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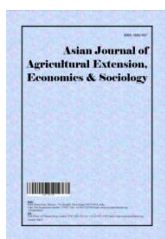
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Determinants of Food Security among Rural Women in Kaduna State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors OEO and OCA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author UUE managed the analyses of the study. Author OSO managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2020/v38i1030433

Editor(s):

(1) Dr. Zhao Chen, University of Maryland, USA.

Reviewers:

(1) Dnyaneshwar Mogale, Cardiff University, Wales.

(2) Binu Thomas, St. Joseph's College, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/61848>

Original Research Article

Received 06 August 2020
Accepted 13 October 2020
Published 29 October 2020

ABSTRACT

Adequate nutrition is a crucial component of a healthy society. One of the major problems of human health is malnutrition and it is in every society. Rural households engage in food production, yet, they are mostly food insecure. This study accessed the determinants of food security among rural women in Kaduna state. Multi-stage sampling procedure was used to draw the sample. Four rural Local Government Areas (LGAs) were randomly selected, while three villages were randomly sampled from each LGA resulting in 12 villages. Ten percent of the rural women in each of the sampled villages were randomly selected to give a total of 240 respondents. Interview schedule was used for data collection. Data were analyzed using descriptive and inferential statistics such as Chi-square, Pearson Product Moment Correlation (PPMC) and Regression. Mean age was 29.7±8.08 years. Most (60.4%) of the respondents were Christians. Thirty-four percent of the respondents

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had secondary education while some (40.0%) of the respondents were involved in trading. Dry season was considered as season of abundance by majority (70.8%) of the respondents. PPMC indicates that age ($r=0.119$; $p=0.009$) and household size, ($r = 0.221$; $P = 0.001$) were significantly related with household food security, while position as wife ($\beta= 0.194$), household size ($\beta= -0.173$) and monthly income ($\beta= -0.095$) were major determinants of household food security. Rural women have reasonable access to food. The study recommends that rural women should practice home gardening and domesticate animals to enhance food secured rural family.

Keywords: *Determinants; food security; rural women; villages; Kaduna state.*

1. INTRODUCTION

Food is life; therefore achievement of food security is an insurance against hunger. The problem of hunger is closely linked to poverty [1]. Agriculture is an essential element in efforts to combat poverty and food insecurity [2]. The [3] described food security as a condition related to the supply of food, and individuals' access to it. Food insecurity, on the other hand, is a situation of limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. According to [4], nearly a billion people across the world experience the effects of food insecurity. Famine and hunger are both rooted in food insecurity and chronic food insecurity translates into a high degree of vulnerability of famine and hunger; ensuring food security presupposes elimination of that vulnerability [5]. According to [6], food insecurity continues to be a key development problem across the globe, undermining people's health, productivity, and often their very survival. The primary cause of food insecurity in developing countries is the inability of people to gain access to food due to poverty. Compounding the problem of poverty is the global rise in food prices. Food insecurity is no longer seen simply as a failure of agriculture to produce sufficient food at the national level, but instead as a failure of livelihoods to guarantee access to sufficient food at the household level [7]. At the household level, food security implies an adequate access to food over time. This is only possible when there is adequate food availability to the household, and a sufficient income capacity for the purchase of the available food.

In line with [8] many countries of the world experience ongoing food shortages and distribution problems; these results in chronic and often widespread hunger amongst significant numbers of people across the world. In the same vein, many countries of the world are currently facing the double burden of hunger and under nutrition alongside with overweight and obesity, it

is normal now to find people with different forms of malnutrition living side-by-side in one country, in one community, or even in the same household. Hence, the prevalence rates of overweight, obesity and diet-related non-communicable diseases such as cardiovascular disease, stroke, certain cancers and type II diabetes, are on the increase in every region, in both developed and developing countries [9],[10].

Food security has a direct relationship with food availability hence, food production [7]. Africa is a continent rich in natural and human resources; Nigeria, also, blessed as it is with abundant agro-ecological resources, is characterized by high reliance on food importation [1]. Peasant agriculture, lack of industrialization, lack of effective irrigation, and lack of efficient postharvest handling during storage and transportation have also compounded the problem of food insecurity in Nigeria and the level of food insecurity in the country has continued to increase steadily [7],[11]. This was also corroborated by [12] that agriculture in Nigeria has suffered from decades of underinvestment, corruption, policy neglect, and lost opportunity. Despite its vast agricultural potential, Nigeria as a country is a major food importer, with the vast majority of people engaged in subsistence agriculture.

