



Food insecurity and nutritional status of mothers in Abia and Imo states, Nigeria.

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Abstract

Background: Food insecurity is a global problem especially in developing countries where most people are estimated to be malnourished.

Objective: The study assessed at food insecurity and nutritional status of mothers in Abia and Imo States, Nigeria.

Methods: The cross-sectional study was carried out on 600 households which were randomly selected from 30 communities from the study area. Validated and pre-tested questionnaire was used to elicit information on household basic and health characteristics and food security status of the households. Mean nutrient intakes of mothers were calculated from weighed food intake carried out on 10% of food insecure households. The results were compared with FAO/WHO reference nutrient intakes. Body mass indices of the mothers were calculated from measured weights and heights and compared with WHO reference standard. Basic and health characteristics of households, socio-economic of respondents and food security status of households were analyzed using SPSS version 20. Logistic regression of food security against household size, mother's income and educational status was done. Simple regression of household food security against body mass indices of mothers was carried out.

Results: Household size ranged from 1-2 (15.8%) to >7 (15.8%) while 87.7% of the households were headed by males and the rest (12.3%) females. The mean nutrient intakes of mothers from low and moderate food insecurity households were higher than reference nutrient intake values for energy, carbohydrate, fat, fiber, calcium, iodine and vitamin C. It was lower than the RNI for protein, iron, zinc, niacin, riboflavin, thiamin, folic acid and vitamin A. Some respondents (33.6%) were in the normal BMI range while 19.4% and 47.0% were underweight and overweight, respectively. There was a weak relationship between food insecurity and household head (odds : 1.032), household size (odds: 1.132) and income of mothers (odds: 0.418). There was a significant positive relationship ($t=13430$, $p< 0.05$) between food insecurity and body mass indices of mothers.

Conclusion: Household food insecurity is one of the factors affecting nutrition security and may have contributed to the malnutrition observed among mothers in the households studied.

Keywords: Food insecurity, nutritional status, Body mass indices, nutrient intake values.

Introduction

Food is a basic necessity of life and the nutrients in food make it very important to life. An adequate food intake in terms of quantity and quality is crucial for healthy and productive life. The body's nutritional health is determined by the sum of its nutritional status with respect to each needed nutrient. A balanced supply of these nutrients to the body provides calories for energy, promotes growth and protects the body against infections.

It has been observed that good nutrition depends on an adequate food supply and this in turn on sound agricultural policy and a good system of food distribution [1]. When this is lacking, it leads to food insecurity which exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain [2]. Food insecurity at the household or individual level may be short term and this results from a temporary limited access to food. Chronic food insecurity is long term, may have a more marked impact and may be more difficult to control. Food insecurity occurs in mild, moderate and severe forms and the level of food insecurity may be related to the relative availability of food [3]. The causes of food insecurity vary from one country to the other and also by region. However, [4, 5, 6, 7 and 8] identified unequal distribution of wealth, rapid population growth, rapid depletion of natural resources/ climate change, under-employment and low incomes, lack of education and unwise investment of funds, demand for food which is greater than supply and inequitable food distribution, rapid urbanization, traditional customs, social conditions, attitudes and services, civil strife/ political disruptions, health status and access to health care, vulnerable populations and access to food and education.

Household food security depends on a nutritionally adequate and safe food supply nationally, at the household level and for each individual, a fair degree of stability in the food availability to the household both during the year and from year to year and access of each family member to the sufficient food to meet nutritional requirements [9]. Food security is a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life [10].

Nutritional status is the condition of the body in those respects influenced by the diet, the levels of nutrients in the body and the ability of those levels to maintain

normal metabolic integrity [11]. This has to do with nutrition security which is concerned with the utilization of the food obtained by a household as well as access to food which is an aspect of food security. A household achieves nutrition security when it has secure access to food coupled with a sanitary environment, adequate health and services and knowledgeable care to ensure a healthy life for all household members [12]. The lack of nutrition security has led to different forms of malnutrition especially among women. In Nigeria, for instance, at the national level, 11.6% of women were suffering from chronic under-nutrition, while 14.2% and 5.7% of women of child bearing age were overweight and obese, respectively. The report further showed that 12.7% of mother had serum ferritin levels $<12\text{mg/ml}$, which was suggestive of iron deficiency, 28.1% of them were zinc deficient while 30.7% had varying degrees of iodine deficiency [13]. These deficiencies lead to maternal mortality.

The obvious consequences of malnutrition exacerbated by food and nutrition insecurity prompted this study which is designed to ascertain the food security status of households and nutritional status of mothers.

Methods

Study design: Cross-sectional study design was employed for the study.

