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HOUSEHOLD FOOD CONSUMPTION AND NUTRITIONAL STATUS OF CHILDREN AGED 6 TO 59 MONTHS IN ZINDER, NIGER REPUBLIC

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ABSTRACT

Malnutrition exists in both urban and rural areas in Niger. An analysis of food and nutrition situation was carried out in the urban municipality of Zinder in order to contribute to a better understanding of the situation. This work was done from February to March 2018, at the household level, sampled by probabilistic method. The study involved 168 children from 6 to 59 months selected from 150 households in 15neighborhoods in the urban municipalities of Zinder. An analysis of the Food Consumption Score and Household Food Diversity Score showed acceptable food consumption and high food diversity respectively in58.7% and 67.3% of households. Furthermore, the results showed that the socio-economic characteristics that determined Score of food consumption were the main activities of heads of households and their wives. Food diversity was generally acceptable, although 2.7 % of households still had low dietary diversity in the study area. Also, food diversity remained low overall for nearly 8.9% of children with a rate of 6.0% for households headed by a woman. Nevertheless, the latter female-headed households had an estimated 13.7% of children with average individual food diversity. The prevalence of acute global malnutrition is 13.1% with the severe form at3%. It should be noted that girls were much more affected by this severe form (3.4%) compared to 2.5% for boys. However, stunting was more prevalent in males than in females with 57.5% and 46.6%,respectively. Moderate form accounting for 28.4% in females compared to 17.5% in males. This nutritional status reflects the relatively acceptable food situation in which these children lived. Furthermore, the appreciation of different foods and modes of consumption have shown on the one hand that the diet remains monotonous. On the other hand, this analysis revealed that cereal-based dishes accompanied by vegetable/leafy sauces predominated in these households in the study area. This situation exposes the members of these households and especially young children to the risk of malnutrition.

Key words: Characterization, food consumption, food diversity, nutritional status, children, household, socioeconomics, Zinder

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INTRODUCTION

The food consumption pattern in Niger varies widely between rural and urban areas [1]. In fact, in terms of food, urban centers are deemed to have less seasonality in supply and have a better availability and a greater variety of foods relative to rural areas [2]. In order to be effective in supporting people to ensure food security, to know the current situations and their causes is necessary. However, stakeholders involved in food security issues have not paid much attention to the urban environment. In cities, food insecurity is obscured by aggregated statistics that do not take into account the wide disparities in social and economic situations, and the characteristics of the urban environment [3]. In addition, itis apparent that the urban poor have child malnutrition rates comparable to those of the rural poor [4]. The national prevalence of overall acute malnutrition is 10.3% (8.8 - 11.8) among children aged 6 to 59 months, which corresponds to a serious nutritional situation according to the WHO classification. Also, the prevalence of overall acute malnutrition is 8.5% for the urban environment, the city of Zinder is at 8.8% (6.3-11.4) [5]. The recurrent food and nutrition insecurity is caused by repeated droughts in the Zinder region [5]. Nearly one third of the population is exposed to food and nutrition insecurity [6]. This food and nutritional insecurity is a major aspect of urban poverty, most of ten resulting in malnutrition [7]. Furthermore, malnutrition is one of the major public health problems in the Zinder region, classified in this study as a seriously affected area [5]. Although the cause of the nutritional issues is multifactorial, insufficient quality and quantity of diet contributes significantly to these problems. Knowledge of the food and nutrition situation also helps to identify pockets of food insecurity and improve the targeting process [8, 9]. The in-depth analysis of data on food consumption and the nutritional status of children will allow achievement of the global objective of the study, which was to contribute to a better understanding of the food and nutrition situation in the city of Zinder.

