

Household Food and Nutrition Security in the City of Abeche

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Authors' contributions

This work was carried out in collaboration among all authors. Author MR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of this manuscript. Authors DHO and HM corrected the manuscript. Authors AMN, PD and AAD managed the literature searches and revised the manuscript. All authors have read and approved the final manuscript.

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ABSTRACT

Households abechois face high food consumption costs that condition different states of food and nutrition security. This study was carried out with the aim of evaluating Household Food and Nutrition Security in the city of Abeche-Chad. A cross-sectional descriptive research survey was adopted for the study and was conducted from 02 May to 30 June 2022 in the seven districts of the city of Abeche. A sample of 213 households and 181 children aged 6 to 59 years old were selected for the study. Data were collected through a structured questionnaire and targeted anthropometric measurements in children aged 6 to 59 years using a scale type Uniscale with 150kg capacity and 100kg/0.1kg accuracy and a locally made wooden measuring board (150±0.1cm). Those data were

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processed with SPSS version 23.0 and ENA version 2011 software and analyzed using the CARI approach and SMART recommendations. The results obtained show that 11.3% of Abechois households are food secure, 37.6% are in borderline food security and 51.1% are in food insecurity, including 31.9% in moderate food insecurity and 19.2% in severe food insecurity. Anthropometry reveals that 32.8% of children are wasted and 37.6% suffer from stunted growth. These high prevalences testify to the critical situation in which Abechois households subsist. The results obtained conclude that households with deficient food consumption devote more than 75% of their expenditure to food and experience a significant loss of their means of subsistence which leads to an accelerated depletion of their assets.

Keywords: Food safety; malnutrition; households; young children; Abeche; Chad.

1. INTRODUCTION

Food and Nutrition Security (FNS) exists when all human beings have, at all times, physical, social and economic access to food in sufficient quantity and of appropriate quality in terms of variety, diversity, nutrient content and security to meet their energy needs and food preferences and can thus lead healthy and active lives, while benefiting from a sanitary environment and adequate health, education and care services [1]. At present, issues affecting food and nutritional insecurity are acute. Globally, nearly 2.3 billion people were food insecure in 2021 [2]. In Africa, more than half of the population is affected by moderate or severe food insecurity [3]. Consumer food price inflation caused by the economic repercussions of the COVID-19 pandemic and the measures put in place to contain it has dramatically increased the number of undernourished people in the world. The war in Ukraine, destabilizing supply chains, has had repercussions on grain prices [4]. Added to this is the double burden of malnutrition which persists at an unacceptably high level in the world. If it does not tragically lead to death, it does lead to retarded physical growth.

In Chad, the food and nutritional situation remains worrying. The country faces high levels of chronic food and nutrition insecurity due to low levels of agricultural production, poverty and limited access to drinking water [5]. According to the results of the 2021 SMART survey, at the national level, the prevalence of global acute malnutrition is 10.9% with a proportion of 2.0% of the severe form. According to the classification of WHO 2019, the nutritional situation is worrying [6]. A decline in agro-pastoral production as well as a rise in the prices of basic foodstuffs affecting the diet have been recorded. The country was declared in a food emergency situation in June

2022, which testifies to the deterioration of the situation of the populations who are already in the grip of major difficulties.

In the field of nutrition, there is a consensus that adopting a sufficiently diversified diet would be the ideal solution to ensure nutrient requirements [7]. However, economic access remains a significant barrier to healthy food consumption for some. However, simple access to a diversified diet is not enough to ensure adequate nutritional status. Given the complexity of the problem, it is recognized that the fight against food insecurity and its nutritional consequences must adopt a multisectoral approach [8,9,10].

However, much research has focused on FNS and has approached it from several angles. However, few studies have addressed the links between household FNS and household characteristics. Most of the studies conducted on FNS in Chad have only focused on measuring the phenomenon. Although it faces persistent malnutrition and food insecurity, the town of Abeche has not been the subject of an in-depth FNS study. This is the basis of the interest in conducting this research, the objective of which was to assess the FNS of households in the city of Abeche. Specifically, it is a question of determining the characteristics of the people most affected by food and nutritional insecurity.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in the city of Abeche, capital of the Province of Ouaddaï which is one of the 23 Provinces of Chad located in the East of the country. The geographical location of the study area is shown in Fig. 1.