Study area: The study involved two local government areas of Abia and Imo States. They are Umunneochi and Okigwe Local Government Areas of Abia and Imo States, respectively. Umunneochi is one of the 17 Local Government Areas of Abia State and it has 72 autonomous communities while Okigwe is one of the 27 Local Government Areas of Imo State comprising 23 autonomous communities. These two local governments share common boundary as well as other things such as foods eaten, agricultural activities. They cultivate crops such as cassava, maize, melon, yam, vegetables like fluted pumpkin, pepper, tomatoes, garden egg. Cash crops such as oil palm, cashew are also grown. Agriculture is the main occupation of the people who subsists on their farm produce. Others engage in small scale trade and petty businesses. There are a handful of civil servants and other secular workers. The communities studied are rural settings.

Sample size and sampling technique: Sample size of infinite population greater than 50000 was calculated using the formula of Creative Research Systems [14] which is: $SS = Z^2 * (P) * (1-P) / C^2$, where SS= sample size, Z=z value which is 1.96 for 95% confidence

level, P= percentage of picking a choice (5 is used for sample size needed),C= confidence interval expressed as decimal which is 0.4. A total sample size of 600 was calculated when the values were substituted.

A multi- stage sampling method involving four stages was employed. At the first stage, two states were purposively selected from the five south-eastern states of Nigeria. Umunneochi and Okigwe Local Government Areas were also purposively selected from the two states. This is because the two local government areas are similar in many respects especially foods eaten. Most of the communities in them are also rural. Secondly, the communities in the two local government areas were stratified into 30 clusters or areas. Thirdly, households in each of the 30 clusters were listed. Finally, from the list, a simple random sample of 20 households from each of the 30 clusters was drawn. This gave a total of 600 households. Written informed consents were obtained from the traditional rulers of each of the communities studied while oral informed consents were obtained from each household head studied.

Data collection methods: Data were collected by the use of questionnaire, anthropometry and dietary study. The structured, validated and pre- tested questionnaire was used to elicit information on basic and health characteristics of households, socio- economic status of mothers and their spouses and food security status of households. The questionnaire was produced and administered in English but was translated to Igbo for the illiterate respondents. The principal care giver mostly the mother or adult female or male was the main respondent. The interview was conducted in the evening by the researcher and her two trained research assistants. The questionnaire was interviewer-administered along with probing questions.

Household food security status was assessed using a structured questionnaire adapted and re-structured from a guide to measuring household food security in the United States by [15] as well as from Household Food Insecurity Access Scale [16]. There were 19 questions on the whole with questions 1-14 having four options each. Scores of 2-6 were assigned to the options, score 6 was for the first option, score 4 was for the second, score 2 was for the third and 0 was for the last option. Questions 15-19 had three options each

with a score of 0-2 assigned to the options. Score 2 was for the first option, score 1 was for the second and score 0 was for the last option. Households with a total

score of 31-100 were classified as food insecure while those with a total score of 0-30 were classified as food secure. Severity of food insecurity was grouped as moderate, mild and severe according to the scores.

The food intake assessment, that is quantitative nutrient intakes of mothers was done on 10% of food insecure households from each of the food insecurity groups. A 3- day weighed food intake comprising 2 weekdays and 1 weekend excluding festive days was done. The approach was that all the raw ingredients used for the preparation of the meals, cooked food, quantity consumed at meals, leftover food, plate waste and discarded foods and snacks, foods obtained as gifts or shared were weighed. The actual quantities of foods consumed by the mothers were determined by subtracting plate wastes and leftovers and these were recorded. Weights of the non- pregnant or lactating mothers were obtained using a bathroom weighing scale set to the nearest 0.1kg. Prior to the measurements, the mothers removed shoes, jewelries and other bulky clothing items. The weighing was done three times for each mother and the average of the three measurements was used in analyses. Heights of the mothers were measured according to standard procedures outlined by [16]. A portable body- metre with a horizontal head- board attachment was used. The mothers removed their shoes and stood as tall and straight as possible with their heads level and shoulders relaxed. Then the vertical distance between the standing surface and the top of the mothers' heads were measured three times to a precision of 0.1cm and the averages of calculated and recorded. The weight and height measurements were used to calculate the body mass indices of the mothers using the formula: $BMI = \text{weight (kg)} / \text{height (m)}^2$.

Data analysis: Nutrient intakes of mothers obtained from food composition data base were compared with the reports of joint FAO/WHO Expert Consultation on Reference Nutrient Intakes (17, 18, 19 and 20). The calculated body mass indices of mothers were classified according to [21].

Statistical analysis: Quantitative data collected on the basic and health characteristics of households, socio-economic status of mothers and their spouses and food security status of households were all analyzed using SPSS version 20. Logistic regression of household head, size and highest educational status and income of mothers against food security status was done. Simple regression of food security against body mass indices of mothers was also done and coefficient of determination was done to determine the strength of the association.

Table 1. Basic and health characteristics of households.