Malnutrition constitutes the gravest single threat to global public health [13]. Malnutrition is implicated in more than half of all deaths worldwide [14]. The [15] stated that the high levels of undernutrition in sub-Saharan Africa pose a major challenge for survival and development despite the diverse agricultural ecosystem that provides a wide range of indigenous and traditional foods which if effectively mobilized and managed can increase food availability, expand household food choices and improve nutrition security. According to [2], major achievements have been reached that most of the people in the world receive sufficient food to meet their energy requirements. However, energy is not sufficient to ensure good

and adequate nutrition. Adequate micronutrients must also be available.

In Nigeria, malnutrition is concentrated among the least educated households, particularly the rural population. Although malnutrition cuts across all age groups and categories of individuals in the rural areas, there is a high level of malnutrition among women in rural Nigeria; the figures differ with geopolitical zones, with 56 percent reported in rural areas of South West and 84.3 percent in rural communities in the Northern part of Nigeria [7]. Malnutrition is prevalent in the Northern part of the country, particularly within the indigenous group. The greatest food insecurity concerns remain in the extreme north, particularly in the northern most parts of Kano, Katsina, Zamfara, Kaduna, Sokoto and Kebbi states in the northwest. These areas were affected by the prolonged dry spells during the 2011 growing season with significant shortfalls in cereal production. Malnutrition in Nigeria especially in the North is a growing problem which is strongly linked to social and economic issues. For instance, the educational and employment achievements of women were attributed to the prevalence of "purdah" found in the northern part of the country. The practice of "purdah" reduces women's mobility and their participation in various aspects of life, whether in education, employment or access to information. Although, there are variations on the nature of strictness to this practice between rural and urban areas. In the rural areas, the relatively more socially homogeneous nature of the society and the demands imposed by the agricultural sector often make the practice weak [16]. The practice of purdah enhances dependence and women's lack of empowerment, thus preventing them from being self-reliant [17].

The present security challenge in the Northern part of Nigeria is another cause for concern. According to the [18], what actually started like a bully at the thresholds of 2009 in Nigeria has grown and assumed a gargantuan dimension. It has caused injury, pain and hunger. As a result, thousands have been forcibly displaced both within Nigeria and beyond. Farming seasons has been lost, threatening the region with a food security and nutritional crisis; maternal mortality has increased, the cost of living has risen sharply and communication with the rest of Nigeria and their international neighbours has been all but cut off [19]. According to [20], civil insecurity remains a driver of food insecurity in localized areas in the

extreme north, causing displacement, loss of income, destruction of agricultural assets, and loss of food stocks. In the north, insecurity caused by Boko Haram persists in Borno, Bauchi, Kano, Kaduna, Niger and Yobe states.

Together, these consequences threaten a foreseeable humanitarian crisis on the region which could endanger the short term gains of the on-going security operations in the Northern part of Nigeria. Insurgency is not caused by poverty alone. Poverty makes it only easy to recruit people for insurgency. Investigations by [19] indicated that the level of damage caused by insurgents in the state through burning of farmlands, looting and setting ablaze of food stuffs and domestic animals have a great impact on the food security of the area that if care is not taken and government does not intervene, the people of Northeast will experience famine, as they did not farm in the last farming seasons [18],[19].

Women contribute to food and nutrition security in significant ways; they are mostly responsible for food production and preparation for their families. Women as producers of food are central towards achieving food security through empowerment [21],[22]. The existing knowledge of food and nutrition security in rural areas of Nigeria does not offer detailed information to the household level, at which greater understanding is required to help design interventions that will change the unacceptable food and nutrition situation of rural women in Kaduna State. It is against this backdrop, the study was undertaken with the following objectives:

- i. To find out the socio-economic characteristics of rural women in Kaduna State;
- ii. To ascertain the food security status of rural women in Kaduna State;
- iii. To describe the length, the time and the causes of the lean season for rural women in Kaduna State and
- iv. To identify the sources of nutritional information available to rural women in Kaduna State.