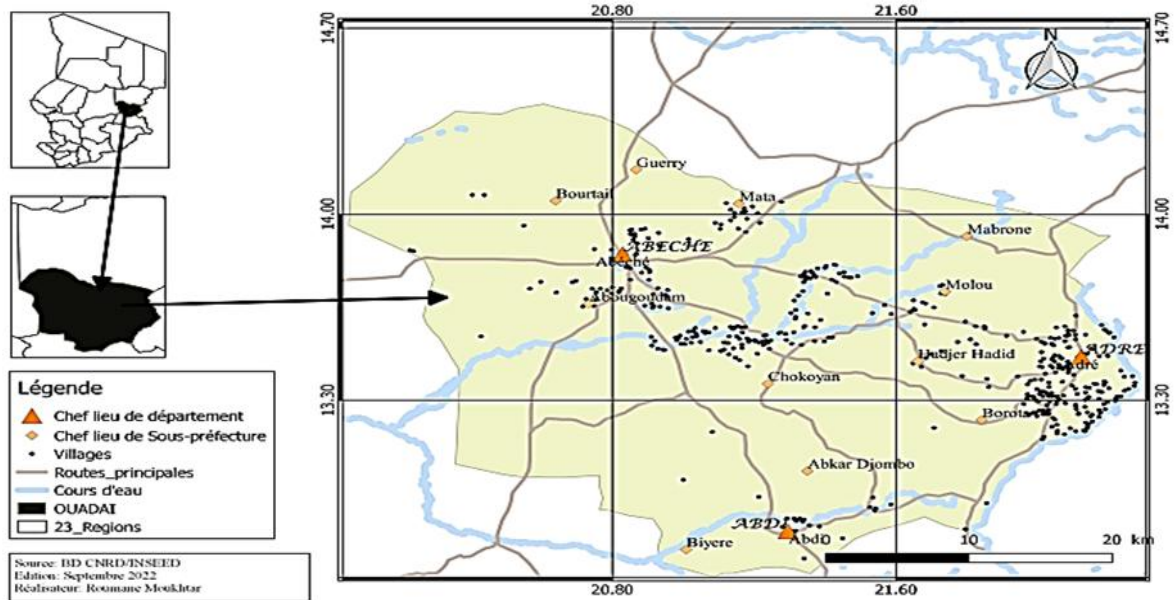


Fig. 1. Geographical location of the city of Abeche

2.2 Type, Period and Study Population

The study is of a cross-sectional type with a descriptive aim, which was carried out for a period of two months, from May 02 to June 30, 2022. The study population consists of heads of households (HH) and children aged 6 to 59 months residing in Abeche for at least 6 months.

2.3 Sampling Method

The sampling method applied is a three-stage probabilistic survey. The 1st stage focused on the selection of arrondissements through a systematic random draw based on the probability proportional to the size of the population. The 2nd level of sampling consisted of randomly drawing neighborhoods in the selected districts. In the 3rd degree, them households were systematically randomly selected with a sampling interval ($P=7$). The transition to the first household is guided by the direction indicated by a pen. Thus, the targeted children present in the households were the subject of a reasoned choice.

2.4 Sample Size

The calculation of the sample size was carried out using the ENA for SMART software version 2011 taking into account the estimated prevalence, the desired precision, the level of confidence, the cluster effect, the proportion of

children less than 5 years old and the no response rate. Thus the size of the sample in number of households ($N=213$) and in number of children ($N=181$) was provided automatically by ENA.

2.5 Data Collection

To achieve the set objectives, the study used a combined approach of quantitative and qualitative data collected through a questionnaire. The latter covers a variety of topics dealing with household characteristics, food consumption, household expenditure and the mechanisms of use of strategies survival to calculate the food security (FS) condition index of households in the city of Abeche.

For data collection, a type scale Uniscale with 150kg capacity and 100kg/0.1kg accuracy, a locally made wooden measuring board ($150\pm 0.1\text{cm}$) are used to measure the anthropometric parameters of the targeted children.

2.6 Method of the Study

The methodology adopted for the food security assessment follows the standardized CARI approach (Consolidated Approach for Reporting Indicators of Food Security). However, the study of nutritional indices follows the recommendations for SMART (Standardized

Monitoring and Assessment of Relief and Transition) survey methodology.

