(94.6%)].

Table 3: dietary intake over 24-hour and 7-days

Food group	**HHs** consumption **/24 hours** (%)	**Average number of consumption days/week**
Cereals	83.4	4.3
Roots & tubers	42.0	2.7
Meat	3.9	0.3
Fish	41.4	2.1
Eggs	3.3	0.1
Dairy	9.9	0.2
Oils & Fats	97.8	6.6
Fruits	14.9	0.2
Vegetables	70.7	2.8
Legumes & nuts	43.6	2.7
Sweets	10.5	0.0
Spices	91.2	1.0

Consumption of cereals, oils and fats, and vegetables was found to be 83.4%, 97.8%, and 70.9% respectively. Faber *et al.,*[13] found consumption of these three food groups to be 83.6%, 65.3%, and 60,0% respectively in a Limpopo province of South Africa. These results reflect the agricultural and dietary preference patterns in the North West region of Cameroon, were maize and vegetables cultivation and consumptions in varying forms is common. The vegetables consumed during this time of the year were principally bitter leaf, huckleberry, cabbage and pumpkin leaves. Households who consumed meat, egg, milk and dairy products

and fruits one day before the interview were less than 20%. These results differ from those of Faber *et al*.,[13] who reported a 27% for egg and 33.9% for Milk and dairy consumption. They reported 69.5% consumption of meat and fish as opposed to 45.3% in this survey.

4.1. Determinants of household food security

Factors that negatively impacted the ability of households to meet their food needs were mainly high food prices (66.9%), insecurity (65.7%) and sickness or other health related expenses (55.8%).

A multiple linear regression was calculated to predict FCS based on HH income (HHINC) and HH average expenditure on food (HHAEF). A significant regression equation was found ($F(1,177) = 12.287$, $P = .05$), with an R^2 of 0.065. Household predicted FCS was determined by the equation: $32.908 + 0.966(\mathrm{HHAEF}) + 2.457(\mathrm{HHINC})$,

where HHAEF was coded as 1 = Less than 10,000F, 2 = 10,000 to 19,999F, 3 = 20,000 to 29,999F, 4 = 30,000 to 39,999F, 5 = 40,000 to 49,999F and 6 = 50,0000F and above, and HHINC was coded as 1 = Less than 50,000F, 2 = 50,000 to 99,999F, 3 = 100,000 to 149,999F, 4 = 150,000 to 199,999F, 5 = 200,000 to 249,999F and 6 = 250,0000F and above.

FCS increased 3.423 units for each 1 unit of HHAEF and HHINC. Only HHINC was a significant predictor of FCS at $P = .05$ level.

A multiple linear regression analysis was done to predict HDDS based on HHINC and HHAEF. A significant regression equation was found ($F(1,177) = 24.741$, $P = .001$), with an R^2 of 0.123. Household predicted HDDS is equal to $4.459 + 0.022\,(HHAEF) + 0.412(HHINC)$, where HHINC was coded as 1 = Less than 50,000F, 2 = 50,000 to 99,999F, 3 = 100,000 to 149,999F, 4 = 150,000 to 199,999F, 5 = 200,000 to 249,999F and 6 = 250,0000F and above, and HHAEF was coded as 1 = Less than 10,000F, 2 = 10,000 to 19,999F, 3 = 20,000 to 29,999F, 4 = 30,000 to 39,999F, 5 = 40,000 to 49,999F and 6 = 50,0000F and above. HDDS increased 0.483units for each 1 unit of HHINC and HHAEF. Only HHINC was a significant predictor of

HDDS at *P* = .001 level. In comparison to high-income households, the overall expenditures on food that includes both milk (and milk products) and meat (and meat products) are limited in low-income households. Household income was found to be a significant predictor of both HDDS, *P*=.001 and FCS, *P*=.05. Since most [173(95.6%)] HHs acquire their food both from subsistence farming and purchase from the market, low income reduces their access to nutritious foods like meat and dairy products. Aidoo *et al*.,[14] reported similar results in a study in Nigeria.

