Food Science and Technology 5(1): 1-8, 2017
DOI: 10.13189/fst.2017.050101 http://www.hrpub.org

Prevalence and Determinants of Food Insecurity in the Southwestern Benin Setting (West Africa)

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Abstract Food insecurity affects life quality. The purpose of the study was to determine the prevalence and identify socioeconomic determinants of food insecurity in southwestern Benin setting. This cross-sectional study included 510 households selected in the southwestern of Benin using randomly using multistage cluster technique. Data on dietary habits were collected from heads of households using questionnaire. Food insecurity was determined using food insecurity pillars (food availability, access and use) and the score of food consumption based on the diversity and the frequency of food groups consumption. Among the 510 respondents, 47.7% were women. The prevalence of food insecurity was 31.5% (CI95%: 31.3-31.7). Households heads who has secondary school training level had 0.4 (CI95%: 0.2–0.9) times less risk to experience food insecurity than those which no schooling. Households heads who has low socio economic level were 4.8 (IC95%: 2.8–7.8) times more at-risk to experience food insecurity than those of medium socio economic level. The prevalence of food insecurity was high in southwestern Benin setting in 2015. Interventions to improve education level and socio economic conditions are needed to prevent food insecurity in households.

Keywords Food Insecurity, Determinants, Socioeconomic, Benin

1. Introduction

According to the Food and Agriculture Organization (FAO) in 2014, eight hundred five millions persons that is a one-ninth of the world population experienced a situation of serious under feeding and majority of those persons underfed live in developing countries [1; 2]. According to the projections, the prevalence of under feeding in Sub-Saharan Africa in 2015 will be 23.2%. [3]. Food insecurity threatens life quality [4] and constitutes a principal cause of child malnutrition [5].

In Benin, food insecurity remains a worrying situation even though the number of persons under fed decreased from 1.5 million in 1992 to 1 million in 2014 with 11% of the households who were affected with food insecurity [2]. Indeed, this prevalence of food insecurity hides important disparities. The report of the global analysis of the vulnerability and food security in Benin in 2014 showed that the departments of Couffo, Mono in southwestern and Atacora in north were mostly concerned with the high level of food insecurity with respectively 29%, 28% and 25% of the households [6]. The purpose of this survey is to identify the determinants of food insecurity in southwestern Benin area.

2. Materials and Methods

2.1. Setting

The study was carried out in southwestern Benin in department of Couffo with 745 328 inhabitants.

This area is characterized by a subequatorial climate with two hot seasons and two rainy seasons for the second one. The annual rainfall varies from 900 to 1100 mm/annually. Those characteristics of the climate undergo some modifications because of certain disruptions [7]. Agriculture is the main economic activity and occupies majority of the population. The households grow mainly maize, cassava and beans. The only cash crops are cotton and groundnuts. The average size of the households was 5.9. Some households have a very low level of expenses whose 50% is reserved to food [7].

2.2. Study Design and Population

This was a cross-sectional and analytic study. The study

population included the heads of households.

2.3. Sampling

Size of the sample was estimated considering the prevalence of food insecurity to be 29% [6], a relative precision of 5%, design effect of 1.5, and a non-response rate of 10%, the sample-size came to be 510. The sample was divided into 51 clusters of 10 households.

The households were selected randomly using a cluster survey technique with multiple stages with proportional allocation according to the size of the villages and neighborhoods. The first grade concerns the choice of the villages where the clusters were formed. The second grade concerned the choice of the households.

2.4. Study Variables

The dependent variable was the food insecurity of the family. It was determined from the Food Consumption Score (FCS). The food consumption score is a composite indicator calculated to reflect food diversity and the consumption frequency in a family during a week [8]. It is an indicator of the accessible dimension of food security and the quantity of food consumption. A family is in severe food insecurity when its FCS≤35 and the family is in food security when its FCS> 35 [9].

The independent variables were concerned:

- The food availability (size of the fields allocated to food production; use of farming inputs; food stocks; family garden; grown products; family size, food source, conservation techniques, transformation techniques; duration of food stock; number of meals per day);
- The food accessibility (socioeconomic level; source of revenue; climate shocks; area of residence; distance between the house and the market; prohibited food; ethnic groups; food consumption). The level of socioeconomic welfare was a composite variable which corresponds to scores related to household amenities (houses, means of transport and information, energy and water source for domestic use). The total score classified in four categories identified four levels of the socioeconomic welfare: very low, low, medium and high [10].
- The use of the food (water source, clean environment, disease);
- The sociodemographic data of the head of the family age, sex, profession, educational background.

2.5. Data Collection

Appropriate standard questionnaire approved by the FAO for households' survey during the global analysis of food security and vulnerability was used. The investigators were formed on its filling. Data collection tools (questionnaires) were pre-tested for required adaptations data were collected from the head of the family.