Variables	Frequency	Percentage
Household size		
1-2	95	15.5
3-4	229	38.2
5-6	177	29.5
>7	99	15.8
Total	600	100.0
Household head		
Male	526	87.7
Female	74	12.3
Total	600	100.0
Age range of mothers		
18-22	23	3.8
23-27	55	9.2
28-32	106	17.7
33-37	127	21.2
38-40	149	24.8
41 and above	140	23.3
Total	600	100.0
Household average area of farmland (Hectare)		
1	300	50.0
2	91	15.2
3	9	1.5
>4	18	3.0
No farmland	182	30.0
Total	600	100.0
Household health care facilities		
Primary health care centres		
Herbalists	229	49.8
Private clinics and hospitals	133	22.2
Traditional healers	127	21.2
General hospitals	21	3.5
Teaching hospitals	17	2.8
Total	3	0.5
Household sources of drinking water	600	100.0
Boreholes		
Streams	385	64.2
Rainfall	142	23.7
Wells	38	6.3
Lakes and rivers	32	5.3
Pipe borne water	3	0.5
Total	-	-
Knowledge of family planning methods	600.0	100.0
None		
Condom	236	39.3
Oral contraceptives	124	20.7
Intra uterine device	64	10.7
Withdrawal	50	8.3
Injectables	47	7.8
Rhythm	40	6.7
Total	39	6.5
	600	100.0

Table 1 shows the basic and health characteristics of households. Household sizes ranged from 1-2 (15.5%) to >7(15.8%), while the largest proportion (38.2%) had modest household size of 3-4 and 29.5% were of 5-6 persons. Majority (87.7%) of the household heads were males while a few (12.3%) were females. The age ranges of the mothers were 18-22 (3.8%), 41 and above (23.3%). The rest (26.9% and 46.0%) fell within 23-32 or 33-40 years, respectively. The average areas of farmland in hectares for the households showed that half (50.0%) had only 1 followed by 15.2% who had 2 and 3.0% and 1.5% who owned more than 4 and 3, respectively. The rest (30.3%) had none. Access to health care facilities revealed that almost half (49.8%) of the households accessed health care at primary health care centres. This was followed by 22.2% whose health care services were sourced from herbalists. However, 21.2% preferred to use private clinics and hospitals while the rest (3.5%, 2.8% and 0.5%) accessed traditional healers, general hospitals and teaching hospitals, respectively. Households got their drinking water from various sources of which boreholes (64.2%) were the most common source. Others were streams (23.7%), rainfall (6.3%), wells (5.3%) and lakes and rivers (0.5%). On the awareness of family planning methods, 39.3% were not aware, 20.7% knew of condom, 10.7% were familiar with oral contraceptives while the rest (8.3%,

7.8%, 6.7% and 6.5%) knew of IUD, withdrawal, injectables and rhythm methods, respectively.

Socio- economic status of mothers and their spouses are shown in Table 2. Basic education was acquired by 32.1% of the mothers while 18.8% of them proceeded to senior secondary school. Different forms of tertiary education were obtained by 30.2% while the rest (1.7%) advanced to graduate studies. Some (10.2%) of the mothers did not get formal education. For their spouses, 43.2% got basic education and 15.2% finished senior secondary education. Some (33.5%) attended different tertiary institutions and the rest (8.2%) had no formal education. Employment status of mothers showed that nearly half (46.8%) of them were self- employed, 19.4% were raising children full time and 17.7% were working full time. The rest (7.8%, 4.5% and 3.5%) were looking for work, working part time and retired, respectively. For their spouses, 23.8% of them were self-employed, 21.1% were skilled workers, 18.3% were subsistence farmers. Some (10.3%) were civil servants while 11.4% were working in private organizations. The rest (6.8%, 4.2% and 4.2%) were unskilled workers, labourers and cooperative farmers, respectively. On the mothers monthly income, majority (53.2%) earned a little above Nigeria minimum wage of #18000. Some (44.7%) earned from #20000-59999 and a few (2.2%) who earned from #60000 and above.

Table 2. Socio-economic status of mothers and their spouses

Variables	Frequency	Percentage
Highest educational level of mothers		
Elementary school	134	22.3
Junior secondary school	59	9.8
Senior secondary school	113	18.8
Tertiary education	181	30.2
None	61	10.2
Total	600	100.0
Education background of spouses		
Elementary school		
Junior secondary school	127	24.1
Senior secondary school	100	19.01
Tertiary institution	80	15.21
None	176	33.5
Total	43	8.2
Employment status of mothers	526	100.0
Self employed		
Raising children full time	281	46.8
Working full time	116	19.4
Looking for work	106	17.7
Working part time	47	7.8
Retired	29	4.5
Total	21	3.5
Occupation of spouse	600	100.0
Self employed		
Skilled worker	125	23.8
Subsistence farmer	111	21.1
Worker in private organizations	96	18.3
Civil servant	60	11.4
Unskilled worker	54	10.3
Labourer	36	6.8
Cooperative farmer	22	4.2
Total	22	4.2
Categories of mother monthly income(#)	526	100
Less than 10000-19999		
20000-59999	319	53.2
60000 and above	268	44.7
	13	2.2

The food security status of households and the severity are shown in Table 3. Majority (79.2%) of the households were food insecure while 20.8% were food

secure. Among the food insecure households, 45.8% were low food insecure, 32.6% were moderate while 21.6% were found to be severely food insecure.