2.7 Data Analysis

The analysis is based on an integrated approach of the different dimensions of food security FS. Using SPSS version 23.0 software, it consisted of the analysis of FS indicators at the household level. The food insecurity index is obtained from an algorithm that combines, at the household level, the results of each FS indicator, namely (the household food consumption through the food consumption score), the share of household expenditure devoted to food indicating long-term food access and household reliance on livelihood-based coping strategies measured at through the asset depletion indicator. This made it possible to explicitly classify households in FS, Borderline Food Security (BFS), Moderate Food Insecurity (MFI) and Severe Food Insecurity (SFI). The nutritional indices were processed and analyzed using the ENA for SMART software according to WHO standards [11] with exclusion of WHO flags.

3. RESULTS AND DISCUSSION

3.1 Household Characteristics

The main socio-demographic and socio-economic characteristics of households investigated are shown in Table 1.

The results show that 45.5% of the households surveyed were headed by married Heads of Households (HH), on the other hand divorced or separated HH only represent 12.2%. The proportion of HH men was higher (76.5%) than that of women (23.5%). The age groups 30-44 years and 15-29 years represented respectively 21.1% and 22.5%. Those between the ages of 45-59 and over 60 accounted for 23.5% and 32.9% respectively. The HH with a primary level of education were in the majority (25.4%) compared to the others. Although education is a factor likely to influence the living conditions of households and especially the improvement of food and nutritional practices 15.5% of HH had not attended school in the formal education system. Re the main activities of HH,

Table 1. Main characteristics of the households surveyed (N=213)

Household characteristics	Workforce (n)	Percentage (%)
Gender of household heads		
Male	163	76.5
Women	50	23.5
Marital status of heads of households		
Bride	97	45.5
Single	44	20.7
Divorced/Separated	26	12.2
Widowed	46	21.6
Age group of household heads		
15-29 years old	45	21.1
30-44 years old	48	22.5
45-59 years old	50	23.5
60 and over	70	32.9
Educational level of household heads		
Never frequented	33	15.5
Coranic	52	24.4
Primary	54	25.4
Secondary	49	23.0
Tertiary	25	11.7
Main activity of household heads		
Official	20	09.4
Agriculture	47	22.1
Breeding	26	12.2
Trade	23	10.8
daily work	65	30.5
Unoccupied	16	07.5
Others	16	07.5
Average household size	5.7	

daily workers were the most represented with 30.5%. In on average, in the city of Abeche, a household has about 6 people (5.7).

3.2 Household Food Consumption

3.2.1 Meal frequency

The average meal frequency is 2.1 for adult household members. The distribution of households according to the number of meals per day is represented in Fig. 2.

The analysis shows that approximately 81% of households only eat at most two meals a day during the 7 days preceding the survey. However, 14.5% take only one meal a day and 14.7% more than 2 meals a day. In view of this result, it is certain that with only one meal per day, households could not cover the required energy needs.

3.2.2 Frequency of consumption by food groups

The consumption frequencies of the food groups are distributed in Fig. 3.