2.6. Statistical Analysis

Data were analyzed using STATA 11 software. The analysis was performed using two approaches: descriptive analysis and regression modelling to determine the factors associated with food insecurity. The proportions with 95% confidence interval were calculated and the means with their standard deviation was estimated. Dependent variables included in the multivariate logistic model, were those previously associated to food insecurity in univariate analysis at significance level of 20%. Variables were adjusted to the model by the backward stepwise method in the multivariate logistic regression, using a significance level of 5%. Statistical analyses were corrected by the complex sample design, using the set of SVY (Stata Survey) commands in STATA software (version 11). Model fit was assessed using goodness-of-fit test specific to survey sample data, and Wald tests, to select the most parsimonious model.

2.7. Ethical Considerations

Local authorities and the participants were informed on the objectives of the survey. Informed consent was obtained from the respondents before the beginning of the data collection. This consent states that the participants are not subject to any harm by refusing to take part in the survey or stopping their collaboration during the survey.

3. Results

3.1. Characteristics of Participants

Among 510 participants, 47.7% were women. The age of the respondents varied from 30 and 50 years with a weighted median age of 39 years. Participants with no schooling represented (66.7%) and 3.6% had a higher level of education. The main profession was agriculture (67.9%) and the predominant ethnical groups were Adjas (95.9%) while Minas represented (2.4%).

3.2. Food Availability in the Households

The average size of the households was 6.7 ± 3.5 and they were mostly (56.5%) over 5km of the markets. Agriculture was the most frequent occupation (92.9%) and the main food product was maize and 33.7% grow also cash crops in addition to food products. They grow (47.9%) on areas varying between one and two hectares. Food stock was available (76.3%), but 70.2% did not have family garden. Among participants, 20.5% had no access to crop conservation techniques and 51.8% had no access to food transformation techniques.

3.3. Access and Use of Food

The main source of income of the households was

agriculture (80.9%). Among participants, 62.0% had a low socioeconomic level and 33.6% had some prohibited food. Rainfall irregularity was found as handicap for 86.3%. Observations showed that 54.5% of the households lived in an unsafe environment, 43.5% had run-off water as water source and 53.3%.

3.4. Food Insecurity in Households

Among participants investigated, 31.5% (IC_{95}: 31.3 – 31.7) experienced food insecurity.

3.5. Determinants of Food Insecurity in Households in Univariate Analysis

3.5.1. Determinants Related to the Head of the Family

Table 1 shows that the heads of the household with primary school level, secondary and higher had respectively: 0.51 (CI95: 0.3 – 0.9); 0.2 (CI95: 0.1 – 0.5) and 0.3 (CI95: 0.1 – 1.0) times less risk of being in food insecurity than those with no education. The heads of household who are civil servants had less risk to be affected by food insecurity than the ones who are farmers 0.3 (CI95%: 0.1–1.0).

3.5.2. Determinants Related to Food Availability

Table 2 shows that the households who practiced agriculture were 3.4% (CI95%: 1.36 – 8.55) times more at risk to be affected by food insecurity than those who did not.

When the number of daily meal increased by one unit, the risk of being affected with food insecurity was reduced of 0.7 (CI95%: 0.5 – 1.0), whereas the households who did not transform food were 1.6 (CI95%: 1.1 – 2.4) at-risk to experience food insecurity than those who transform food.

3.5.3. Determinants Related to Food Access

Table 3 summarizes the links between the factors related to food access and food insecurity. The households with only one source of income had 1.9 (CI95%: 1.1 – 3.3) times more risk to experience food insecurity than those who has two or more source of income. Households who lived in rural areas had 2.69 (IC95%: 1.65 – 4.37) times more risk than those living in urban areas. Living at a distance higher than 5km of the market increased 1.17 (CI95%: 1.13 – 2.53) times the likelihood of being in food insecurity. Households with low socioeconomic level had 5.6 (CI95%: 3.4 – 9.23) times risk to be affected with food insecurity than others.

3.6. Determinants of Food Insecurity in Multivariate Analysis

Table 4 describes the results of the logistic regression of the dependent variable on the independent variables. The heads of household with secondary education level had low risk 0.4 (CI95%: 0.2 – 0.9) to be affected by food insecurity than those with no education level. Households with low socioeconomic level had 4.8 (C95%: 2.8 – 7.8) times more risk to be affected with food insecurity than those with medium socioeconomic level.