Table 3. Household food security status and levels

Status	Scores	Frequency	Percent
Food secure	0-30	125	20.8
Food insecure	31-100	475	79.2
Total		600	100.0
Levels of food insecurity			
Low food insecurity		217	45.8
Moderate food insecurity		155	32.6
Severe food insecurity		103	21.6
Total		475	100.0

Table 4 shows the calculated nutrient intakes of mothers, the percentages of reference nutrient intakes and WHO/FAO recommended nutrient intakes. Energy intakes in kilojoules for mothers from low, moderate and severe food insecure households were 11631.5, 10836.6 and 8359.6, respectively. Grams per day of total protein were 47.7, 43.5 and 39.5 for the three groups, respectively. Total carbohydrate in gram per day were 250, 249.5 and 235.8 for the three

groups, respectively. The values for calcium, iron, zinc and iodine in milligrams per day for the three groups of food insecure households were 818.6, 805 and 752; 11.2, 9.9 and 8.85; 5.9, 5.0 and 4.8; and 162, 163 and 158, respectively. The values for the vitamins thiamin, folic acid, vitamins C and A were 1.0mg, 0.9mg and 0.86mg; 465ug, 460ug and 449.6ug; 50.2mg, 48mg and 47.5mg and 595.3ugRE, 585.4ugRE and 565ugRE, respectively.

Table 4: Nutrient intakes of mothers (active not pregnant or lactating) from 3 food insecurity groups

Nutrients	Low food insecure	% of RNI	Moderate food insecure	% of RNI	Severe food insecure	% of RNI	WHO/FAO RNI	Source
Energy (kcal) (kj)	2780 11631.5	125.8	2590 10836.6	117.2	1998 8359.6	90.4	2210 9246.6	FAO(1990b)
Total protein(g/d)	47.7	97.3	43.5	88.8	39.5	80.6	49	WHO(1985)
Total carbohydrate (g/d)	250	101.2	249.5	101	235.8	95.5	247	WHO/FAO (1998)
Total fat (g/d)	39.5	106.8	41.8	113	43.5	117.6	37	FAO/WHO (1994)
Fibre (g/d)	23	117.9	21.8	111.8	20.3	104	19.5	WHO/FAO (2004)
Calcium (mg/d)	818.6	102.3	805	100.6	752	94	800	WHO/FAO (2004)
Iron (mg/d)	11.2	86	9.9	76.2	8.85	68.1	13	WHO/FAO (2004)
Zinc (mg/d)	5.9	98.3	5.0	83.3	4.8	80	6.0	WHO/FAO (2004)
Iodine (mg/d)	162	108	163	108.7	158	105.3	150	FAO (1988)
Thiamin (mg/d)	1.0	90.9	0.9	81.8	0.86	78.2	1.1	WHO/FAO (2004)
Riboflavin (mg/d)	1.29	99.2	1.25	96.2	1.0	76.9	1.3	WHO/FAO (2004)
Niacin (mg/d)	1.25	96.2	1.19	91.5	1.0	76.9	1.3	WHO/FAO (2004)
Folic acid (ug/d)	465	93	460	92	449.6	89.9	500	WHO/FAO (2004)
Vitamin C (mg/d)	595.3	99.2	585.4	97.6	565	94.2	600	WHO/FAO (2004)
Vitamin A (ugRE/d)	595.3	99.2	585.4	97.6	565	94.2	600	WHO/FAO (2004)

RNI: Recommended Nutrient Intake

The body mass indices of the mothers are shown in Table 5. Underweight was seen in 19.5% of the mothers while 33.6% were found to be of normal weight. Overweight was prevalent as 23.1% of them were overweight. Various proportions (14.7%, 5.5% and 2.9%) of the mothers were of obesity classes I and

II and extreme obesity, respectively. Table 6 displays the variables in the logistic Table of food security status against household head and size, highest educational levels and incomes of mothers. In Table 6, the logistic equation is:

In (odds)= 2.448+ 0.031 household head + 0.124 household size + 0.492 highest educational level-0.872 income.

The odds ratio showed a weak relationship between food security status and household head (odds: 1.032),

household size (odds: 1.132) and income of mothers (odds: 0.418). However, a moderate positive association was found between food security status and highest educational level (odds: 1.635).