1.1 Hypotheses of the Study

The following hypotheses were tested:

- i. H_0 : There is no significant relationship between socio-economic characteristics of rural women and household food security.

- ii. H_0 : There is no significant difference in food security status during dry and rainy seasons
- iii. H_0 : There is no significant relationship between rural women's sources of nutritional information and household food security.

2. METHODOLOGY

The study was carried out in Kaduna State. Kaduna State is located on the Southern end of the High Plains of Northern Nigeria, bounded by parallels $9^{\circ}03'N$ and $11^{\circ}32'N$, and extends from the upper River Mariga on $6^{\circ}05'E$ to $8^{\circ}48'E$ on the foot slopes of the scarp of Jos. Kaduna State has a semi-arid climate with natural resource potentials that are grouped into agriculture/forestry, livestock, and minerals [23]. The agriculture and forest resources are enormous with large agricultural production potential which enables farmers to produce a wide variety of arable crops such as maize, millet, cowpea, groundnut, sorghum, wheat, rice, pepper, and leafy vegetables. Although the soils are poor because of leaching and poor cover management, but with good conservation and land management practices it is capable of supporting calcium-rich annual grass for livestock development [24]. Poor distribution of rainfall in this zone leads to soil moisture deficit and declining soil fertility but large areas of fadamas are being used for economically valuable market gardening for growing tomatoes, chillies, sweet pepper, okra, onion, Irish potato and sugar cane using traditional "shadoof" irrigation. The ecological and socio-economic conditions of this zone determine the farming systems and the specific constraints to agricultural productivity. Kaduna is endowed with a wide range of natural resources [23].

The "Hausa" is the term that refers to a language spoken indigenously by savanna people spread across the far north Nigeria's western boundary. It also includes a common set of cultural practices and, with some notable exceptions. The ethnic groups include Hausa, Jabba, and Kataf. The interaction with other states and ethnic groups in the region is usually by links of warfare, raiding, trade, tribute, and alliances. There are central markets, special wards for foreign traders, complex organizations of craft specialists, and religious leaders and organizations. The rural areas are fundamentally small to medium-sized settlements of farmers

ranging from less than 2,000 to 12,000 persons. Farm production is used for both cash and subsistence, and as many as two-thirds of the adults also engaged in off-farm occupations for meeting livelihood needs [24],[25]

2.1 Sampling Procedure and Sample Size

The study used multi stage sampling procedure. The State was stratified into urban and rural Local Government Areas (LGAs), (using indices of rurality such as the size of population, occupation, level of literacy, style of leadership, closeness to nature and level of infrastructure). Random sampling was used to select four rural LGAs from the twenty-three LGAs. Three villages were randomly selected from the LGA to give a total of twelve villages. Ten percent of the women were selected from each village to give a total number of 240 respondents.

2.2 Data Analysis

The data collected were analyzed using descriptive statistics. Inferential statistics (Chi-square, Pearson Product Moment Correlation (PPMC) were used to test the hypotheses while regression analysis was used to isolate the determinants of food security.

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics of Rural Women

The socio- economic characteristics considered in this study are age, marital status, household size, religion, educational level, membership of organization, primary occupation and monthly income.

3.2 Distribution of Rural Women Based on Socio-Economic Characteristics

Majority of the women were within the middle age range while the modal class age range was 21 – 30 years for 54.8%, and the mean age of 29.7 ± 8.08 years (Table 1). This showed that the women were still in their productive years. The profile of the respondents by marital status showed that majority (77.7%) of the respondents were married, about twelve percent (12.7%) of the respondents were single and few (5.4%) were widowed. With this, it is evident that most of the respondents were responsible for their

household food security status. This agrees with the findings of [26] that women are producers of food, they prepare food for their families and are responsible for the distribution of food at the household level. This supports the findings of [27] that the effect of poverty on household food security is pervasive. From the data collected, position as a wife clearly showed that only wife was prominent (54.2%) with the average household size of between 6 -10 members. The indication of this is that the women will encourage their households to focus on food security.

Drawing on the result, there were more Christians (60.4%) among the respondents, while the Muslims were less than half (39.2%), out of which most (29.2%) of them were in purdah. Some(16.7%) of the respondents had no formal education. About forty percent (39.2%) of the respondents had tertiary education while others completed primary education (12.1%) and secondary education (27.1%) respectively.