There was a significant mean difference in FCS for households with an average monthly income of less than 50.000FCFA (37.7 ± 9.2, *P*=.05) and income between 50.000 and 100.000FCFA (38.8 ± 10.2, *P*=.05) compared to households with income of 250.000FCFA and above (45.5 ± 1.4). Post hoc tests revealed a significant mean difference in HDDS for HHs with an average monthly income of less than 50.000FCFA (4.9 ± 1.2, *P*=.05) compared to households with income between 200.000FCFA and 250.000FCFA (7.3 ± 0.6). Drammeh et al.,[2] has noted that low-income household status leads to the consumption of both an inadequate quantity and low-quality foods; the limited dietary diversity leads to a low-quality diet with poor vital nutrient content. Poverty, coupled with other socio-economic and political predicaments, leads to food insecurity in Sub-Saharan Africa. Mahmudiono *et al.,*[16] in a study in Indonesian households found that households with some level of food insecurity were significantly different in terms of monthly income. This tie with the results we obtained in this study.

Findings from this study reveal stunting (HAZ<-2) prevalence rate of infants 6-60months of age was 30.7% (Table 4). This rate is higher than that reported by UNICEF, WHO, World Bank: Joint child Malnutrition Estimates (JME) of 2020 for Cameroon which was 27.2%.[20]. This rate of stunting is comparable to that reported by Sumbele *et al.,*[17] (range = 30–39%), and 31% observed in children under 2 years in Batouri, East Region, Cameroon, the area with the highest percentage of stunting. [17] The prevalence of severe stunting (17.8%) is comparable to the 17.1% reported in the mount Cameroon area by Sumbele *et al*., [17], but

lower than the 29.1% reported in Northern Cameroon [11]. The nature of diet of children in the Tubah is similar and has been affected by a steady rise in hostilities over the last 5 years. This has led to Type II nutrient deficiency, with slow growth and consequently stunting. These nutrients are also abundant in the food groups which are consumed least, and include: meat, pulses, milk, egg and fruits.

Table 4: Length/height-for-age Z-score (HAZ)

Age groups	N	n(%) < -3SD	(95% CI)	n(%) < -2SD	(95% CI)	Mean	SD
Total (0-60)	101	18(17.8)	(9.8%, 23.6%)	31(30.7)	(22.9%, 40.3%)	-1.11	2.10
(6-11)	5	1(20.0)	(0.9%, 81.4%)	3(60.0)	(14.9%, 95.8%)	-1.46	2.67
(12-23)	24	7(29.2)	(12.2%, 46.8%)	11(45.8)	(26.2%, 64.3%)	-1.26	2.80
(24-35)	31	8(28.6)	(12.2%, 42.5%)	10(35.7)	(18.9%, 51.7%)	-1.66	2.42
(36-47)	19	0(0.0)	(-, -)	2(10.0)	(2.1%, 34%)	-0.29	1.12
(48-60)	22	1(4.2)	(0.5%, 28.3%)	4(16.7)	(8.7%, 44.7%)	-0.79	1.08

There was a statistically significant association between stunting and food insecurity classified using the HDDS, $\chi 2$ (1, N = 101) = 8.8, *P* =.05. This suggests that households that consume less than or equal to 4 food groups are more likely to have stunted children. The more diverse the diet of a household is the less likely children under five in this household would be stunted. HDDS was found to be a significant predictor of HAZ. Inadequate household food security has been identified as one of the underlying causes of malnutrition; [4] hence these results tend to endorse this relationship. Mahmudiono *et al.,* [16] in a study in Indonesia found that Chi-squared tests showed significant differences in the household's food insecurity status for the number of children under five in the household (P =.046) which is similar to the results we obtained. Gassara and Chen[18] in a systematic review reported that in two thirds of articles selected, household food insecurity and dietary diversity were significantly associated with stunting. These results show the importance of improving household food security and dietary diversity in order to protect the nutritional status of children.

4. CONCLUSION

Both the HDDS and the FCS used as proxy indicators of household access to food has shown that most residents of Bambui Health area live on a poor diverse diet with cereals as the main staple eaten mainly with green leafy vegetables as a sauce. There is a low consumption rate of meat, dairy products and fruit.

Household income is a key determinant of food access and hence dietary diversity. Low monthly income negatively impacted the ability of households to meet their food needs. Decreased agricultural production due to insecurity and the high food prices that follow this have affected household consumption most leading to the consumption of both an inadequate quantity and low-quality foods, with limited dietary diversity.