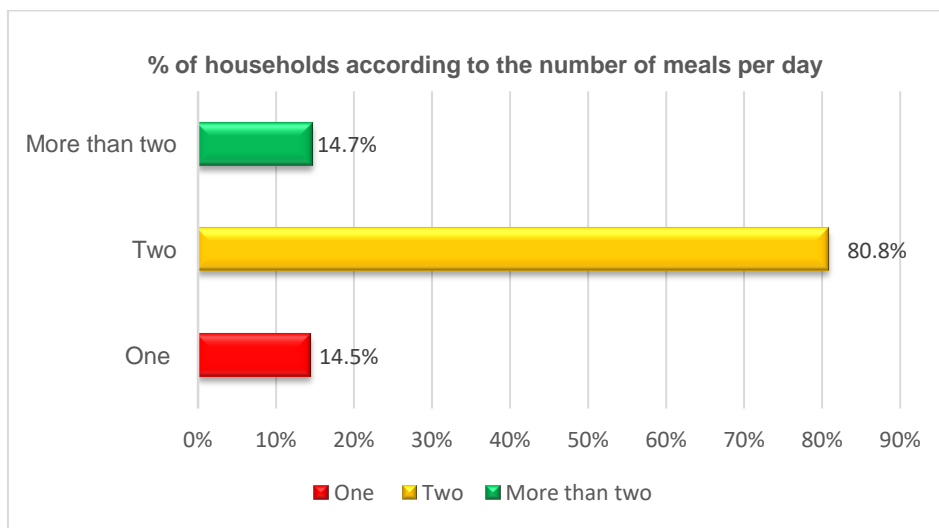


Fig. 2. Percentage of households according to the number of meals per day

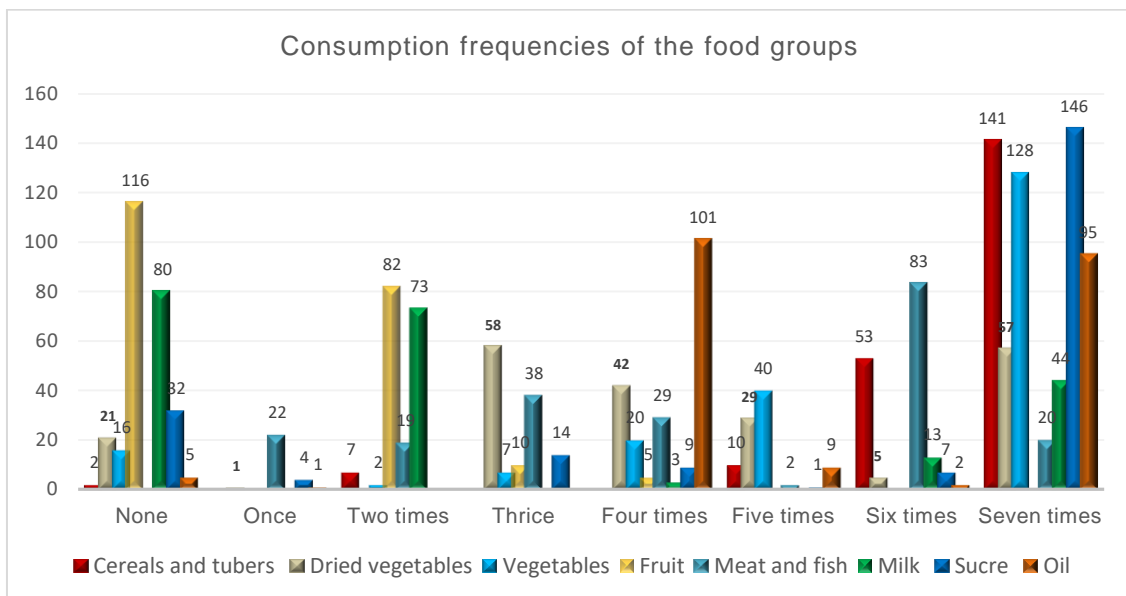


Fig. 3. Frequency of consumption of the 8 food groups

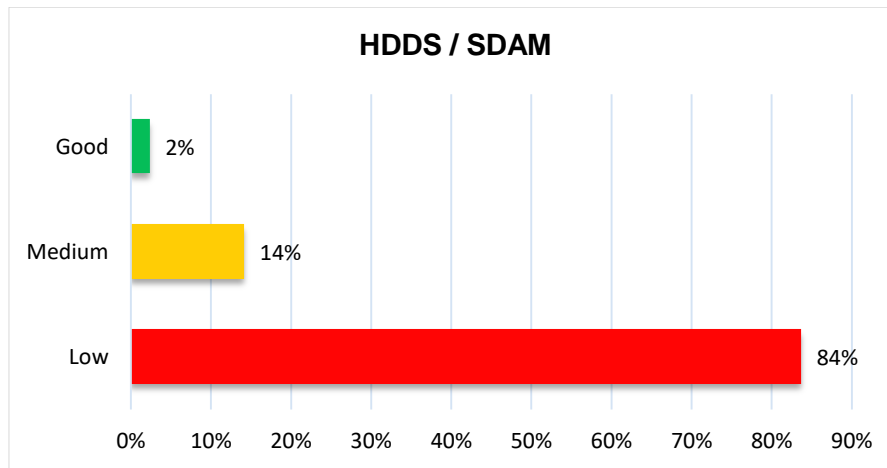


Fig. 4. Distribution of households according to their HDDS/SDAM

It emerges from the analysis of the result that the group of cereals and tubers is the most consumed by the majority of households. It is consumed 7 days a week by (141 households), 6 days a week by 53 households and 5 days a week by 53 households. Indeed, cereals are often consumed in different combinations with pulses, green vegetables, red meats, milk and oils in the form of seasonings. Similar results were obtained by Sanu et al. [12] in Burkina Faso and Diara [13] in Mali which revealed the high frequency of cereal consumption by households. The food groups not consumed at all, by a large part of the households, during the 7 days preceding the survey are fruit (116 households) and milk (80 households). However, 82 and 73 households consumed them but with a frequency of twice a week.