Table 1. Participants characteristics and food insecurity in households, southwestern Benin, 2015 (n = 510)

Variables	Food Insecurity		OR	CI95%	p-value
	Yes	No			
Age					
Under 60 years	147	300	1		0.81
60 years and more	19	44	0.9	0.5 – 1.7	
Sex					
Male	77	190	1		0.064
Female	89	154	1.4	1.0 – 2.1	
Ethnical groups					
Adja	163	326	1		
Fon	2	6	0.6	0.1 – 3.3	0.6
Yoruba	-	1	-	-	-
Mina	1	11	0.2	0.02 – 1.5	0.13
Education level					
None	130	212	1		
Primary	26	70	0.5	0.3 – 0.9	0.013
Secondary	1	47	0.2	0.1 – 0.5	0.001
Higher level	3	15	0.3	0.1 – 1.0	0.049
Occupation					
Farmer	131	215	1		
Civil servants	4	19	0.3	0.1 – 1.0	0.049
Craftsman	16	43	0.5	0.2 – 0.9	0.017
Trader	13	51	0.4	0.2 – 0.8	0.007
Employee	2	16	0.2	0.04 – 0.8	0.023

Table 2. Food production and food insecurity in households, southwestern Benin, 2015 (n = 510)

Variables	Food insecurity		OR	CI95%	p-value
	Yes	No			
Working in agriculture					
No	3	30	1		
Yes	160	314	3.4	1.4 – 8.6	0.009
Types of production					
Food	104	207	1		
Cash crops	2	1	5.4	0.5 – 6.3	0.175
Both	51	106	1.0	0.7 – 1.6	0.86
Cultivated area					
Less than1 hectare	51	116	1		
1 – 2 hectares	83	148	1.3	0.8 – 2.0	0.28
More than 2 hectares	26	50	1.30	0.7 – 2.4	0.4
Use of fertilizers					
Yes	155	301	1		
No	5	13	0.9	0.3 – 2.9	0.89
Stock duration (monthly)					
0 – 4	63	106	1		
5– 8	50	113	0.8	0.5 – 1.3	0.37
9 – 12	49	108	0.9	0.6 – 1.5	0.74
Garden					
Yes	47	110	1		
No	119	234	1.3	0.8 – 2.0	0.26
Size of households					
<= 7	119	226	1		
8 – 15	45	108	0.8	0.5 – 1.3	0.43
16 – 26	2	10	0.6	0.1 – 2.7	0.45
Access to technique of conservation					
Yes	131	274	1		
No	35	70	1.0	0.6 – 1.6	0.92
Access to technique of transformation					
Yes	66	181	1		
No	100	163	1.6	1.1 – 2.4	0.014
Food stocks					
Yes	130	256	1		
No	36	88	0.8	0.5 – 1.3	0.43

Table 3. Food access, food use and food insecurity in household, southwestern Benin, 2015 (n = 510).

Variables	Food insecurity		OR	CI95%	p-value
	Yes	No			
FACTORS RELATED TO FOOD ACCESS					
Sources of income					
2 and mores	22	77	1		
Less than 2	144	267	1.9	1.1 – 3.3	0.019
Shock					
None	14	55	1		
Dry season	152	289	2.7	1.4 5.2	0.003
Prohibited food					
No	104	233	1		
Yes	62	111	1.2	0.8 – 1.8	0.32
Area of residence					
Urban	28	118	1		
Rural	138	226	2.7	1.7 – 4.4	<0.001
Market distance– area					
Less than 5km	63	159	1		
More than 5km	103	185	1.7	1.1 – 2.5	0.009
Level of economic welfare					
Medium	25	169	1		
Low	141	175	5.6	3.4 – 9.2	<0.001
FACTORS RELATED TO FOOD USE					
Health expenses					
Less than 50% of the budget	78	160	1		
50% and more of the budget	88	184	0.97	0.7 – 1.4	0.89
Water source					
Tap	12	45	1		
Well	78	149	1.7	0.8 – 3.4	0.16
Run-off water	76	150	1.8	0.9 – 3.7	0.11
Safety					
Yes	78	163	1		
No	88	181	0.95	0.6 – 1.4	0.81

Table 4. Determinants of food insecurity in households, multiple logistic regression, initial and final model, southwestern Benin, 2015 (n = 510).