Table 5. Body mass indices of mothers

BMI grades (kg/m ²)	Number of mothers (n)	Percent
Underweight < 18.5	46	19.5
Normal weight 18.5-24.9	80	33.6
Overweight 25-29.9	55	23.1
Obesity I 30-34.9	35	14.7
Obesity II 35-39.9	13	5.5
Extreme obesity > 40	7	2.9

Table 6. Logistic regression of food security status against household head and size, highest educational level and income of mothers.

Variables	B	S.E	Wald	Df	Sig	Exp (B)
Household head	0.031	0.322	0.09	1	0.923	1.032
Household size	0.124	0.119	1.086	1	0.297	1.132
Highest educational level	0.492	0.104	22.297	1	0.000	1.635
Income	-0.872	0.091	92.361	1	0.000	0.418
Constant	2.448	0.521	22.105	1	0.000	11.567

Simple linear regression of food security status against body mass indices of mothers is shown in Table 7. In Table 7, the regression equation is:

Body mass indices of mothers= 13.891 + 0.201 (food security status). The coefficient value for food security status is 0.201, standard error of 0.015 with a t- value of 13.430 which was positively significant at 0.05 (t= 13.430; p< 0.05).

Table 8. Simple linear regression of food security status against body mass indices of mothers and coefficient of determination.

Model	B	Std. error	Beta	T	Sig.
Constant	13.891	0.858		16.190	0.000
Food security status	0.201	0.015	0.659	13.430	0.000
	Model	Summary			
Model 1	R 0.659 ^a	R square 0.434	Adjusted square 0.432	R	Standard error of the estimate 4.458

a.Predictors: (Constant), food security status. From the table, the regression equation is: Body mass indices of mothers= 13.891 + 0.201 (food security status).

Discussion

The modest household size of 3-6 members reported in this study is similar to the national average of about 5 persons for Nigeria reported by the [22]. Many factors might be responsible for the modest family size we observed in this study. One of such could be due to the proportion (30.2%) of mothers who had one form of tertiary education or the other. This probably may have delayed their time of giving birth and thus reduced the number of children they had. Another factor could be age of the mothers where the study reported that nearly half of the mother were in their late thirties and more than forty years of age. For the households with large family sizes, it could be that the mothers started child bearing earlier while another probable reason could be extended family system. The study also revealed that male headed households were dominant in the communities where the study was carried out. [22] also identified that most households in North Central, Nigeria were male headed. This result is not out of place because an ideal family in Igboland is one which is legally contracted in a marriage union between a man and a woman. Under such situation, a man becomes the head of the family. There may be exceptions, for instance, a woman can head a family in case of death of her husband or divorce. Such may be the situation for the rest of households headed by women.

The study reported that 3.8% of the mothers were between the age range of 18-22 years. At the national level, [23] reported that 56% of women were under age 30. These could be women who got married immediately after completing their junior or secondary school. Substantial proportions (23.3%) of the mothers were above age 40. This finding is not unusual because in most rural areas, younger people often migrate to urban areas in search of jobs while older ones retire to their villages. On the average farmland owned by households, the results showed that most people were still practicing subsistence agriculture while others did not have any farmland. This could probably be attributed to those households where the mothers raised children full time and their spouses did not engage in agriculture. Another reason could be households who do not have land and could neither rent nor lease one.

Education is considered to be a basic and obvious process by which skills, knowledge and attitudes are acquired for the performance of socio- economic responsibilities, social integration, improving personal competence and seeking better opportunities [24]. We found that most of the mothers obtained basic

education while an encouraging proportion got one tertiary education or the other. At the national level, it was reported that 45% of women had either secondary or higher level of education, however the proportion was higher in urban than in rural areas [24]. The education status of spouses of the women showed that women were less educated than their husbands. Also less (8.2%) men than women (10.2%) had no formal education. This result is consistent with the NDHS report which stated that 38% of Nigerian women and 21% of men aged 15-49 had no education. The disparities were also noted in the different levels of education. This could be due to the common practice and belief that the education of the females is not important as has been earlier observed by [25]. This discrimination make most people to believe that girls should be married off because they see their education as a waste of family resources. There has been a gradual increase in the proportion of women who were employed. This was confirmed in the study where majority (64.5%) of the mothers were either self-employed or employed full time. The proportion of women who were employed increased from 59% among those with no education to 66% among those with more than a secondary education. Specifically, 7% of the women were employed in professional, technical or managerial position [26]. Unemployment is still a challenge in rural areas as the study showed that 19.4% of women were unemployed. In Nigeria, a national manpower stock and employment survey showed that there were more unemployed females (24.9%) than males (17.7%) [27]. Interestingly, the study revealed that household heads were all engaged in different forms of occupation which ranged from self- employment to labourer or cooperative farmer. This is expected their responsibilities are to care and provide for their household members. In congruent with this findings, [28] reported that rural men were more likely to be currently employed while 70% of men of South East zone were likely to be currently employed.