3.2.3 Household dietary diversity

Dietary diversity is a qualitative measure of food consumption that reflects nutritional quality through access to more nutrients. Fig. 4 shows the distribution of households according to the Household Dietary Diversity Score (HDDS or SDAM) measured on the basis of 7 food groups during a 24 hour recall period. Thus, household dietary diversity is said to be low, when the SDAM is less than 4.5, average when the SDAM is between 4.5 and 6 and good diversity, when it is greater than 6.

It appears that 84% of households have low HDDS/SDAM, 14% have medium diversity and only 2% have good dietary diversity. This diversity is very low compared to the results obtained by Oumarou et al. [14] in Niger who find 67.3% of households with a high HDDS/SDAM.

The low dietary diversity of the households surveyed could be due to the economic and/or physical inaccessibility of certain foods in our study area.

3.2.4 Food consumption score

The Food Consumption Score (FCS) was obtained using the different foods consumed by households during the last 7 days preceding the survey, their frequency of consumption and taking into account their weighting in terms of energy intake. Food is said to be inadequate in quality and quantity when the FCS is ≤ 28 . It is quantitatively inadequate when the FCS is between 28.5 and 42 and adequate or acceptable when the FCS > 42 . Fig. 5 shows the obtained results.

The results show that 42% of surveyed households have poor FCS, 55% have borderline FCS and 3% have acceptable FCS. These results are statistically different from those obtained in 2020 by Mulumeoderhwa et al. [15] in Minembwe where they found 39% of households with a borderline consumption score and 17.5% with a poor consumption score. The poor food consumption of households in Abeche could be explained by the fact that our study was conducted during the lean season and also by the fact that in the study area, fish and fruits are less available and less accessible by households because of their high costs.

3.3 Share of Household Food Expenditure

Expenditures are generally taken as a proxy for the level of household income. The 'share of food expenditure' indicator is simply constructed by

dividing the total food expenditure by the total monthly expenditure of each household surveyed. However, the value of food consumed but not purchased is also estimated and included in the calculation. The results obtained are detailed in Fig. 6.