Most of the respondents belong to either religious groups (29.2%) or occupational groups (20.1%), while others belong to informal savings group (7.5%), work exchange group (9.2%) and cooperative society (2.1%). Discussion with the groups during the Focus Group Discussion (FGD) showed that most of these associations ("Kungiya") were restricted to house alone and they select their leaders based on individual's capability. This is because they usually receive help and assistance from the group in their time of need. This also implies that the respondents though were in purdah, they were exposed to information. The main occupation the rural women were involved in is trading (40.8%). Others were involved in farming (25%), processing of food and non-timber forest products (19.2%), tailoring (10.4%) and civil service (2.5%). Other income generating activities the women were involved in are selling of cooked foods/snacks (33.8%), rearing of livestock (12.9%) and gathering/processing of non-timber forest products (17.1%). Conversation with the groups during the FGDs also indicated that most of respondents especially traders and processors allow their young children to hawk their products around the village while others sell their products in the house. Only few (4.2%) of the respondents do not earn any form of income on a monthly basis. About twenty percent of the respondents earn between N31,000 – N40,000 while few (4.6%) of

the respondents earn more than N50,000 monthly. This indicates that, to a large extent, the respondents are empowered and can give necessary support to their households to ensure household food security. In the same vein, [28] added that women in seclusion generate substantial income through food processing.

3.3 Seasonality Profile

Seasonality profile as presented on Table 2 showed that most (48.3%) of the respondents experienced only one planting season while others (44.6%) experience two planting seasons and only few (7.1%) of the respondents experience more than two planting seasons. This implies that, it is possible to be in the same locality and have varied planting seasons due to irrigation and other local systems of farming such as molding of sand, known locally as *Bankasa*. The dry season is considered as the season of abundance by majority (70.8%) of the respondents while the rainy period is considered as the lean season by majority (94.2%) of the respondents. Few (24.2%) of the respondents have the lean season to be less than two months, while for some (37.0%) it lasts for about three months and for others (38.8%), it extends to four months and above. Result further showed that 44 percent of the respondents borrow money to eat while others buy food on credit as coping strategies during the lean season.

3.4 Sources of Nutritional Information

The major source of nutritional information for rural women is the radio (Table3). The discussants during the FGD affirmed that they have heard that good and nutritious food keeps them healthy and away from sickness and diseases. This is usually via the radio, health centre, family and friends. Most (41.7) percent of the respondents use radio as source of nutritional information this may be as a result of the price of radio that is relatively cheap compared with television.; about twenty-five percent of the respondents use the health centre and others (18.8%) use family and friends as source of their nutritional information. Family and friends (27%) is also prominent than other sources of information. Without adequate nutritional information, ignorance will be inevitable and ignorance cannot be a defense. Hence there is a need to be well informed about essential nutrients [29].

Table 1. Distribution of rural women based on socio-economic characteristics

Variable Descriptions	Frequency	Percentage	Mean
Age	17.7	7.1	
<20			
21-30	120	50.0	
31-40	65	27.1	
41-50	27	11.3	
>50	11	4.6	31.4
Marital Status			
Single	41	17.1	
Married	175	72.9	
Widowed	16	6.7	
Divorced	8	3.3	
Position as Wife			
Not Applicable	41	17.1	
Only Wife	130	54.2	
1	20	8.3	
2	35	14.6	
3	11	4.6	
>3	3	1.2	1.40
Household Size			
1-5	94	39.2	
6-10	89	37.1	
11-15	42	17.5	
16-20	7	2.9	
Religion			
Christianity	146	60.8	
Islam	94	39.2	
Purdah			
No	170	70.8	
Yes	70	29.2	
Educational level			
Non-formal education	40	16.7	
Koranic education	12	5.0	
Primary education	29	12.1	
Secondary education	65	27.1	
Tertiary education	94	39.2	
Membership of Organization.			
No Group	76	31.7	
Cooperative Society	23	9.6	
Religious Group	70	29.2	
Occupational Group	71	29.3	
Primary Occupation			
Not Applicable	5	2.1	
Farming	60	25.0	
Trading/Selling	98	40.8	
Processing	46	19.2	
Tailoring	25	10.4	
Civil servant	6	2.5	
Monthly Income			
Not Applicable	10	4.2	
<N 10,000-N 20,000	49	20.4	2.31
N 21,000-N 30,000	96	40.0	
N 31,000-N 40,000	49	20.4	
N 41,000-N 50,000	25	10.4	
>N 50,000	11	4.6	