[29] posited that women labour market participation is generally associated with education. This then means that more educated women are expected to have higher income aspirations and tend to be more active in the labour market. This thought came to the fore in the results on income of mothers which showed that the least proportion (2.2%) earned from #60000 and above. This group of women could be those with tertiary education. In contrast, many women earned below #18000 and could be those without job, retired or working part time.

Access to health care facilities is very crucial to the health of individual members of households. Primary health care centres were the most commonly accessed by the households. This might be because they are easily accessible as most autonomous communities in the rural areas where the study was carried out have those facilities. According to [30], 25.56% of Nigerians accessed modern medical care with an increasing trend to 55.96%. However, the same source noted that both the non-poor and the poor patronized the traditional healers decreasing from 11.64% to 7.71%. This was evident in this study where some households sourced from herbalists. This may be due to poverty and ignorance. In most rural markets, different herbal mixtures are hawked which they claim cure different diseases. Most people especially in rural communities still believe that any form of sickness or ill-health is caused by an attack. Such belief could be the reason why those households went to traditional healers for cure and future attacks. Few of the households sought medical care in general and teaching hospitals. It is likely that highest educational training of mothers as well as their monthly income could have contributed to the health care facilities they patronized when any of their family members is sick. Educated mothers may have preferred to take their children to government health centres and hospitals where there are qualified personnel. In line with this argument, [31] posited that with increased income, women were more likely to make joint decisions with their husbands regarding their children's medical care and school attendance. Several researches had shown that placing assets in the hands of women increases household spending on children's clothing and education and reduces the rate of illness among girls [32]. This may not be true of women with less education and income. They may resort to patronize quacks and this poses a great danger to the health and entire well being of the family.

Borehole was the most common source of drinking water for the households studied. Other sources were streams, lakes and rivers and harvested rain water. All these might not be good and safe drinking water sources as no form of water treatment was done on them. However, no household reported pipe borne water which is a good and safe drinking water because of the treatment processes it is subjected to. This is in contrast with the [33] report which stated that overall, 6 in 10 households have access to an improved source of drinking water. Specifically, three quarter of households in urban areas have access to an improved source of water compared with half of households in rural areas.

More than half (50.7%) were aware of the different family planning methods. In contrast to this finding, knowledge of family planning was said to be high in Nigeria by [34] which reported that 85% of women and 95% of men aged 15-49 knew at least one method of family planning. The educational status of mothers and their spouses evidently contributed to the households knowledge of family planning methods. In confirmation of the thought that contraceptive use increases with education, 37% of married women with more than secondary education use any contraceptive method in comparison with 3% of married women with no education [35]. The proportion of households of households who were not aware of any family planning method could be those where either the mothers or their spouses had no formal education.

High prevalence of food insecurity was noted among the households studied. This result corroborated what [36] reported that there was 62.8% food insecurity among farming households in North Central Nigeria. In Kenya, 44.7% of small scale farming households was reported to be food insecure by [37]. In a study of rural households in Malaysia, [38] reported that 83.3% were food insecure. According to [39], vulnerability to food insecurity is location specific and must be assessed independently in each community. The households that were food secure could be those families where the mothers were economically engaged. This may have contributed to their input for the overall welfare of their households. The important role of women in developing countries towards achieving households food and nutrition security was emphasized by [40] who posited that women were involved in households food production, participated in economic activities so as to supplement household incomes and are responsible for the care of the household members.

According to [41] nutritional requirements refer to the quantity of energy and nutrients expressed on a daily basis necessary for a given category of individuals that will allow these individuals when in good health to develop and lead a normal life. Reference Nutrient Intakes (RNIS) are used as standards to assess the adequacy of intake of various nutrients. For mothers in the low and moderate food insecure households, the calculated nutrient intakes were higher than the reference nutrient intakes for energy, carbohydrate, fat, fibre, calcium, iodine and vitamin C. The high intake of energy could be because the communities studied produce cassava, yam, cocoyam, plantain. These foods contributed to their energy needs. For instance, cassava was processed into garri, foo-foo,

flour, fresh and dried cassava chips. These constituted greater part of their daily meals and may have contributed to the high energy and carbohydrate intakes. Their main sources of fats and oil were palm oil and other vegetable oils which were used to prepare different meals and this may have contributed to their high fat intake above the reference value. Palm fruits were also used by the mothers in preparing soups which were used to eat garri, foo-foo or rice. These equally might have contributed to high fat intake. Other things which may have contributed to high fat and energy intakes were pears, groundnuts, coconuts, cashew nuts, melons and avocado. The diets of the mothers consisted of whole grains and legumes, vegetables and fruits. These could have contributed to the increased dietary fibre intakes. More so, majority of the mothers were not exposed to refined and fast foods that lack dietary fibre. Intakes of calcium were high probably because of crayfish, bones, dark green leafy vegetables and occasionally milk and beverages fortified with calcium which form parts of their diets. The use of iodized salt could have increased their iodine intake.