MATERIALS AND METHODS

Materials

Study site

The town of Zinder or Damagaram, is located 900 km east of Niamey, the capital city of Niger. The Zinder region covers an area of 559.66 square kilometers. Its geographical coordinates are: 13° 48 19 North and 8° 59 18 East. It should be noted that the city is entirely circumscribed by Mirriah, one of the 10 departments of Zinder region. However, the city of Zinder had the highest population (3.556.239 people) growth rate of (4.4) in 2016, showing a rapidly changing population.

Data collection tools

The study material used consisted of:

A questionnaire for Household Level Surveys that covers general socio-economic characteristics, the characteristics of children aged between 6and59 months, food consumption data, the child nutritional status, the dietary diversity including the food consumption score (FCS), and the household food diversity score (HDS). A weighing

scale and a heightometer used for measurements of children's anthropometry were made available.

Data processing tools
These are primarily ENA, SPSS 23, and Microsoft Office 2013 (Excel). ENA and SPSS software were used for the design of the capture mask and data processing. Excel was used to produce tables and graphs.

Sampling
The study involved a sample of 150 households. The sampling frame consisted of the list of villages and neighbourhoods from the 2012 GPHN and the 2014 National Repository of Localities. The sample number for each study area was randomly determined using the SMART method. A three-degree probabilistic method was used for this sampling: In the first degree, four (4) urban municipalities were selected in the city of Zinder out of the five (5) municipalities. In the second degree, 15 neighborhoods in the 4 urban municipalities (out of a total of 44) were selected randomly and proportionally to their size in terms of the number of households using the NAS software. Finally, 4 neighbourhoods were chosen per municipality except for municipality number 2, where only 3 neighbourhoods have been selected. In the third stage, a fixed number of 10 households in each neighbourhoods was randomly drawn. So, in each household chosen, all children aged 0 to 59 months were included in the sample.

Data analyses

The anthropometric data
The analysis of the anthropometric data was made on the basis of the standard plan of analysis of the ENA software and continued by the SPSS software. Based on the basic data of sex, age, weight, height, presence of nutritional edema, the values of the nutritional indices were calculated compared to the WHO reference 9(2006). Indeed, these indices below were considered for:

- Acute malnutrition (Weight/Height): Severe (-3 SD and/or edema); Moderate (between -2 SD and >= -3 SD); Global (-2 SD and/or edema)
- Chronic malnutrition (Height/Age) and Underweight (Weight/Age): Severe (-3 SD); Moderate (between -2 SD and >= -3 SD); Global (-2 SD) [10].

The food consumption
For the analysis of the dietary frequency and the diversity in the study area, the Food Consumption Score (FCS) and the Household Food Diversity Score (HFDS) were evaluated. A descriptive analysis determined their distributions.

Food consumption score (FCS)
The Food consumption score is a composite score based on the diversity, the frequency and the relative nutritional importance of different food groups. It makes it possible to assess the frequency of the consumption of food and food groups during the 7 days preceding the data collection, as well as the sources of food. The calculation formula is as follows:

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$$\text{Score} = a_{cereale}X_{cereale}+a_{pulse}X_{pulse}+a_{vegetable}X_{vegetable}+a_{fruit}X_{fruit}+a_{animal}X_{animal}+a_{sugar}X_{sugar}+a_{milk}X_{milk}+a_{oil}X_{oil}$$

Xi: Frequencies of the consumption of the food or number of days that the food has been consumed in the last 7 days (for the same food group, this number may not exceed 7);ai: Weight of each food group(this parameter reflects the quality of the predominant nutrients and the degree of absorption. Its value varies from 0 to 4). Country-adjusted daily consumption thresholds for oil and sugar were also used to establish the household food profile (Table 1).

The Household Diversity Score (HDS)

The Household diversity score is a simple count of the food groups that a household consumed during the 24 hours prior to maintenance. The approach is based on the methodology developed by FAO and the FANTA project. The classification of the different types of household was made on the basis of the thresholds mentioned in Table (2).

The estimated proportions were presented with their 95% confidence intervals.