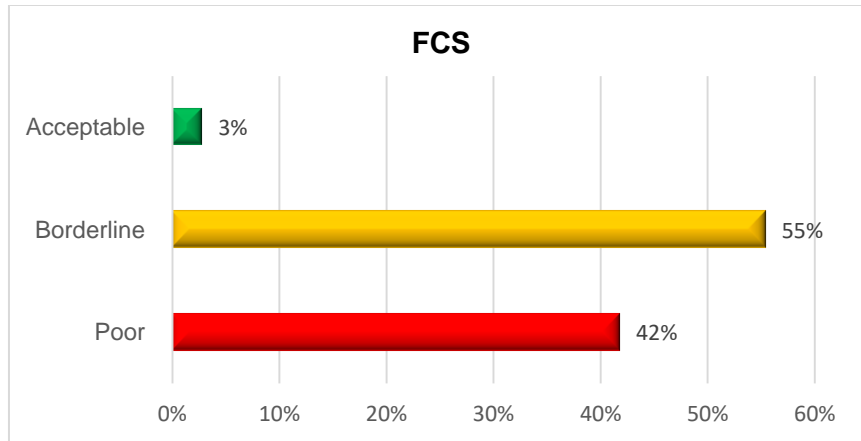


Fig. 5. Distribution of households according to their FCS

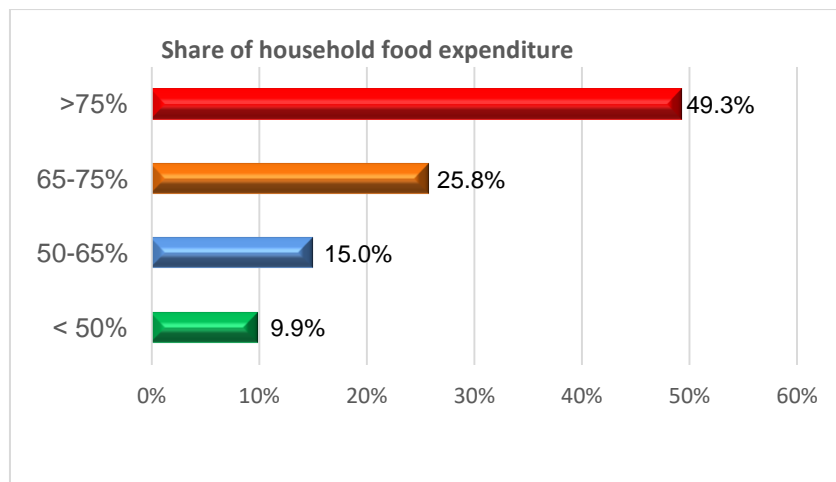


Fig. 6. Share of household food expenditure

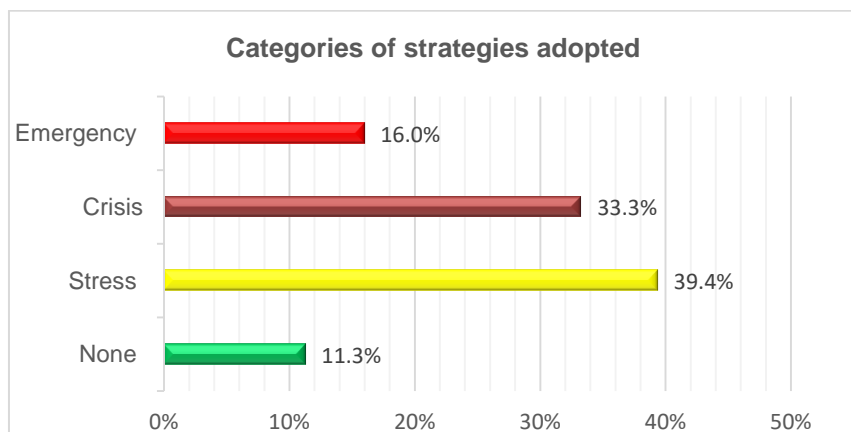


Fig. 7. Distribution of households according to the categories of strategies adopted

The results show that 49.3% of households allocate more than 75% of their expenditure in food, 25.8% of households spend more than 65% and 15% spend between 50 to 65% on food. Only 9.9% of households have food expenditure shares below 50% of their total expenditure. Similar findings were highlighted in the 2021 ENSA report [16] where nearly half of the households (51.3%) have high and very high food expenditure, that is to say households that devote more than 65% of their expenditure to the purchase of food.

3.4 Livelihood-Based Survival Strategies

The 'livelihood-based coping strategies' indicator is used to describe the capacities of households to cope with difficulties. Thus, all strategies are grouped into three broad categories. A distinction is made between so-called stress strategies, those called crisis and those called emergency. They are evaluated over a period of 30 days. Households engaged in routine economic activities that do not include any of these strategies are considered food secure for this indicator. Fig. 7 illustrates the results obtained.

Generally, during the previous 30 days survey, 11.3% of households did not resort to any survival strategy that negatively affected the means of existence. However, 39.4% resorted to stress mechanisms. More worrying, 33.3% of households have adopted crisis strategies and 16% emergency. What directly reduces their future productivity.

3.5 Food Status

Each household was assigned a food security group based on simple average calculations using the scores achieved for each indicator on the four-level scale. This made it possible to give the overall food security index and therefore the

prevalence of the different forms of food insecurity.

The composite food insecurity index shows that 19.2% of the households surveyed are in SFI and 31.9% in MFI, for a total prevalence of 51.1% of food insecurity. This reflects a generally difficult food situation. The prevalence of BFS is 37.6% and only 11.3% of households are in FS. These high prevalences of global food insecurity are linked to poor FCS and reduced coping capacity of households. Compared to these results, the 2021 ENSA [16] revealed that 39.7% of households are food insecure, including 3.4% in SFI.

3.6 Index of Security Food According to Household Characteristics

The results obtained from the index of Food Safety according to household characteristics are detailed in Table 3.