Table 2. Distribution of respondents' based on their seasonality Profile

Variable description	Frequency	Percentage
Planting Seasons		
1	116	48.3
2	107	44.6
>2	17	7.1
Eat more due to abundance		
Rainy Season	70	29.2
Dry Season	170	70.8
Lean Season		
Rainy Season	168	70.0
Dry Season	72	30.0
Length of lean Season		
<2 months	58	24.2
3-4 months	89	37.0
>4 months	93	38.8
Effect of lean season on food consumption		
Little	108	45.0
Much	88	36.7
Very much	44	18.3
Situations to Survive		
Fast	20	8.3
Borrow to eat	111	46.3
Buy food on credit	68	26.3
Work for food	41	17.1

Source: Field survey, 2019

Table 3. Distribution of respondents' according to their sources of nutritional information

Sources of Nutritional Information	Frequency	Percentage
Television	27	11.3
Radio	100	41.7
Newspaper	7	2.9
Health Centre Staff	61	25.4
Family and friends	45	18.8

Source: Field survey, 2019

3.5 Food Security Status

The Household Food Insecurity Access Scale (HFIAS) (FANTA scale) [3] was used to categorize households. The HFAIS Score, which was calculated for each household by summing the codes for each frequency of occurring item. The maximum score for a household is 27 while the minimum is 0. The higher the score, the more the food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced. Table 4 showed that some of the respondents (54.0%) worry about food; most of the respondents (65.0%) eat limited variety while some of the respondents (34.8%) have smaller

meal to eat and few of the respondents (9.2 percent) do not have any kind of food to eat and probably sleep hungry. The implication of this is that, a food secured household experiences none of the food insecurity (access) conditions or just experiences worry but rarely. A mildly food insecure (access) household worries about food no having enough sometimes or often, and / or is unable to eat preferred food or monotonous diet than desired or considered some foods undesirable but rarely. But of the three most severe conditions (running out of food, going to bed hungry or going a whole day and night without eating).

3.6 Household Food Insecurity

Table 5 showed HFIAS results which indicated that majority (70.4%) of the respondents are food secured. While some (28.3%) of the respondents were mildly food insecure (15.4%). Only few (1.3%) of the respondents were severely food insecure among the respondents. [27] concluded that food security is achieved when a person has access to food for an active and healthy life. The involvement of rural women in farming activities and other income generating activities gave them adequate access to food crops (mostly grains) and farm animals (ruminants) which gives them access to animal products such meat, milk and cheese.

Table 4. Household food insecurity access scale (HFIAS) (Item score)

HFIAS	No	Yes	Not Applicable	Rarely	Sometimes	Often
1 Worry about food	221(46.0)	259(54.0)				
1a How often			219(45.6)	162(33.8)	83(17.3)	16(3.3)
2 Not able to eat	168(35.0)	312(65.0)				
2a How often			166(34.6)	174(36.3)	126(26.3)	14(2.9)
3 Eat limited variety	162(33.8)	318(66.3)				
3a How often			161(33.5)	155(30.3)	144(30.0)	20(4.2)
4 Eat some food really	201(41.9)	279(58.1)				
4a How often			204(42.5)	111(23.1)	131(27.3)	34(7.1)
5 Have smaller meal	313(65.2)	167(34.8)				
5a How often			311(64.8)	75(15.6)	81(16.9)	13(2.7)
6 Eat fewer meal	349(72.7)	131(27.3)				
6a How often			350(72.9)	60(12.5)	49(10.2)	21(4.4)
7 No food of any kind	436(90.8)	44(9.2)				
7a How often			438(91.3)	27(5.6)	12(2.5)	3(0.6)
8 Sleep hungry	436(90.8)	44(9.2)				
8a How often			437(91.0)	20(4.2)	22(4.6)	1(0.2)
9 Whole day and night	463(96.5)	17(3.5)				
9a How often			464(96.7)	11(2.3)	5(1.0)	00(0.0)

Source: Field survey, 2019

Table 5. Distribution of respondents' based on household food insecurity access score

Food Insecurity Scale	Frequency (n= 240)	Percentage (%)
Food Secure	169	70.4
Mildly Food Insecure	68	28.3
Severely Food Insecure	3	1.3

Source: Field survey, 2019

3.7 Test of Hypotheses

There is no significant relationship between socio-economic characteristics of rural women and food security status.

