African Journal of Agriculture and Food Science
ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)
www.abjournals.org

RURAL HOUSEHOLDS' PERCEPTION ON PROTEIN FOOD CONSUMPTION PATTERN OF SCHOOL-AGED CHILDREN (6-11 YEARS) IN KATSINA STATE

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Cite this article:

Aniefiok, A. C., Ikwuakam, O. T. (2024), Rural Households' Perception on Protein Food Consumption Pattern of School-Aged Children (6-11 Years) in Katsina State. African Journal of Agriculture and Food Science 7(3), 284-302. DOI: 10.52589/AJAFS-J1V07RJD

Manuscript History

Received: 9 Jul 2024

Accepted: 10 Sep 2024

Published: 16 Sep 2024

ABSTRACT: *In Nigeria, most rural households tend to adhere to the old and improper food eating patterns. This seemed more evident in the protein food consumption pattern (PFCP) which could be attributed to unverified wrong PFCP ideologies and cultures among distinctive ethnic groups. Consequently, the study investigated PFCP of school-aged children from rural households in Katsina State. A sample of 288 rural households was selected through the multistage sampling procedure from all Katsina rural households. Descriptive survey design and structured questionnaire were adopted in collecting data on households' socioeconomic characteristics, protein food awareness, PFCP, perception and constraint. Frequency counts, percentages, means, Analysis of Variance (ANOVA) and multiple regression analysis were employed in data analysis. The result revealed that most respondents were young, married, low income earners, Muslims, and farmers with Quaranic educational qualification. Levels of awareness and information were high and low respectively. While the pattern of consumption was inadequate, perception and constraint levels were unfavourable and high respectively. The ANOVA result showed that Katsina Central (KC) has significantly higher protein consumption than Katsina North (KN) and Katsina South (KS) just as KN had the highest awareness compared to KC and KS. Significant differences existed in PFCP KC, KN and KS. Age, marital status, income, awareness, perception, information and constraint were determinants of PFCP. The PFCP was inadequate with an unfavourable level of perception. While government and non-governmental agencies should explore the scaling up option of information sources other than radio, health workers and friends, households' income diversification is germane for better PFCP.*

KEYWORDS: Rural households, awareness, protein food consumption pattern, perception, constraint.

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

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www.abjournals.org

INTRODUCTION

Adequate nutrition, including sufficient protein intake, is essential for supporting the growth and development of school-aged children. Children between 6-11 years old have elevated nutritional needs to fuel their physical and cognitive development (Schwarzenberg, & Georgieff, 2021). In rural settings, where access to diverse food sources may be constrained, ensuring acceptable protein consumption can pose significant challenges.

Protein is a critical macronutrient involved in building and repairing body tissues, bolstering immune function, and providing energy (Semba, 2023). School-aged children require high-quality protein from sources like lean meats, fish, eggs, dairy, legumes, and nuts to meet their heightened growth demands. However, dietary choices in rural communities can be influenced by cultural norms, socioeconomic factors, and availability of protein-rich foods (Fanzo, Haddad, McLaren, Marshall, Wong, Schneider, & Herforth). Household food insecurity, constrained access to varied protein sources, and cultural beliefs have also been highlighted shaping children's dietary patterns (Kavle, Mehanna, Saleh, Foua, Ramzy, Hamed, & Galloway, 2019).

However, understanding rural households' views and behaviors on protein consumption is vital for developing tailored interventions and educational initiatives to enhance the nutritional status of school-aged children. Evidently also, despite the recognized critical role of adequate protein intake during childhood, there remains a knowledge gap in understanding the specific perceptions, practices, and challenges facing diverse rural households in providing sufficient protein for their school-aged children. Addressing this gap is crucial for informing strategies to improve protein consumption and overall nutritional well-being in this vulnerable population group. It therefore believed that by garnering insights into the local context and identifying potential barriers and facilitators, the study's findings can inform culturally-sensitive and locally-relevant interventions to promote adequate protein intake and support the healthy growth and development of school-aged children in rural areas.