The prevalence of stunting in the area is higher than the national figure, indicating that stunting' is still an important major public health problem among children in the area.

Household food insecurity prevalence rate found in the Bambui Health Area is high and this could be related to the conflict which has led to many households losing their livelihoods and

the reduced agricultural productivity leading to poor consumption of foods that are sources of type 2 nutrients which are greatly related to child growth.

DEFINITIONS, ACRONYMS, ABBREVIATIONS

DIA DIETARY INTAKE ASSESSMENT

EFSA EMERGENCY FOOD SECURITY ASSESSMENT

FAO FOOD AND AGRICULTURAL ORGANIZATION

FCFA FRANCS, COMMUNAUTÉ FINANCIÈRE D'AFRIQUE

FCG FOOD CONSUMPTION GROUP

FCS FOOD CONSUMPTION SCORE

FIEMS FOOD INSECURITY EXPERIENCE-BASED MEASUREMENT SCALES

HAZ HEIGHT FOR AGE Z SCORE

HDDS HOUSEHOLD DIETARY DIVERSITY SCORE

HESM HOUSEHOLD EXPENDITURE SURVEY METHOD

HH HOUSEHOLD

HHAEF HOUSEHOLD AVERAGE EXPENDITURE ON FOOD

HHH HOUSEHOLD HEAD

HHINC HOUSEHOLD INCOME

HHS HOUSEHOLD HUNGER SCALE

IDDS INDIVIDUAL DIETARY DIVERSITY SCORE

IPC INTEGRATED FOOD SECURITY PHASE CLASSIFICATION

IDP INTERNALLY DISPLACED PERSON

MUAC MID UPPER ARM CIRCUMFERENCE

NIS NATIONAL INSTITUTE OF STATISTIC

OCHA ORGANIZATION FOR THE COORDINATION OF HUMANITARIAN AFFAIRS

RCSI REDUCED COPING STRATEGIES INDEX

RRA RAPID RURAL APPRAISAL

SDGS SUSTAINABLE DEVELOPMENT GOALS

STD STANDARD DEVIATION

USAID UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

USDA UNITED STATED DEPARTMENT OF AGRICULTURE

WAZ WEIGHT FOR AGE Z SCORE

WFP WORLD FOOD PROGRAM

WHZ WEIGHT FOR HEIGHT Z SCORE

CONSENT (WHERE EVER APPLICABLE)

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

This study included the use of human participants. Ethical approval was obtained from the Regional Delegation of the North West, Bamenda with authorization number 203/ATT/NWR/RDPH/BRIGAD.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc. have been used during the writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

1.

2.

3.

REFERENCES

1. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household food security indicators. Int. J. Food Safety, Nutrition and Public Health, Vol. 2, No. 1, 2009, Available from: https://www.academia.edu/17421728/Dietary_diversity_in_relation_to_other_household_food_security_indicators
2. Drammeh W, Hamid NA, Rohana AJ. Determinants of Household Food Insecurity and Its Association with Child Malnutrition in Sub-Saharan Africa: A Review of the Literature. Curr. Res. Nutr Food Sci Jour., Vol. 7(3) 610-623 (2019). Available from: http://dx.doi.org/10.12944/CRNFSJ.7.3.02
3. Tanankem VB, Fotio AH. Food Insecurity in Rural Households of Cameroon: Factors Associated and Implications for National Policies. ICAS VII Seventh International Conference on Agricultural Statistics I Rome 24-26 October 2016. DOI: 10.1481/icasVII.2016.b11
4. FAO. Policy Briefs. Food Security, June 2006 Issue 2. Available from: https://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf
5. OCHA 2021, Cameroon Situation Report
6. Muche M, Endalew B, Koricho T. Determinants of Household Food Security among Southwest Ethiopia Rural Households. Food Science and Technology

2014; 2(7): 93-100, Available from: http://www.hrpub.org DOI: 10.13189/fst.2014.020701