Determinants of the household food consumption

The logistic regression or logistics model was used to analyze the determinants of household food consumption**.** Indeed, it should be noted that this model was used by several authors in the analysis of the determinants of food security in Niger [11], and in the evaluation of the determinants of the nutritional status of children in Pakistan, respectively, by Alderman and Garcia [12], in Madagascar, by Rasolofo and Joseph [13], and finally in Côte d'Ivoire by Yabile [14].

This model was also used by Agbodji and Abalo [15]. Also, Améwuamé [16] during the study on the determinants of malnutrition in Togo. For example, the dichotomous variable "y" designating the sub diet and defined as: 1, whether the household has a poor or a limit FCS and 0 if the household has a FCS acceptable [14]. In addition, a cross-reference of each dependent variable with all the explanatory variables selected following the bivariate tests was made to assess their coefficients (or proportions) in relation to the explained variable (dependent). This procedure provided an assessment of the strength or weakness between the two groups of variables.

RESULTS AND DISCUSSION

The socio-economic characteristics of households

Table 3 shows that an average household was consisted of 5 to 7 persons. This relatively high household number is largely related to the high fertility rate in the region. The activity that was practiced most by heads of households and their wives was trading.

The Households surveyed were characterized by an average size of 57.3 persons. Also, close to 57.3% of households had 5 to 7 people. However, 82% of households were headed by men. These characteristics are similar to those of the INS [11] (88.9% of male

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heads of households at national level) and INS [5]. These are explained by the fact that in Niger, the households are largely headed by men.

The nutritional status of children

The nutritional status has been appreciated through various forms of malnutrition including acute malnutrition, underweight and stunting. The figure (1) shows the prevalence of the acute malnutrition by sex.

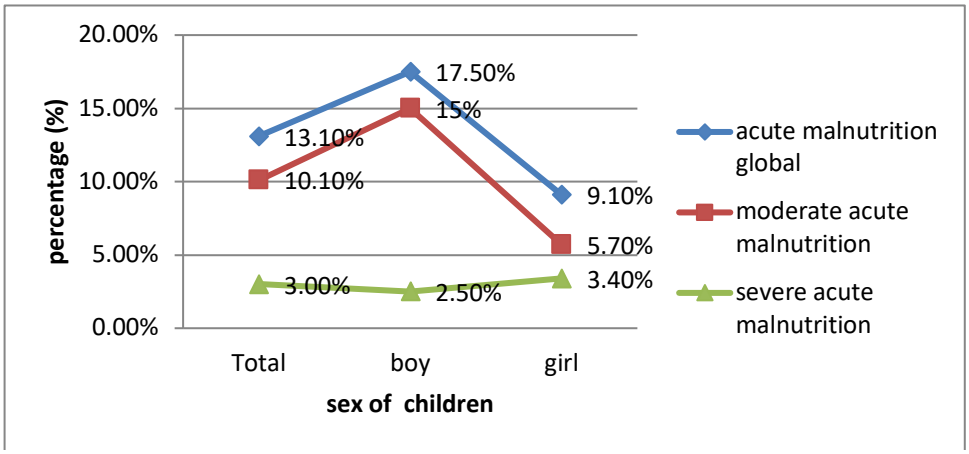

Figure 1: The prevalence of acute malnutrition

This figure shows that the prevalence of overall acute malnutrition is 13.1% (6.9 - 23.3) among children aged 6 to 59 months. In addition, the severe form is estimated at 3% with a gender disparity. In fact, girls are much more affected by this severe form with a prevalence of 3.4% compared to 2.5% for boys. The figure 2 shows the prevalence of underweight by sex.