Statement of the Problem

Ensuring adequate protein intake is critical for supporting healthy growth, development, and overall well-being in school-aged children. Its deficiency in the body has negative health complications including kwashiorkor, impaired mental health, wasting and shrinkage of muscle tissues, impaired mental health, oedema, organ failure, immune system wasting and shrinkage of muscle tissues (Khan et al., 2017). To guide against this therefore requires an intake of 133 mg nitrogen per kg of body weight per day, or 0.83 g protein per kg of body weight per day representing 10 to 35 percent of daily calories irrespective of age (Giller, 2020).

However, despite the recognized importance of adequate protein consumption for child growth and development, there remains a paucity of research exploring the perceptions and practices of rural households regarding protein food consumption patterns for their school-aged children. Giller also noted that in sub-Saharan Africa the benchmark has not been achieved resulting into malnutrition being recognized as the most prevalent important risk factor of diseases and deaths especially in rural households (Giller, 2020). In Nigeria particularly, high prevalence of nutritional deficiency has been reported across the states with per capita daily protein intake (45.4 g) being lower than the Food and Agriculture Organization (FAO) recommended minimum per capita daily protein intake (53.8 g) and the global daily intake (64 g) (Protein Challenge, 2020).

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Distinctive array of factors including limited access to diverse protein-rich food sources, limited agricultural production, lack of cold storage facilities, and poor transportation infrastructure (Maitra, & Rahim, 2022), socioeconomic factors and food insecurity, cultural beliefs, traditional dietary practices, and lack of nutrition education have been implicated to significantly influence protein food consumption patterns (Kavle et al., 2019) in rural areas. It is believed that understanding these patterns, perceptions and identifying the barriers and enablers to adequate protein intake is crucial for developing effective interventions and strategies to improve the nutritional status of this vulnerable population group.

Objectives of the Study

The overall objective of the study is to find out rural households' perception of protein food consumption pattern of school-aged children (6-11 years) in Katsina State. The specific objectives include to:

1. determine households' level of awareness of protein food in Katsina State
2. find out protein food consumption pattern of school-aged children in Katsina State
3. find out rural households' perception of protein food consumption pattern of school-aged children in Katsina State
4. identify factors influencing school-aged children's protein food consumption pattern in Katsina State.

LITERATURE REVIEW

Adequate protein intake is crucial for supporting healthy growth, development, and overall well-being in school-aged children. However, achieving sufficient protein consumption in this age group, particularly in rural areas, remains a significant challenge that requires investigation and intervention.

It is worthy of note that numerous studies have emphasized the importance of adequate protein intake for optimal physical and cognitive development in children (Semba, 2023; Schwarzenberg, & Georgieff, 2021; Giller, 2020). It has been noted too that the functions are not restricted to providing the body's building blocks, but they also act as precursors of several biologically relevant molecules of which either excess or deficiency can lead to diseases such as nervous system defects, metabolic problems, organ failure, and even death (Lippi & Plebani, 2020). A systematic review by Semba (2023) further highlighted the detrimental effects of protein-energy malnutrition on child growth, immune function, and cognitive performance. Also, Rytter, Kolte, Briend, Friis and Christensen, (2019) found that children with malnutrition exhibited impaired immune responses, increasing their susceptibility to infections. Grantham-McGregor and Baker-Henningham (2022) also emphasized the long-term consequences of childhood malnutrition, including stunted growth, impaired cognitive development, and reduced productivity in adulthood. These findings underscore the critical need to ensure adequate protein consumption during the crucial developmental years of childhood.