Variables	Food insecurity (Yes)	Initial model		Final model	
		OR (CI95%)	p-value	OR (CI95%)	p-value
Education level					
None	130	1		1	
Primary	26	0.5 (0.1 – 0.5)	0.013	0.8 (0.5 – 1.4)	0.41
Secondary	1	0.2 (0.30 – 0.87)	0.001	0.4 (0.2 – 0.9)	0.032
Higher level	3	0.3 (0.07 – 0.99)	0.049	0.7 (0.2 – 2.5)	0.54
Occupation					
Farmer	131	1			
Civil servants	4	0.3 (0.1 – 0.99)	0.049		
Craftsman	16	0.5 (0.2 – 0.9)	0.017		
Trader	13	0.39 (0.2 – 0.8)	0.007		
Employee	2	0.2 (0.04 – 0.78)	0.023		
Working in agriculture					
No	3	1			
Yes	160	3.4 (1.4 – 8.6)	0.009		
Types of production					
Food	104	1			
Cash crops	2	5.4 (0.47 – 6.25)	0.175		
Two types (Both)	51	1.03 (0.7 – 1.6)	0.86		
Food transformation					
Yes	66	1			
No	100	1.6 (1.1 – 2.4)	0.014		
Number of source of income					
2 and mores	22	1			
Less than 2	144	1.9 (1.1 – 3.3)	0.019		
Shock					
None	14	1			
Dry season	152	2.7 (1.4 – 5.2)	0.003		
Area of residence					
Urban	28	1			
Rural	138	2.7 (1.6 – 4.4)	0.000		
Distance with the market					
Less than 5 km	63	1			
5 km and more	103	1.7 (1.1 – 2.5)	0.009		
Level of economic welfare					
Medium	25	1		1	
Low	141	5.6 (3.4 – 9.2)	0.000	4.8 (2.8 – 7.8)	<0.001
Drink water source					
Tap	12	1			
Well	78	1.7 (0.8 – 3.4)	0.16		
Run-off water	76	1.8 (0.9 – 3.7	0.11		

4. Discussion

The study examined the socioeconomic determinants of food insecurity of the households, in southwestern Benin. The prevalence of food insecurity in household was 31.5%. Education level and the socioeconomics level were its determinants.

4.1. Prevalence of Food Insecurity

The prevalence of food insecurity was a little higher than those reported (28%) in the global analysis survey of the vulnerability of food security in 2013 [3]. The difference might be from the fact that in the present study, data were collected in weld period. A similar prevalence was reported in Niger in 2006 [11]. However, a prevalence of food insecurity of 22% has been observed in Chad in 2013 [12]. This difference might be explained by the fact that the survey was conducted during a post-harvest period and did not concern rural households. Higher prevalence were reported in Democratic Republic of Congo considering the fact that the country faced many political instabilities, numerous conflicts that deprived the population from their cultivation soils and stop them (most of the households) to practice agriculture [13].

4.2. Determinants of Food Insecurity

The heads of the household who were educated were less at-risk to be affected by food insecurity than those who were not. The same association was observed in several surveys [11; 12; 14-16]. However, the survey that went on in Ivory Coast by Kinimo (2013) came up with a reverse association. The author observed that the uneducated heads of household were less at risk to be affected by food insecurity than those with the primary level. This was justified by the fact that no schooling households were mainly farmers who practiced auto consumption while the ones with primary level are often unemployed in towns [15].

Contrary to what reported other studies [17; 18]; the sex of the head of the household was not associated with food insecurity. The fact is that the heads of the households (in the present study) who are women had access to the soil and can then farm and diversifies their food consumption. The age of the heads of the household was not associated to food insecurity. Old heads of household hire the youth to do the farming job on their soils. A similar association was found in study conducted by Owolade and al. in Nigeria and Omidvar and al. in Iran. Meanwhile, other surveys pointed out an obvious fact of an association between the high age of the heads of household and food insecurity [7; 12; 19; 20].

Our results showed a great association between the level of socioeconomic welfare and food insecurity. Indeed, the households with a low socioeconomic welfare level were at high risk to be affected by food insecurity than the households with a medium socioeconomic level. Other surveys showed similar results [3; 12; 21]. The low level of socioeconomic welfare is characterized by the inability to produce sufficient income to ensure adequate food needs. A consequence of the poor state of the household would be food insecurity because the economic access to food is reduced for the poor household due to low income [22; 23].

Contrary to our results concerning the area of the households, Ategbo (1993) found that the living environment was associated to food insecurity. The author reported that households living in rural areas were more at risk to be affected by food insecurity than those living in urban areas [24]. Other studies came out with the same results. [6; 12; 25]. Indeed, households living in the rural areas produce foods and sell part of them. More and more, climate changes reduce the quantity of crops.

The limits of this survey are related to the fact that the SCA captures only a week consumption and does not include season variations and food consumption although it's a valid proxy of food security.

5. Conclusions

The prevalence of food insecurity remains high in department of Couffo in Benin in 2015. The education level and the socioeconomic welfare level of the head of household were the socioeconomic determinants of food insecurity. Schooling strategies and interventions that increase incomes of households are needed to prevent households from food insecurity.

Acknowledgements

We are very grateful to participants in the study.

Author Contributions

The research proposal was written by MNP CSJ and FB. The data collection was realized by FB. Data analysis was assured by MNP, FB and CSJ. All the authors had contributed to the revision of this paper.

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