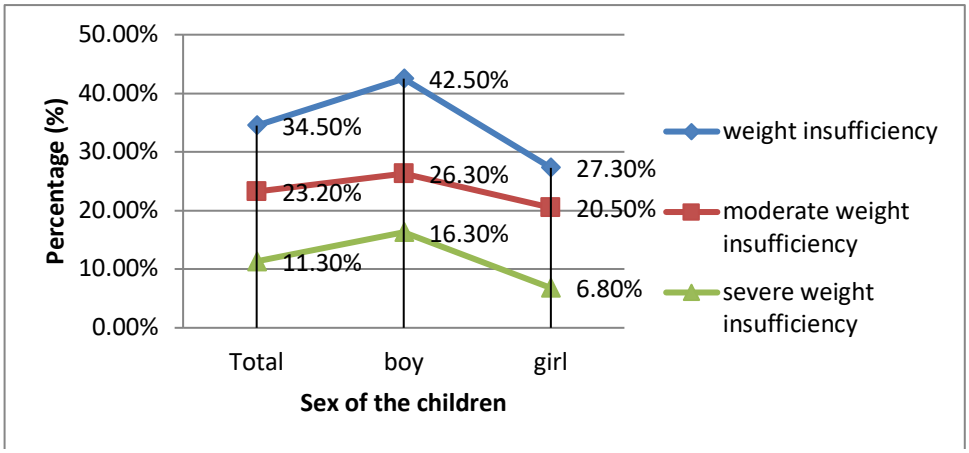

Figure 2: The prevalence of underweight

The results show that 34.5% of children were underweight, but with an intersex disparity (42.5% for boys versus 27.3% for girls). The moderate form also prevails over severe form (boys (16.3%), girls (6.8%).)

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Stunting affects boys much more than girls with 57.5% and 46.6% respectively as prevalence rates (Figure 3). The moderate form accounted for 28.4% of girls compared with 17.5 % for boys.

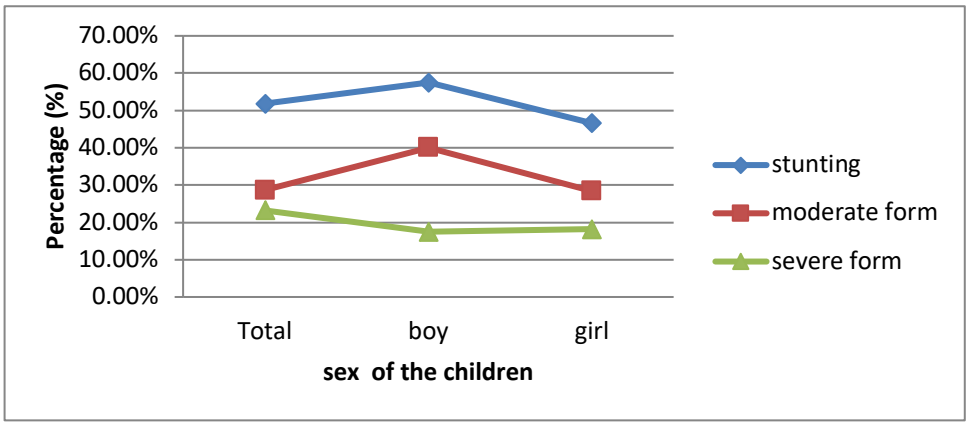

Figure 3: The prevalence of stunting

The prevalence of overall acute malnutrition is 13.1% (6.9 - 23.3) among children aged 6 to 59 months, 10.1% for the moderate form and the severe form is 3%. These results were lower than INS [5], which had a prevalence of 8.8%, the severe acute malnutrition of 0.9% and the moderate acute malnutrition of 7.9% in urban areas of the Zinder region, respectively. This proportion of overall acute malnutrition is above the alert threshold (10%) and corresponds to a critical situation on the WHO classification scale. In households, 34.5% of children were underweight (42.5% for boys versus 27.3% for girls). This result is higher than the various INS nutritional surveys at the national level and for the Zinder region where it was registered in 2016 25.0% of cases and in 2014, 27.1% and in 2013, 24.8% of children who were underweight. The prevalence of the chronic malnutrition exceeded the WHO critical threshold of 40% in surveyed households (51.8%). This result is much higher than that of the nutrition surveyed in2016, which found34.9% and 31.3%, respectively in rural Zinder and urban Zinder but similar for the Zinder region overall by 50.1% (45.5-54.7).