Animal-based protein foods such as eggs, dairy, meat, seafood and soy-based foods are instances of protein food sources that provide all nine of the essential amino acids in sufficient

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amounts just as whole grains, nuts, legumes, and seeds possess high levels of some amino acids. Unfortunately, access to these diverse protein-rich food sources is a significant challenge for rural households. Beal, Massiot, Arsenault, Smith, and Hijmans (2019) had however confirmed global disparities in dietary nutrient supplies, with rural communities often facing the worst hit of limited availability of animal-based proteins, legumes, and nuts. Maitra and Rahim (2022) who specifically examined protein consumption and child malnutrition in rural Bangladesh also highlighted the impact of socioeconomic factors and limited access to protein-rich foods.

Market access and affordability have also been implicated to exacerbate the factors influencing the intake of nutritious foods, including protein sources, among rural households (Hirvonen, 2019). The report of UNICEF, WFP and WHO (2020) has added the cost of healthy diets, economic slowdowns and downturns. It is believed that if the current food consumption patterns continue, diet-related health costs linked to mortality and diet-related non-communicable diseases are projected to exceed USD 1.3 trillion per year by 2030 (FAO, IFAD, UNICEF, WFP & WHO, 2020). Culture and traditional dietary practices, and environmental factors also have a significant influence on protein food consumption patterns in rural areas (Beal et al., 2021). This is in tandem with the study of Kavle et al. (2019) that revealed a significant influence of sociocultural norms and beliefs on dietary choices. As horrible and painful as it is to accept, it is unsurprising that the burden of shifts in protein rich food consumption will remain a threat around the world and particularly in the developing nations if nothing is done to ameliorate the situation.

METHODOLOGY

The study was conducted in Katsina State located in the North-Western zone of Nigeria. Katsina has 34 LGAs from three senatorial districts, shares common boundaries with Niger Republic in the north, Jigawa and Kano States in the east, Kaduna State in the South and Zamfara State in the West. All household members formed the population of the study.

Multistage sampling procedure was used for the study. First, two LGAs were selected from the selected senatorial districts using random sampling technique. These were Batsari, Safana, Mashi, Baure, Malumfashi and Bakori LGAs. The second stage involved a random selection of three villages from each selected LGAs to give 18 villages. The third stage also involved using simple random sampling techniques to select four households from each of the villages to give 72 households. The fourth stage also involved using purposive sampling procedure to sample 4 household members from the selected households. This gave a sample size of 288 respondents that was used for the study.

A descriptive survey design was adopted due to its high propensity of inclusiveness and ease of obtaining participants' opinions on the variables under study. A structured questionnaire was developed, validated and reliability was tested using Cronbach Alpha. A reliability index of .086 was achieved and adjudged a good instrument. The questionnaire comprised Sections A, B, C, D and E based on the objectives of the study (awareness of protein food, protein food types consumed, consumption pattern, perception of consumption pattern and factors influencing consumption pattern).

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www.abjournals.org

These variables were measured as follows: awareness of protein food types was determined as respondents indicated if they were aware (1) or not aware (0) for each of the awareness statements. The mean awareness obtained was used to categorize respondents' level of awareness into high (≥ mean score) and low (< mean score). Consumption pattern was measured on a 5-point Likert scale of daily (5), weekly (4), and fortnightly (3) monthly (2) never (1). The mean score was determined and used to categorize respondents' pattern of consumption into adequate (scores of mean and above mean) and inadequate (for scores below mean). For households' perception, a 5-point Likert scale was used to assess respondents' level of agreement to each consumption pattern. Scores of 5, 4, 3, 2 and 1 were to be assigned to each strongly agree, agree, undecided, disagree and strongly disagree, respectively, for positively worded statements and a reverse for negatively worded statements. The mean perception pattern was obtained and used to categorize respondents' level of perception into favourable (≥ mean score) and unfavourable (< mean score) respectively. Factors influencing consumption patterns were measured by presenting a list of factors to respondents on a 4-point scale of very strong (4), strong (3), and rarely (2) not at all (1). The mean scores and standard deviation obtained were used to categorize the factors into low (< mean ± 1SD), moderate (within mean ± 1SD) and high (> mean ± 1SD) levels of influence. Data analysis was carried out using descriptive (frequency, mean, standard deviation and percentages) and inferential (ANOVA and regression) statistics.