7. FAO. Food Security Information for Action: An Introduction to the Basic Concepts of Food Security. 2008. Available from: www.foodsec.org/docs/concepts_guide.pdf
8. Kennedy G, Berardo A, Papavero C, Horjus P, Ballard T, Dop MC *et al.* Proxy measures of household food consumption for food security assessment and surveillance: comparison of the household dietary diversity and food consumption scores. Public Health Nutrition: 13(12), 2010–2018, Available from: http://dx.doi:10.1017/S136898001000145X
9. Vhurumuku E. Food Security Indicators [slides]. Published 17 February 2014, accessed December 14, 2021. https://pdf4pro.com/view/food-security-indicators-food-and-agriculture-51269b.html
10. Screening Tool for the Assessment of Malnutrition in Paediatrics (STAMPS). Measuring Infants and Children. [internet] Available from: https://www.stampscreeningtool.org/measuring-instructions
11. Kamgaing S, Fotio AH. Food Insecurity in the Northern Part of Cameroon: Calorific Contribution Approach versus Score of Dietary Diversity. 4th Wye Group Conference 2011 "Wye Group on Statistics on Rural Development and Agriculture Household Income" Rio de Janeiro, Brazil, 9-11th November, 2011. Available from: https://www.fao.org/fileadmin/templates/ess/pages/rural/wye_city_group/2011/documents/session3/Kamgaing__Hermann_-_Paper.pdf
12. Vaitla B, Coates J, Glaeser L, Hillbruner C, Biswal P, and Maxwell D. The measurement of household food security: Correlation and latent variable analysis of alternative indicators in a large multi-country dataset. Food Policy. [Internet] April 2017, Volume 68, Pages 193-205. Available from: https://www.sciencedirect.com/science/article/pii/ S0306919216304055. DOI: https://doi.org/10.1016/j.foodpol.2017.02.006

13. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household food
security indicators. Int. J. Food Safety, Nutrition and Public Health, Vol. 2, No. 1, 2009, Available from: https://www.academia.edu/17421728/Dietary_diversity_in_relation_to_other_household_food_security_indicators
14. Aidoo R, Mensah JO, Tuffour T. Determinants of household food security in the Sekyere-Afram plains District of Ghana. Glo. Adv. Res. J. Agric. Sci. [Internet] Vol. 2(1) pp. 347-353, January, 2013 Available from: https://www.researchgate.net/publication/325929844_Determinants_of_Household_Food_Security_in_the_Sekyere-Afram_Plains_District_of_Ghana/link/5b2cfb21a6fdcc8506bdd9d7/download
15. Drammeh W, Hamid NA, Rohana AJ. Determinants of Household Food Insecurity and Its Association with Child Malnutrition in Sub-Saharan Africa: A Review of the Literature. Curr. Res. Nutr Food Sci Jour., Vol. 7(3) 610-623 (2019) Available from: http://dx.doi.org/10.12944/CRNFSJ.7.3.02
16. Mahmudiono T, Nindya TS, Andrias DR, Megatsari H and Rosenkranz RR. Household Food Insecurity as a Predictor of Stunted Children and Overweight/Obese Mothers (SCOWT) in Urban Indonesia. [Internet]. Nutrients 2018, 10, 535. Available from: https://doi.org/10.3390/nu10050535
17. Sumbele IUN, Asoba GN, Teh RN, Metuge S, Anchang-Kimbi JK and Nkuo-Akenji T. Burden of moderate to severe anaemia and severe stunting in children < 3 years in conflict-hit Mount Cameroon: a community based descriptive cross-sectional study. BMC Pediatrics (2020) 20:396. Available from DOI: https://doi.org/10.1186/s12887-020-02296-2
18. Gassara G, Chen J. Household Food Insecurity, Dietary Diversity, and Stunting in Sub-Saharan Africa: A Systematic. [Internet]. *Nutrients* 2021, *13*, 4401. Available from: https://doi.org/10.3390/nu13124401
19. Measuring the Food Access Dimension of Food Security: A Critical Review and Mapping of Indicators Jef L. Leroy Marie Ruel, […], and Terri J.

Ballard+2View all authors and affiliations, Food and Nutrition Bulletin, 2015. Volume 36, Issue 2. https://doi.org/10.1177/0379572115587274

20. UNICEF, WHO, World Bank: Joint child malnutrition estimates (JME). Prevalence of stunting, height for age (modeled estimate, % of children under 5) – Cameroon. Available from: https://data.worldbank.org/indicator/SH.STA.STNT.ME.ZS?locations=CM