The characteristics of the household nutrition

The results of the survey on the characterization of the food consumption showed that cereals, oils and condiments were consumed daily (Figure 5). The oil and condiments were consumed by the households surveyed mainly in the preparation of dishes.

Analysis of the results in Figure 5 also showed that dairy products and milk were not consumed much in these households. It should also be noted that there was a relatively high use of sugar and sweetened products as well as egg, fish and meat.

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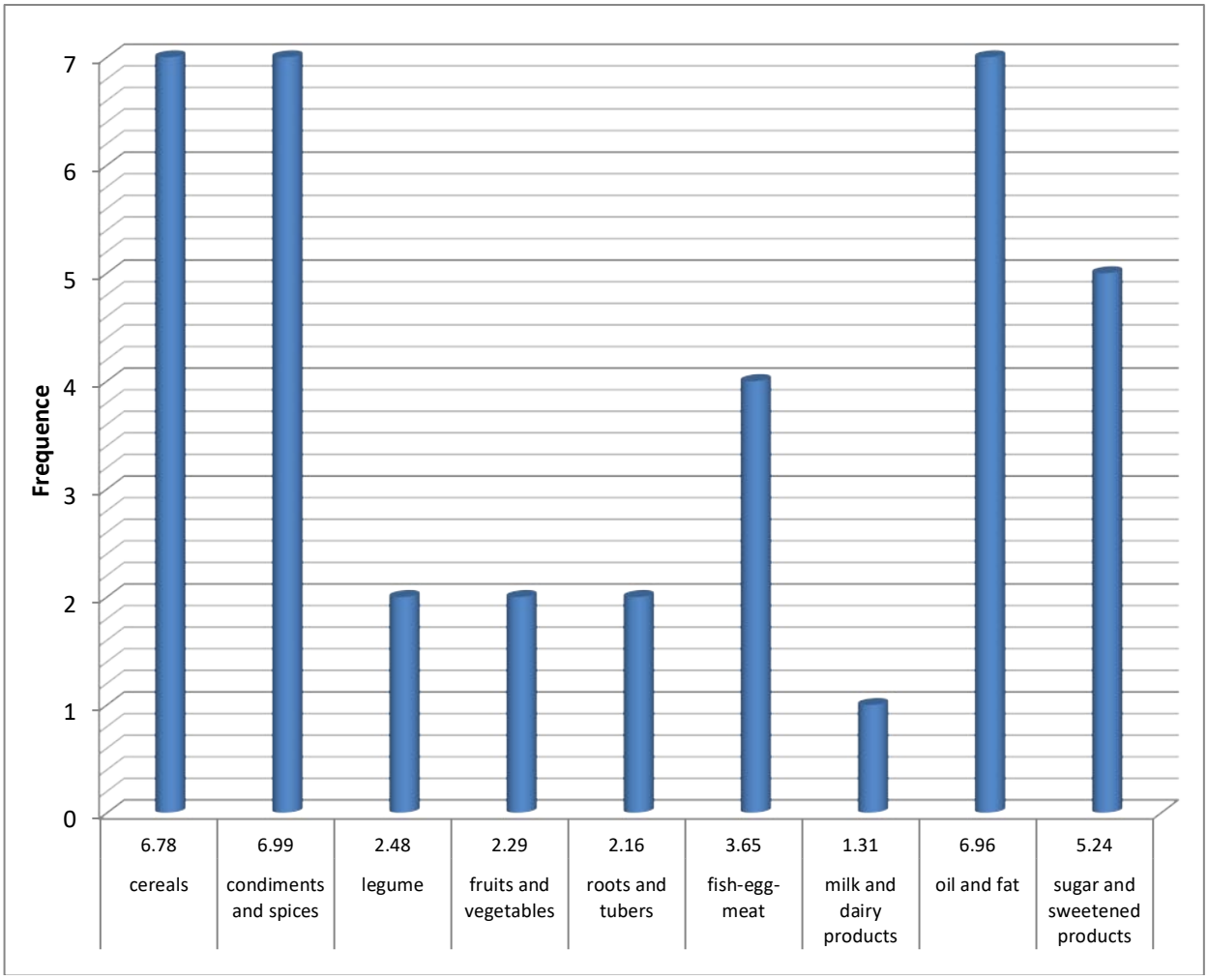