RESULTS

Respondents' Demographic Characteristics

The respondents' demographic result as in Table 1 shows that overall (30.2%) were within 21-30 years of age. Across the senatorial districts, Katsina central (29.2%) and south (34.4%) were also within 21-30 while 34.4% in the north were within 31-40 years of age. The result on educational qualification shows that overall (60.4%) possessed Qua'ranic educational qualification while 62.5%, 66.7%, and 52.1% in Katsina central, south and north respectively also had Qua'ranic educational qualification. The result on household size revealed that overall (61.3%), Katsina central (67.7%), south (49.0%) and north (67.4%) all had household size of more than 8 people. Table 1 further shows that overall (85.8%), Katsina central (83.3%), south (80.2%) and north 93.8% were married. On respondents' religious affiliation, the result shows that overall (98.3%), Katsina 100%, south (95.8%) and north (99%) were Muslims. Gender result reveals that overall (61.1%), Katsina central (63.5%) and south (63.5%) were females while north (55.2%) were males. The result on respondents' occupation shows that overall (63.54%), Katsina central (54.17%), south (91.66%), and north (91.66%) had farming as their households' occupation. Result on respondents' income showed that both overall (50%), Katsina central (54.2%), south (58.4%) and north (61.5%) earned <= ₦500,000 monthly.

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Table 1: Profiling of respondents by demographic characteristics

Category	Level	Total	Katsina Central	Katsina South	Katsina North
Age	<=20	6.2	7.3	9.4	2.1
	>60	6.2	8.3	5.2	5.2
	21-30	30.2	29.2	34.4	27.1
	31-40	27.8	25	24	34.4
	41-50	19.4	19.8	21.9	16.7
	51-60	10.1	10.4	5.2	14.6
Educational status	Primary	18.1	16.7	21.9	15.6
	Quaranic	60.4	62.5	66.7	52.1
	Secondary	18.1	16.7	11.5	26
	Tertiary	3.5	4.2		6.2
Household size	>8	61.3	67.7	49.00	67.4
	1-4	11.1	9.4	10.4	13.7
	5-8	27.5	22.9	40.6	18.9
Marital status	Divorced	5.2	7.3	8.3	
	Married	85.8	83.3	80.2	93.8
	Single	1.4	2.1		2.1
	Widowed	7.6	7.3	11.5	4.2
Religion	Christianity	1.7		4.2	1
	Islam	98.3	100	95.8	99
Sex	Female	61.1	63.5	75	44.8
	Male	38.9	36.5	25	55.2
Occupation	Trading	25	45.83	18.75	18.75
	Farming	63.54	54.17	91.66	91.66
	Civil Service	9.38	8.33	1.04	1.04
	Artisan	9.38	7.29	1.04	1.04
Monthly income	<=500000	50	54.2	58.4	61.5
	>150000	12.4	15.6	14.6	7.3
	100001-150000	19.4	19.8	21.9	16.7
	50001-100000	10.1	10.4	5.2	14.6

Respondents' Awareness of Protein Sources

The result in Table 2a shows that overall **(**82.29%), Katsina central (84.38%), south (73.96%) and north (88.54%) were aware that beef is a protein source. In the same vein, overall (95.49%), Katsina central (92.71%), south (94.79%) and north (98.96%) were aware of beans as a protein source. The awareness on fish as a protein source was among overall (72.22%), Katsina central (61.46%), south (68.75%) and north (86.46%). Although overall (53.82%) were aware of goat meat as protein source, only 46.88%, 39.58% and 75% were aware in Katsina central, south and north respectively. Also, overall (73.26%), Katsina central (69.79%), south (65.62%) and north (84.38%) were aware that chicken is a source of protein. The result on turkey shows that