Vitamin C intakes of the mothers were higher than the reference value and this could be as a result of high consumption of fruits and vegetables especially citrus fruits, paw paw, tomatoes, okra, guava. These fruits and vegetables were grown in home gardens and farms. Palm oil delivers pro-vitamin A. Other rich sources of pro-vitamin A are carrots, sweet potato, tomato, mango, paw paw and dark green leafy vegetables [42]. This probably explained why vitamin A intakes of the mothers were close to the reference intake value.

The intakes of the other nutrients calculated were lower than the reference intake values. These nutrients are protein, iron, zinc, niacin, riboflavin, thiamin, folic acid and vitamin A. [43] stated that if people are normally eating less than the reference nutrient intakes, they will almost certainly be deficient in those nutrients. The low intake of protein and most of the micro-nutrients calculated concurred with what [44] observed that in the short term, supply and/ or demand shocks will affect the stability of the food and nutrition status of members of the households. [45] noted that gender differences seem to be largest in severely food insecure households and that it appears to be a problem of quality rather than quantity or caloric intake. The low intakes of these nutrients may be attributed to the lack of proper nutrition knowledge. Nutrition education has a role to play in food security.

This is because several studies have shown this to be true. For instance, a United States study of 219 female heads of households receiving food stamps who were randomly assigned to either receive or not receive education regarding food and nutrition showed significantly improved food security in the intervention group [46]. Another reason for the low intakes could be minimal intakes of animal sources of protein which are also rich sources of nutrients like vitamin A, iron and zinc. [47] noted that already formed vitamin A which is known as retinol is found only in animal products. In the same way, haeme iron is obtained from meat while flesh foods are the richest sources of bio-available zinc. This shows that nutrition education for mothers will greatly enhance their choice of food for the overall improvement in nutrient intakes.

Thiamin, riboflavin, niacin and folic acid intakes of the mothers were all lower than the reference intake values. Even though the difference is very small, but it is still a cause for concern. A number of reasons could cause low intakes of these B- vitamins. They may include poverty, poor food selection and misinformation. [48, 49 and 50] identified food sources thiamin, riboflavin, niacin and folic acid. According to them rich sources of thiamin are meat, whole grain and enriched cereals and legumes. Fortified bread and cereals, milk, cheddar cheese, eggs, fish, meat, spinach are sources of riboflavin. The sources of niacin are meats, poultry, yeast, peanut, fortified bread and cereals. Green leafy vegetables, citrus juices, legumes, fortified cereals and bread, kidney, liver, mushrooms are sources of folic acid. Most of the mothers were poor that they cannot some of those foods like liver, poultry, milk. Additionally, poor selection of foods could have probably made these mothers loose out on these important nutrients while some may have been misinformed about certain foods like egg, pork that they entirely avoided eating such foods.

For the mothers in the severe food insecure households, all the nutrient intakes were lower than the reference nutrient intakes except for fat, iodine and vitamin C. This is in agreement with [51] who stated that food insecurity is related to lower macro and micro-nutrient intakes, lower intake of fruits and vegetables and lack of diet diversity. It could therefore be possible that mothers in severe food insecure households had little or no access to foods of different varieties that could have contributed to increased nutrient intake, hence their low intakes of those nutrients as reported by this study. It could also be

often true that they had no access to foods, couldn't eat adequate food and worried about food.

Several studies have reported that food insecure households have lower nutrient intakes, diet diversity or variety and number of servings from expensive food groups such as meat, fish, poultry and fruits and vegetables. For example, the mean energy intake of Indian women in a study by [52] was 1193kcal. A study of women in urban squatters of Malaysia showed that mean energy intake was 1224kcal [53]. These show that food insecurity may probably affect the quantity, quality and eating behaviours of individuals in the households affected.

The body mass indices of the mothers showed that the double burden of malnutrition is substantial in the communities studied. In consonance with this finding where the proportion of overweight and obesity exceeded underweight, [54] found that overweight exceeded underweight among women in developing countries. Similarly, it was reported that in Sub-Saharan Africa, as well as other developed countries, overweight and obesity were becoming a problem especially among poor adult women [55, 56 and 57]. The number of women who were found to be underweight could be those women who engage in strenuous farming activities. The amount of energy in kilojoule may be insufficient to balance the daily activities. Most times, adequate food and rest may not be obtained and this could probably lead to negative energy balance. Some women who may not be involved in strenuous activities could also be underweight if they are not eating adequate food. This may be true of working mothers who may not have time to eat adequately at home and are busy with work both outside the home and at home.