3.8 Correlation between Respondents' Socio-Economic Characteristics and Food Security Status

The result of correlation test (PPMC) on Table 6 indicates that some of the rural women's socio-economic characteristics were significantly related to their food security status. Age ($r=0.119$; $p=0.009$), household size, ($r = 0.221$; $P = 0.000$) and monthly income ($r = 0.183$, $P = 0.00$) were significantly related with food security status. These contribute immensely to food security

status. The implication of this finding is that young women in their productive age are able to take responsibility for the getting and feeding of members of their households. The household size also affects the food security status of rural women, this is because the more the size of the household, the better the food security status for the rural women despite the fact that they were in Purdah. This is because they send their young children to hawk for them around the village thereby generating more income and of course the more the income for the household, the better the food security status. This support the finding of [30] that age and household size has been identified as a factor affecting food security status. Monthly income also contributes significantly to food security status. This is in line with the findings of [31], that the importance of empowerment of women in social development is essential for the potential of the next generations and for economic prosperity of nations. Diversifications of income sources also play a great role in reducing income fluctuations. [32] also emphasized that, by educating girls, effort is been made to lower population growth, increase family income and reduce gender inequalities. This agrees with the findings of [33] that maternal education has a positive effect on nutritional status and it would make the biggest difference if increased to its desirable level.

3.9 Chi-Square Analysis of Respondents' Socio-Economic Characteristics and Food Security Status

Result of Chi-square analysis on Table 7 revealed that some of the socio- economic characteristics were significantly related to food security status and these are position as wife ($\chi^2 = 27.753$, $p = 0.006$), purdah ($\chi^2 = 12.183$, $p = 0.002$) and other income generating activities ($\chi^2 = 16.157$, $p = 0.000$). These implied that position as wife, purdah and other income generating activities contribute significant effect to food security status. Based on the marriage patterns and individuals peculiarities, the position a woman occupies as a wife determine the kind of access a woman gained to her husband's resources. In some situations, especially in the rural settings, it is usually the first and the oldest that have access to the family resources while other wives will be subjected to her. On the other hand and in some peculiar households, the youngest wife is usually the husband's favorite; hence have access to the family resources more than any other person. Purdah also takes various forms but in essence, it excludes women from participation in wider society thus, adding to their poverty, impedes their right to contribute to family income and care for the family [34]. Other income generating activities also influence food security status with more than one source of income, there will always be a way out of household food insecurity.

3.10 T-Test Analysis of Different Seasons and Food Security Status

T -test revealed a significant difference in the different seasons ($t = 3.210$, $P = 0.001$) on respondents food security status (Table 8). According to [35] diets evolve over time, being influenced by many factors and actual food availability may vary by region and seasons. [36] corroborated this position that most poor households in the extreme north regions depend on their own food stocks and are less market dependent between April/June. They also depend on the above average dry season harvest which peaks in March especially for maize, rice and vegetables within the floodplains. The increased income derived from the sale of the dry season products are used in accessing food by the poor farming households, who also sell small ruminants to earn income and access food. Household food stocks deplete seasonally during the normal July-September lean season, as most households will resort to market for their food at normally high prices as demand

increases. Poor households during this period will also supplement food needs through income earning activities such as agricultural labour, weeding and unskilled labour. During the lean season, others will depend on debt from relations and the rich to access food before the harvest in October.

3.11 Chi-Square Analysis between Sources of Nutritional Information and Food Security Status

Chi-square analysis presented on Table 9 showed a significant relationship between sources of nutritional information ($\chi^2 = 33.322$, $p = 0.000$) and food security status. This implies that as the relationships among diet, health, and disease prevention have become clearer, nutritional information and the promotion of healthy eating behaviors and lifestyles continue to receive increased attention. This was explained by [37], that nutrition education is any combination of educational strategies designed to facilitate voluntary adoption of food choices and other food- and nutrition-related behaviours conducive to health and well-being; which is delivered through multiple venues and involves activities at the individual, community, and policy levels.