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overall (19.44%), Katsina central (19.79%), south (7.29%) and north (31.25%) were aware of it as a protein source. Awareness for soymilk was among overall (77.78%), Katsina central (69.79%), south (79.17%) and north (84.38%). Result on milk shows that overall (68.06%), Katsina central (58.33%), south (64.58%) and north (81.25%) were aware. Awareness for groundnut was among overall (90.97%), Katsina central (89.58%), south (86.46%) and north (96.88%). The result on melon shows that only overall (28.12%), Katsina central (25%), south (13.54%) and north (45.83%) were aware. Similarly, awareness on rodents was among overall (20.14%), Katsina central (20.83%), south (10.42%) and north (29.17%). On the other hand, grasshopper was known to overall (60.07%), Katsina central (57.29%), south (57.29%) and north (65.62%) as a protein source. The result as shown in Table 3 further reveals that 92.01%, 56.25%, 59.38% and 59.38% of the respondents had high awareness level in overall, and Katsina central, southern and northern senatorial districts respectively.

Table 2a: Distribution of respondents based on awareness of protein food sources

Item	Total	Katsina Central	Katsina South	Katsina North
Beef	82.29	84.38	73.96	88.54
Beans	95.49	92.71	94.79	98.96
Fish	72.22	61.46	68.75	86.46
Goat meat	53.82	46.88	39.58	75
Chicken	73.26	69.79	65.62	84.38
Turkey	19.44	19.79	7.29	31.25
Soymilk	77.78	69.79	79.17	84.38
Milk	68.06	58.33	64.58	81.25
Groundnut	90.97	89.58	86.46	96.88
Melon	28.12	25	13.54	45.83
Rodents	20.14	20.83	10.42	29.17
Grasshopper	60.07	57.29	57.29	65.62

Table 2b: Distribution of respondents based on level of awareness

Senatorial District	Level	%	F	Mean	SD	Min	Max
				8.174	3.130	0	13
Overall:	High	92.01	265				
	Low	7.99	23				
Katsina Central:	High	56.25	54				
	Low	43.75	42				
Katsina south:	High	59.38	57				
	Low	40.63	39				
Katsina North :	High	84.38	81				
	Low	15.63	15				

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Respondents' Information Sources

Table 3a presents respondents' sources of information on various types of protein. The result shows that overall; radio, health workers, friends and family members occasionally provided information to 54.5%, 45.1%, 42.7%, 42.7% and 39.2% of the respondents on protein food sources. On the overall also, television (51.4%), printed media (79.2%), church (97.2%), mosque (59.7%), association (61.1%) and internet (85.1%) were never sources of information. Using the mean values also, the result shows that radio ($\underline{x}$ = 1.83), health workers ($\underline{x}$ = 1.37), friends ($\underline{x}$ = 1.27) and family members ($\underline{x}$ = 1.23) were the main sources of information. Across the senatorial districts, respondents in Katsina central also accessed information from friends ($\underline{x}$ = 1.385), health workers ($\underline{x}$ = 1.37), family members ($\underline{x}$ = 1.37) and radio ($\underline{x}$ = 1.99). In Katsina north, sources of information included radio ($\underline{x}$ = 1.72), health workers ($\underline{x}$ = 1.41), family members ($\underline{x}$ = 1.19), and friends ($\underline{x}$ = 1.15). Similarly, radio ($\underline{x}$ = 1.79), health workers ($\underline{x}$ = 1.33), friends ($\underline{x}$ = 1.28) and family members ($\underline{x}$ 1.17) provided information to households in Katsina south. Table 3b shows respondents' level of information sources. Overall, the result reveals that 92.01% of the respondents had a low level of information sources. Also across the three senatorial districts, 91.67%, 90.62%, 93.75% of the respondents had low scale of information sources respectively.