The results show that the prevalence of AS is 10.3% in male-headed households and 0.9% in female-headed ones. However, the SFI is high in households headed by men (17.4%) against (1.9%) in women. Widowed and married HH are more affected by SFI with respective prevalences of 21.6% and 14.1%, while single and divorced or separated HH are not at all affected by SFI. The prevalence of SFI is 8.5% in households headed by HH aged ≥ 60 years and that of the MFI is 16.0 for the same bracket.

Households headed by HH with a higher level of education are in FS, on the other hand, most of the households headed by HH who have never attended are in food insecurity. HH-headed households civil servants and traders are not affected by the SFI like the households of breeders, farmers or daily workers. Finally, households made up of 1 to 3 people are in FS compared to other households larger than 1-3 people.

Table 2. Overall food security index in the city of Abeche

Domain	Indicator	FS	BFS	MFI	SFI	
Actual status	Alimentary consumption	Food Consumption Score	Acceptable 2.8%		Limit 55.4%	Poor 41.8%
	Survivability	Economic vulnerability	Share of food expenditure	50%<Share 9.9%	50-65% 15%	65-75% 25.8%
Depletion of assets		Livelihood-based coping strategies	None 11.3%	Stress 39.4%	Crisis 33.3%	Emergency 16.0%
Food insecurity index			11.3%	37.6%	31.9%	19.2%

Table 3. Index of Food Safety according to household characteristics

Household characteristics		Food security index			
		FS	BFS	MFI	SFI
Gender of HH	Male	10.3%	26.8%	22.1%	17.4%
	Women	0.9%	10.8%	9.9%	1.9%
Marital status of HH	Married	5.2%	10.8%	15.5%	14.1%
	Single	4.2%	14.1%	2.3%	0.0%
	Divorced/separated	1.4%	4.7%	6.1%	0.0%
	Widowed	0.5%	8.0%	5.2%	21.6%
CM age range	15-29 years old	3.8%	12.7%	2.8%	1.9%
	30-44 years old	3.3%	12.2%	4.7%	2.3%
	45-59 years old	0.9%	7.5%	8.5%	6.6%
	≥ 60 years old	3.3%	5.2%	16.0%	8.5%
Education level of HH	Never frequented	0.5%	0.9%	5.6%	8.5%
	Coranic	3.3%	12.2%	6.1%	2.8%
	Primary	0.5%	7.0%	13.6%	4.2%
	Secondary	2.8%	15.0%	1.9%	3.3%
	Tertiary	4.2%	2.3%	4.7%	0.5%
Main activities of HH	Official	0.5%	4.2%	4.7%	00%
	Agriculture	0.5%	4.2%	10.2%	7.0%
	Breeding	0.5%	1.9%	2.3%	7.5%
	Trade	4.2%	4.2%	2.3%	0.0%
	daily work	4.2%	16.0%	8.0%	2.3%
	Unoccupied	0.0%	3.3%	2.8%	0.9%
	Others	1.4%	3.8%	1.4%	1.4%
Household size	1 to 3 people	10.3%	2.8%	2.3%	15.0%
	4 to 6 people	00%	8.5%	11.7%	12.7%
	More than 6 people	0.9%	26.3%	17.8%	72.3%

Table 4. Proportion of children aged 6 to 59 months by age group according to gender

Age groups (months)	Girls		Boys		Total	
	n	%	n	%	n	%
6 to 12	6	3.3	12	6.6	18	9.9
12 to 24	21	11.6	33	18.2	54	29.8
24 to 36	37	20.4	20	11	57	31.5
36 to 48	15	8.3	17	9.4	32	17.7
48 to 59	13	7.2	7	3.9	20	11
Total	92	50.8	89	49.2	181	100

3.7 Characteristics of Children from 6 to 59 Months

3.7.1 Distribution of children from 6 to 59 months by age group according to sex

The anthropometric study involved 181 children, 89 of whom were male and 92 female (Table 4).

The analysis of the data reveals that the age of most children aged 6-59 months surveyed falls within the age range of 24-36 months. Which represents the highest proportion (31.5%) while the lowest proportion concerns those aged 6 to 12 months (9.9%). According to gender, girls

represent (50.8%) and boys (49.2%). Ratio boys/girls is 1.