3.12 Regression Analysis of Determinants of Food Insecurity

Regression analysis of determinants of household food security on Table 10 indicates that position as wife ($\beta = 0.194$, $p = 0.000$), household size ($\beta = -0.173$, $p = 0.001$), monthly income ($\beta = -0.095$, $p = 0.042$) were the determinants of food security among the rural women. Household size have inverse relationship with food security status that is the more the household size, the less the food insecurity. This is against the a priori. This because the rural women though in purdah generate income through trading and processing of non-timber forest products. Apart from this, they also involve members of their households in these activities which have a positive effect on their food security status. The income also had a significant effect on food security status; the higher the income, the more the food affordability and food security status of the household. When households are not food secured, it would be difficult to have a good consumption pattern regardless of the level of knowledge. When the foods are not available, there is little or nothing anyone can do.

Table 6. Correlation between respondents' socio-economic characteristics and food consumption pattern

Variable	r-value	p-value	Remark
Actual age	0.119	0.009	S
Educational level	0.087	0.056	Ns
Household size	0.221	0.000	S
Monthly income	0.183	0.000	S

Source: Field survey, 2019

Table 7. Chi –square analysis of respondents' socio-economic characteristics and food security status

Variable	χ^2	Df	p-value	Remark
Marital status	11.018	6	0.088	Ns
Position as wife	27.753	12	0.006	S
Religion	2.394	4	0.664	Ns
Purdah	12.183	2	0.002	S
Primary occupation	22.516	14	0.069	Ns
Other income generating activities	60.075	12	0.000	S
Membership in organization	13.742	12	0.318	Ns

Source: Field survey, 2019

Table 8. T-test analysis of different seasons and food security status

Variable	t-value	Df	p-value	Remark
Different seasons (dry and rainy seasons)	3.210	477	0.001	S

Key: S- Significant; Source: Field survey, 2019

Table 9. Chi-square analysis between sources of nutritional information and food consumption pattern

Variable	χ^2	Df	p-value	Remark
Sources of nutritional information	39.971	10	0.002	S

Key: S- Significant; Source: Field survey, 2019

Table 10. Regression analysis of determinants of food insecurity

Variables	Std. Error	Coefficients	T	p-value	Remark
Actual age	.024	-.087	-1.668	.096	Ns
Marital status	.440	.010	.201	.841	Ns
Position as wife	.163	.194	3.625	.000	S
Household size	.198	-.173	-3.373	.001	S
Islam	.557	-.062	-.893	.373	Ns
Purdah status	.522	-.046	-.679	.498	Ns
Educational level	.112	.008	.170	.865	Ns
Monthly income	.159	-.095	-2.043	.042	S
Org membership status	.361	.059	1.266	.206	Ns

Source: Field survey, 2019

4. CONCLUSION

Based on the findings from this study, the following conclusions were drawn:

Adequate nutrition is essential for a healthy life. Agriculture contributes a lot to both rural and urban food and health systems. While good

health and productive agriculture are both essential in the fight against poverty in agricultural communities, women in poor health are less productive. The quality of life for rural women is very important for their effective participation in development. Hence, the nutritional and health status of rural women in particular is of great concern in the contemporary

world because of the multiple roles they play. Also, knowing the causes of the problem enables everyone to learn how to prevent and often even reverse them. Development of public health can be guaranteed through agriculture, food and good nutrition which are about healthy people, healthy communities and healthy nation. Good health is a major resource and an important dimension of the quality life. The determinants of food security therefore were position as wife, household size, monthly income and food that women should not eat. It is also possible to be in the same locality and have varied planting seasons due to irrigation. The radio is a major source of nutritional information for rural women. Rural women have reasonable access to food (70.4%).

5. RECOMMENDATIONS

The following recommendations were made from the findings of the research

1. Women should be encouraged to practice home gardening and domesticate animals to enhance food secured family.
2. The agricultural sector should be well transformed to ensure adequate provision varieties of food crops at all times of the year.
3. The radio should be used maximally as a source of nutritional information for rural women.
4. The government should give food and agricultural sector due importance since a healthy living also involves the consumption of adequate quantities of safe and good quality foods, which will in turn increase the potential of families, communities and societies hence, be strengthened for a productive life.

CONSENT

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

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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