Table 3a: Distribution of respondents based on information sources

Information Sources	Never	Rarely	Occasionally	Always	Katsina Central	Katsina North	Katsina South	Overall
Radio	8.7%	18.1%	54.5%	18.8%	1.99	1.72	1.79	1.83
Television	51.4%	20.8%	23.3%	4.5%	1.09	0.83	0.5	0.81
Health workers	20.8%	27.8%	45.1%	6.2%	1.37	1.41	1.33	1.37
Friends	22.6%	31.2%	42.7%	3.5%	1.39	1.15	1.28	1.27
Printed media	79.2%	13.5%	6.2%	1.0%	0.41	0.33	0.14	0.29
Churches	97.2%	2.4%	0.3%	0.00	0.06	0.01	0.02	0.03
Mosque	59.7%	25%	14.2%	1.0%	0.51	0.60	0.58	0.57
Association	61.1%	22.9%	15.6%	0.3%	0.49	0.49	0.68	0.55
Internet	85.1%	6.9%	6.9%	1.0%	0.33	0.19	0.20	0.24
Family members	22.9%	34.4%	39.2%	3.5%	1.34	1.19	1.17	1.23

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ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)

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Table 3b: Distribution of respondents based on levels of information sources

Senatorial District	Information category	F	%	Mean	SD	Min	Max
				8.194	4.365	0	26
Total:	High	23	7.99				
	Low	265	92.01				
Katsina Central:	High	8	8.33				
	Low	88	91.67				
Katsina North:	High	9	9.38				
	Low	87	90.62				
Katsina South:	High	6	6.25				
	Low	90	93.75				

Protein Food Consumption Pattern

Table 4a presents the result on respondents' protein consumption pattern. The result reveals that overall, beef (41.3%), chicken (32.6%), milk (30.9%) and grasshopper (30.2%) were fortnightly consumed. Although beans (36.8%) was daily consumed, egg (37.2%), fish (43.4%) and goat meat (33%) were consumed monthly. Weekly consumption of soymilk and groundnut was recorded among 35.4% and 42.4% of the respondents respectively. Using the mean values, the result also shows that overall, beans ($\underline{x}$ = 4.97), groundnut ($\underline{x}$ = 4.91), soymilk ($\underline{x}$ = 4.47) ranked 1st, 2nd, and 3rd respectively as the most frequently consumed protein food. In Katsina central also, beans ($\underline{x}$ =5.06), groundnut ($\underline{x}$ = 4.89), soymilk ($\underline{x}$ = 4.40) ranked 1st, 2nd and 3rd respectively as the protein foods frequently consumed. Bean ($\underline{x}$ = 4.94), groundnut ($\underline{x}$ = 4.84) and soymilk ($\underline{x}$ = 4.28) also ranked 1st, 2nd and 3rd respectively in the northern senatorial district while groundnut ($\underline{x}$ 5.01), beans ($\underline{x}$ = 4.90) and soymilk ($\underline{x}$ = 4.72) were frequently consumed in Katsina south. However, Table 4b reveals that the levels of protein food consumption patterns in the state (89.24%), Katsina central (89.58%), north (85.42%) and south (92.71%) senatorial districts were inadequate among majorities.

Table 4a: Distribution of respondents based protein food consumption pattern

Protein consumed	Never	Yearly	Monthly	Fortnightly	Weekly	Daily	Katsina Central	Katsina North	Katsina South	Overall
Beef	8.3	8.3	22.2	41.3	17	2.8	3.69	3.23	3.84	3.59
Beans	0.7	1.7	5.2	21.9	33.7	36.8	5.06	4.94	4.90	4.97
Egg	0.7	16	37.2	35.1	10.4	0.7	3.62	3.23	3.38	3.41
Fish	1.4	13.9	43.4	34.7	6.2	0.3	3.52	3.20	3.23	3.32
Goat meat	1	26.4	33	28.5	8.7	2.4	3.40	3.16	3.23	3.25
Chicken	14.6	29.2	18.8	32.6	4.9	0	3.05	2.76	2.71	2.84
Turkey	93.1	3.1	0.7	2.8	0.3	0	1.20	1.19	1.04	1.14
Soymilk	5.6	2.4	6.2	30.9	35.4	19.4	4.40	4.28	4.72	4.47
Milk	21.2	11.8	18.8	30.9	13.5	3.8	3.35	3.06	3.04	3.16
Groundnut	1	3.5	2.8	19.4	42.4	30.9	4.89	4.84	5.01	4.91