Figure 5: The average frequency of the consumption of food groups

Household food consumption and dietary diversity scores

Figures 6 and 7 show the household food consumption score and the dietary diversity score, respectively.

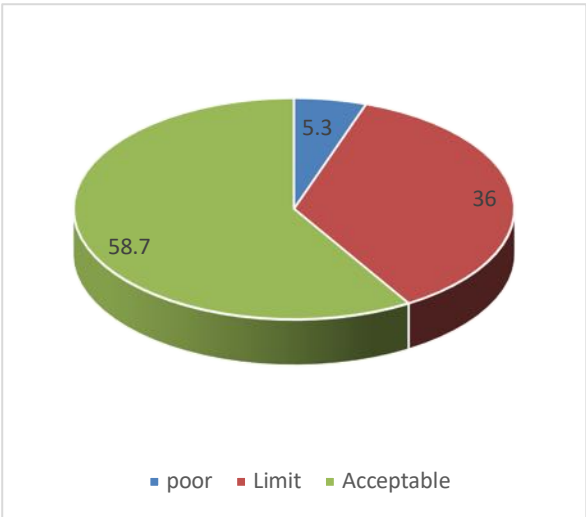

Figure 6: The food Consumption Score

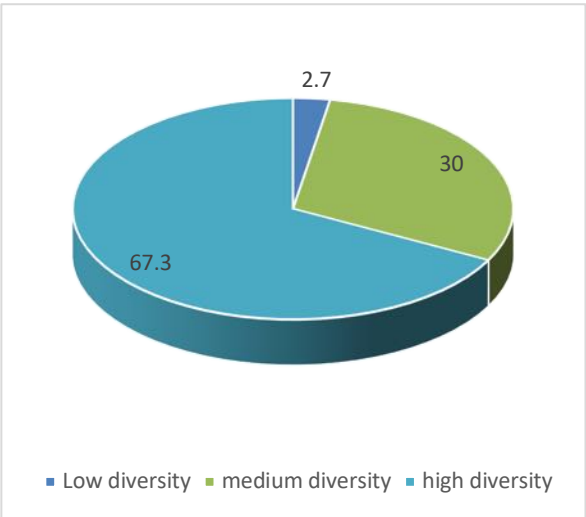

Figure 7: The dietary Diversity Score

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The frequency of consumption of food groups by households made it possible to assess their food consumption. Indeed, the food consumption was considered acceptable in 58.7% of the households. Nevertheless, food consumption was limited in 36% and poor in 5.3% of households (Figure 6). For the dietary diversity (Figure 7), the results show that 67.3% of surveyed households had a high diversity, meaning that they consumed at least six food groups, while 30% consumed between four and five and 2.7% of the households consumed between one and three.

Dietary Diversity Score for Children

The analysis of infant feeding resulted in a relatively acceptable Individual Dietary Diversity (SDAI) score (Table 4). This SDAI is high for 65.5% of children, medium for 25.6% and low for 8.9%, respectively.

However, the dietary diversity reference to the gender of the head of household revealed a low proportion of children (5.97%) with low SDAI in households headed by women.