The high rate of overweight and obesity reported by this study showed that over-nutrition was also a nutritional concern in rural areas. An explanation to this may be the availability of cheap energy dense foods. This might have encouraged mothers especially the unemployed ones to over-eat these low quality diets. The overall effect is subsequent weight gain. This was evident in the nutrient intakes of the mothers where their energy intakes were above the reference intake. Certainly, the weight gain does not happen instantly but rather gradually which subsequently led to obesity, a chronic condition that develops over a period of months or even years. This may be especially true for mothers who do little or no exercise which helps to burn out excess calories. The increasing prevalence of in overweight and obesity

may be as a result of change in lifestyle patterns in most developing countries. Economic growth, modernization and globalization may have also contributed to involvement in more sedentary lifestyles such as motorcycles everywhere which makes people to find it difficult to walk even small distances. Wrong interpretation of body size could also play a role in the increasing prevalence of overweight and obesity. In most places, people favour large body size, often misconstruing it as a sign of wealthy living. In Nigeria, 11% of women of reproductive age were thin or undernourished. Rural women were more likely to be thin (13%) than urban women (10%) [58]. [59] reported that obesity was a public health problem in Nigeria where 17% of women were overweight and 8% were obese. The trend of obesity has not abated because overweight and obesity among women of reproductive age was reported to increase with age and was higher in urban areas (33%) than rural areas (18%). Among women in Abia State, 30.1% and 9.1% were overweight and obese, respectively while 21.9% and 14.7% were same in Imo State [60].

[61] argued that if food security were to be considered only in terms of access to food in sufficient quantity, it might follow that food insecurity would be associated only with being underweight. According to them, the relationship between food insecurity and weight is more complex and not yet clearly defined. In literature, many studies have reported overweight and obesity existing alongside food insecurity [62, 63, 64, 65 and 66]. According to [67 and 68], food deprivation in low income households promotes binge eating (over-eating when food is available and restriction at the time of food insufficiency and contributes to cycling of weight gain and weight loss, which could contribute to development of overweight and obesity). It could be possible that other factors such as genetics (family history of obesity), behavior of food intake (added sugar or fat), environment (physical activity) and socio-economic factors (education, income) contributed to overweight/ obesity (69 and 70).

The odds ratio showed that there was a weak relationship between food security and three of the factors entered into the model. These values showed that the contribution of each variable in the model depended on the other variables, hence it is difficult to predict with certainty what each variable will do to the food security status of the households. However, household head was regressed as the only variable against food security status and it predicted that there was more likelihood of male headed (86%) to be food

insecure than female headed (77%) households. This result was in contrast to the findings of [71 and 72] who reported that female headed households were more food insecure than the male headed households. The reasons for such contrast could be that those females who head their households were either working full time or have one skill or the other. Possibly, most times they combined working with farming or other skill works. It could therefore be inferred that better resourced women who have better nutritional status themselves can provide higher quality care for their children.

The study under discussion showed a weak relationship between food security and household size. Household size in this study was categorized and this may have contributed to the weak relationship as well as the earlier reason of interaction of other variables. Several studies have predicted the effect of household size on food security. For instance, [73] posited that increase in household size decreases the probability of household food security. According to them, it could mean that households that are large are more likely to be food insecure than small households. This is similar to [74] who stipulated that there was a negative relationship between household size and food security status. This means that larger household sizes have higher food demands which thus affect their food security statuses. This is because large family size creates more pressure on household food security status due to the expenditure on food and other things. According to [75], as family size increased by one the odds ratio in favour of food security decreased by 0.57. Therefore, a shift to smaller family size decreases the probability of being food insecure [76].

In Table 6, the model showed that if income level goes up to 1 point, the log odds would go up to 0.418 point. This indicated a weak association between income level of mothers and food security status of households. That notwithstanding, when all other variables remain constant, changes in income could alter the quantity and quality of foods purchased and consumed. In this study, it could be possible that women who earn more income may be able to contribute to improve their families' food security status. There is growing evidence that increasing women's income in the households significantly improves family and societal welfare. Enhancing women's earnings and share of family income has also been known to empower women by strengthening their bargaining power in the household [77]. There is a moderate relationship between household food security status and highest educational level. The odds

ratio in favour of food security was increased by 1.635 as the mothers in the households were educated. This study is in congruent with previous studies [78 and 79]. Also high educational status would positively influence production and nutrition decisions [80]. In line with this, [81] asserted that education catalyses the process of information flow and lead persons to explore as wide as possible different pathways of gathering information about agriculture and food security.

Conclusion

There was a strong positive relationship between food security status and body mass indices of the mothers and the R value was 0.659. The coefficient of determination represented the percentage of the data that was closest to the line of best fit. This was shown by the R square value of 0.434. This implied that only 43.4% of the total variation in body mass indices can be explained by the linear relationship between food security status and body mass indices or vice versa. More than half (56.6%) of the total variation in body mass indices remained unexplained by the food security status. Household food insecurity is one of the factors affecting nutrition security and may have contributed to the malnutrition observed among mothers in the households studied.

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