Article DOI: 10.52589/AJAFS-J1V07RJD
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Melon	59	4.5	8	14.2	11.1	3.1	2.22	2.57	1.91	2.23
Rodents	79.9	6.6	4.5	7.3	1.4	0.3	1.73	1.29	1.32	1.45
Grasshopper	34	13.5	9	30.2	9.7	3.5	3.16	2.65	2.55	2.79

Table 4b: Distribution of respondents based on level of protein consumption pattern

Senatorial District	Protein consumed category	F	%	Mean	SD	Min	Max
				41.500	8.142	13	73
Katsina Central:	High	10	10.42				
	Low	86	89.58				
Katsina North	High	14	14.58				
	Low	82	85.42				
Katsina South	High	7	7.29				
	Low	89	92.71				
Total	High	31	10.76				
	Low	257	89.24				

Perception of Protein Food Consumption Pattern

Table 5a presents respondents' perception of the pattern of protein food consumed. The result shows that overall, 56.2%, 55.9% and 51.7% of the respondents agreed that weekly, fortnight and yearly, respectively, protein rich food consumptions are respectively adequate. On the other hand, 48.6% disagreed on the adequacy of daily consumption and 56.2% agreed on the inadequacy of weekly and monthly consumptions. Also, while 53.5%, 50% and 49.3% agreed that weekly, fortnightly and monthly consumptions are very adequate, respectively, 30.9% agreed that protein rich food consumption is never good. Using the mean values, the result shows that overall, yearly consumption ($\underline{x}$ = 3.833), monthly ($\underline{x}$ = 3.80) and fortnightly ($\underline{x}$ = 3.64) were seen to be very adequate. Also, consumption of protein food yearly ($\underline{x}$ = 386), fortnightly ($\underline{x}$ = 3.77) and monthly ($\underline{x}$ = 3.75) was considered inadequate. In Katsina central, weekly ($\underline{x}$ = 3.58), fortnightly ($\underline{x}$ = 3.29), yearly ($\underline{x}$ = 3.20) and daily ($\underline{x}$ = 2.75) consumptions were adequate. Yearly ($\underline{x}$ = 3.68), weekly ($\underline{x}$ = 3.53) and fortnight ($\underline{x}$ = 3.46) consumptions were also perceived as adequate in the northern district. Similarly, yearly ($\underline{x}$ = 3.39), monthly ($\underline{x}$ =3.82) and weekly ($\underline{x}$ = 327) in the southern district were perceived as adequate. Respondents' levels of perceptions in the state and across the senatorial districts were also shown on Table 5b. The results revealed that overall (96.88%), Katsina central (93.75%), north (97.92%) and south (98.96%) levels of perceptions of protein consumption patterns were unfavourable among most households.

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

African Journal of Agriculture and Food Science
ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)

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Table 5a: Distribution of respondents based on perception of protein food consumption pattern