The food consumption patterns at the household level

The Table 5 shows the food normally consumed by the surveyed households by municipality. According to the results, cereals (rice, maize, millet) were the main staples consumed. Also, these foods were presented to household members in the form of pasta, porridge or other with various sauces associated.

On the dietary side, the analysis of food consumption and dietary diversity scores revealed acceptable scores among the majority of households. The food consumption score was acceptable in 58.7% of households and only 5.3% of households had a poor consumption. This shows, according to CILSS's harmonized framework, that consumption is acceptable with some degree of deterioration linked to the proportion of households with poor food consumption slightly above the threshold of 5% indicating a food security situation [17]. The SDAM analysis reflected a situation similar to that recorded by INS [11]. It indicated that one in five households (20%) had low food diversity and 43% of households consumed at least 6 food groups.

The determinants of the household food consumption

The result of the model's predictive power estimates, the identification of determinants of household food consumption and their interpretation show that the model has good predictive power in that it predicts the household food consumption at 76.9%. However, it appears that acceptable food consumption was better predicted (88.6%) than poor or limited food consumption (52.6%) (Table 6).

The model was generally significant in that at least one of the explanatory variables has an influence on the food situation of households.

Table 7 presents the results of the logit model estimates. The dependent variable is the dichotomous variable that translates quality of food consumption. The estimated model identifies two relevant variables explaining household food consumption: the main

activity of the head of household (p=0.010) and the main activity of the wife (p=0.024) significant at 5% (Table 7).

The main activity of the head of household is an important factor for household as it is the main source of household food. The results indicated that by referring to the terms "public or private administration and commerce and entrepreneurship", having received a fairly large income would consequently reduce the probability of being undernourished by 0.308.

The wife's main activity: the significance of this variable and the positive sign of its coefficient informed that the more the wife performs an income-generating activity the more the household's probability of having an acceptable food consumption. It should be noted that even if the level of education, age and household size were not significant, the interpretation of the sign of their coefficient gives:

Age: The older the head of household and spouse, the less likely the household was to be undernourished. The results also showed that this trend was decreasing after 60 years for heads of households. This is what the negative sign of the coefficient of this variable meant through the model.

Educational attainment: The negative sign of its coefficient showed that the higher the educational attainment of the head of household and his wife, the more likely the household is to have an acceptable food intake.

Household size: This was an essential feature in the analysis of food consumption. Also, the results in Table 6 indicate that the probability of having a low diet increases by 0.047 with household size. The negative sign of the coefficient showed that the larger the household size, the more likely the household is to have an acceptable food consumption.

The results revealed that the determinants of the consumption and the dietary diversity are simultaneously associated with the characteristics of households and respondents. Among the characteristics of households, the main activity of the head of household and of the wife was positively associated with consumption. The meaningfulness of this variable and the positive sign of its coefficient explained the probability of having a limit or a poor dietary consumption if income is not significant for the purchase of sufficient and diversified foods [14]. Within this same framework, the INS [11] found that the most exposed persons were those living in households headed by persons engaged in insecure jobs such as wrecks, private sector workers.

CONCLUSION

The region of Zinder, like the other 7 regions of Niger, showed a persistence of malnutrition prevalence among children. In fact, the estimated prevalence in this study among the children surveyed was 13.1%, 34.5% and 51.8%, respectively for acute global malnutrition, underweight and stunting. However, these levels of prevalence resulted from interactions between multiple factors, including food and non-food. Indeed, an established relationship between food consumption and socio-economic characteristics

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has shown that the food consumption score is associated with these household characteristics. The main income-generating activity of the head of household (p=0.010) and that of his wife (p=0.024) were significant at 5% and, therefore, influenced food consumption. Also, it should be noted that the food consumption score (FCS) and the food diversity score (FDS) of households, revealed that just over half of surveyed households (58.7%) had an acceptable diet with nevertheless a fairly good food diversity for only 67.3%. However, the diet remains monotonous as it consisted of rice and maize meals to which were added oils, spices and other seasoning.