3.8 Nutritional Status

3.8.1 Distribution of z-scores of children's nutritional indices

The red and blue curves in the Figs. 8 and 9 illustrate the distribution of the nutritional index z-scores of the sample, while the green curves represent the nutritional index z-scores of children in the 2006 WHO reference population. The comparison of these curves shows a shift to the left of the red (girls) and blue (boys) curves

compared to the green curves. This discrepancy reflects the difference between the nutritional status in terms of the magnitude of malnutrition of the children surveyed and that of the children in the reference population.

3.8.2 Prevalences different forms of malnutrition

Table 5 shows the prevalence of the different forms of malnutrition according to the nutritional

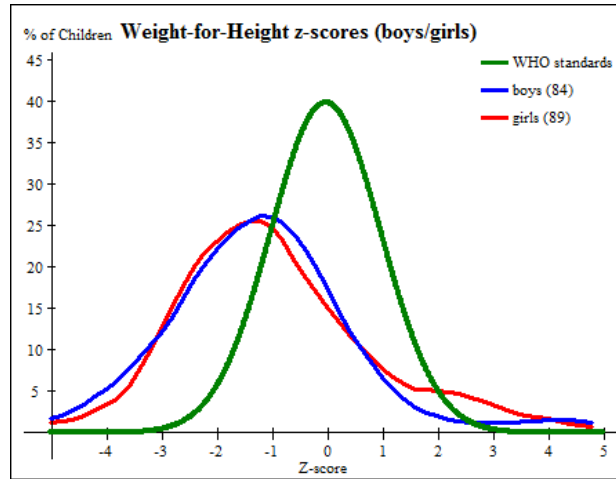


Fig. 8. Distribution of Z-scores weight-for-height index

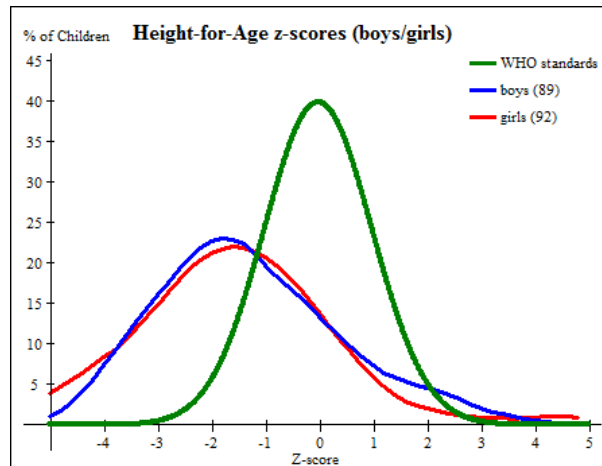


Fig. 9. Distribution of Z-scores of the height-for-age index

Table 5. Prevalence of different forms of malnutrition according to nutritional indices

Indices	Z-scores	Degrees	Workforce	Percentage
Weight for height (acute malnutrition)	<-3 and/or edema	Severe	27	15.0
	<-2 and ≥ -3	Moderate	32	17.8
	<-2 and/or edema	Global	59	32.8
Height for age (chronic malnutrition)	<-3	Severe	32	17.7%
	<-2 and ≥ -3	Moderate	36	19.9
	<-2	Global	68	37.6
Weight for age (underweight)	<-3	Severe	25	14.5
	<-2 and ≥ -3	Moderate	40	23.1
	<-2	Global	65	37.6

indices and according to the z-scores calculated on the basis of the 2006 WHO standards.

Anthropometric analysis revealed that 32.8% of children aged 6-56 months were wasted and 37.6% suffered from chronic malnutrition in the city of Abeche. These prevalences are higher than those obtained by the DNTA [6] and [17] for acute and chronic malnutrition with respective prevalences of 13.7% and 27.3%. The prevalence of acute and chronic malnutrition exceeds the threshold of $\geq 15\%$ set by the WHO qualifying the situation as critical.

4. CONCLUSION

This study has highlighted the contributing factors of household food and nutrition insecurity in the city of Abeche through an in-depth FNS assessment and the identification of the characteristics of those most affected by food and nutrition insecurity. The results obtained conclude that the Abeche households with deficient food consumption devote more than 75% of their expenditure to food and experience a significant loss of their means of subsistence which leads to significant deficits in food consumption. This economic vulnerability of households leads them to resort to irreversible coping strategies leading to an accelerated depletion of their assets. Households therefore find themselves in a circle of poor nutrition and reduced adaptive capacity. This study therefore constitutes a decision-making aid tool in order to effectively combat food and nutritional insecurity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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