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Table 1: FCS Thresholds and Profiles

Thresholds	Profile
0 – 28	Poor food consumption
28.5 – 42	Food consumption at limit
>42.5	Acceptable food consumption

Table 2: MARS Classification Thresholds

Thresholds	Profile
1 to 3 groups	Low diversity
4 to 5 groups	Middle diversity
6 groups and above	high diversity

Table 3: The socio-demographic characteristics of households

Characteristics		Percentage (%)
Sex of the head of household	Male	82
	Female	18
Level education of the head of household	Primary	16
	Secondary and more	38
	Coranic	20
	Never gone to school	26
Main activity of the head of household	Agriculture	1.3

	Trade	45.3
	Crafts	06
	Public or private administration	26.0
	Daily worker	6.7
	Without any occupation	14,7
Level education of the wife	Primary	35.0
	Secondary and more	27.3
	Never frequent	37.6
Main activity of the wife	housewife	36.8
	Small business	38.5
	Student	6.0
	Public/private administration	17.1
	Daily work	1.7
Age of the head of household	30 years and under	10.0
	Between 31 and 49 years	45.3
	50 years and more	44.7
Number of persons in the household	1 to 4	27.3
	5 to 7	57.3
	8 and more	15.3
Age of the wife	30yearsand under	40.2
	Between 31 and 49years	47.1
	50 years and more	128

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Table 4: Characterization of dietary diversity of children

	Percentage (%)	Sex of the head of household	
	Global	Male	Female
Low diversity	**8.93**	**2.96%**	**5.97%**
Middle diversity	**25.59**	**11.90%**	**13.69%**
High diversity	**65.48**	**60.72%**	**4.76%**

Table 5: The typical form of the household foods consumed

Commune	Usually consumed food	Frequency a week
I	Rice with baobab leaf sauce	3 to 4
	Millet porridge	3 to 4
	Corn tô with leaf sauce	4 to 5
	Corn tô with gombo sauce	5 to 6
	Dan wake (soy cheese)	4 to 5
II	Rice with cowpea	3 to 4
	Rice tô with gombo sauce	4 to 5
	Rice tô with baobab leaf sauce	3 to 4
	Millet porridge	4 to 5
	Tô de mais with leaf sauce	5 to 6
III	Rice with red sauce (tomato sauce)	3 to 4
	Rice with cowpea	4 to 5
	Rice tô with baobab leaf sauce	3 to 4
	Millet porridge	3 to 4
	Corn tô with gombo sauce	4 to 5
	Awara (soy cheese))	3 to 4
IV	Rice with gombo sauce	4 to 5
	Rice tô with gombo sauce	4 to 5
	Millet porridge	4 to 5
	Corn tô with leaf sauce	4 to 5
	Dan wake (cowpea flour and baobab leaf)	3 to 4

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Table 6: The predictive Power of the Model

		Projections		
		Food consumption score (FCS)		
		Poor or limits	Acceptable	Percentage correct
FCS	Poor or limits	20%	18%	52.6%
	Acceptable	9%	70%	88.6%
global percentage				76.9%

a, the cut value is 0.500

Table 7: The logistic regression results

	B	E.S	Wald	ddl	Sig.	Exp(B)
Age of head of household	-0.055	0.053	1.069	1	0.301	0.947
Level of education of head of household	-0.157	0.150	1.101	1	0.294	0.855
Main activity of the head of household	0.308	0.119	6.725	1	0.010	1.361
Age of the wife	0.009	0,061	0,020	1	0.888	1.009
Level of education of wife	-0.067	0.120	0.319	1	0.572	0.935
Main activity of the wife	0.553	0.244	5.131	1	0.024	1.739
Size of the household	-0.047	0.160	0.085	1	0.771	0.954
Constant	0.800	1.464	0.299	1	0.585	2.227

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