Perception statement	SD	D	U	A	SA	Mean Katsina Central	Mean Katsina North	Mean Katsina South	Mean Overall
Dail consumption is adequate	21.5	48.6	4.2	18.4	7.3	2.75	2.62	1.88	2.41
Weekly consumption is adequate	2.8	24.7	2.8	56.2	13.5	3.29	3.41	3.90	3.53
Fortnight consumption is adequate	3.8	27.1	2.1	51.7	15.3	3.20	3.44	3.79	3.48
Yearly consumption is adequate	1.7	14.9	5.9	55.9	21.5	3.583	3.71	4.13	3.81
Protein consumption is never good	23.3	21.9	4.9	32.3	17.7	3.34	3.24	2.40	2.99
Daily consumption is inadequate	2.8	22.2	4.2	42.4	28.5	3.44	3.67	4.04	3.72
Weekly consumption is inadequate	2.4	19.1	2.4	56.2	19.8	3.53	3.59	4.03	3.72
fortnightly consumption is inadequate	1.7	19.8	3.5	49.3	25.7	3.53	3.75	4.04	3.77
Monthly consumption is inadequate	2.1	17	4.9	56.2	19.8	3.46	3.72	4.06	3.75
Yearly consumption is inadequate	2.1	16.3	4.2	49.3	28.1	3.68	3.75	4.13	3.85
Protein consumption is never good	24.7	24.7	3.5	22.6	24.7	3.39	3.34	2.21	2.98
Daily consumption is very adequate	22.6	46.9	4.9	19.1	6.6	2.90	2.46	1.85	2.40
Weekly consumption is very adequate	4.5	20.5	4.5	56.6	13.9	3.18	3.67	3.80	3.55
Fortnightly consumption is very adequate	3.8	20.8	4.2	50.0	21.2	3.27	3.75	3.87	3.64
Monthly consumption is very adequate	4.2	13.5	4.9	53.5	24	3.32	3.90	4.17	3.8
Yearly consumption is very adequate	5.2	11.1	6.6	49.3	27.8	3.39	3.98	4.14	3.83
Protein consumption is never good	23.3	19.1	4.9	30.9	21.9	3.44	3.41	2.43	3.09

Table 5b: Distribution of respondents based on level of perception of protein food consumption

Senatorial district	perception category	F	%	Mean	SD	Min	Max
				58.313	7.979	40	74
Katsina Central:	High	6	6.25				
	Low	90	93.75				
Katsina North:	High	2	2.08				
	Low	94	97.92				
Katsina South:	High	1	1.04				
	Low	95	98.96				
Total:	High	9	3.12				
	Low	279	96.88				

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

African Journal of Agriculture and Food Science
ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)

www.abjournals.org

Factors Influencing Protein Food Consumption Pattern

Table 6a presents results on a list of factors that could influence protein food consumption pattern. The result reveals that cost (92%), income (85.4%) and availability (50.7%) were very strong factors that influenced protein consumption in the entire state. Using mean values, overall ($\underline{x}$ = 2.85), Katsina central ($\underline{x}$ = 2.77), north ($\underline{x}$ = 2.83) and south ($\underline{x}$ = 2.94) had income as a very strong factor. Overall ($\underline{x}$ = 2.89), Katsina central ($\underline{x}$ = 2.90), north ($\underline{x}$ = 2.91) and south ($\underline{x}$ = 2.88), cost was also revealed to be a very strong factor. In same vein, availability was shown to be a very strong factor to overall ($\underline{x}$ = 2.23), Katsina central ($\underline{x}$ = 2.41), north ($\underline{x}$ = 2.18) and south ($\underline{x}$ = 2.12). The result in Table 6b further reveals that levels of factors that influenced PFCP in both Katsina central, north, south and overall were high.

Table 6a: Distribution of respondents based on factors that influence protein food consumption pattern

Factors	Not at all	Strong	Very strong	Katsina Central	Katsina North	Katsina South	Overall
Income	0.7	13.9	85.4	2.77	2.83	2.94	2.85
Religion	83	14.9	2.1	1.30	1.12	1.16	1.19
Tradition	80.6	19.1	0.3	1.27	1.13	1.20	1.20
Availability	27.4	21.9	50.7	2.41	2.18	2.12	2.23
Health/allergies	74.3	20.8	4.9	1.54	1.17	1.21	1.31
Household background	65.6	20.5	13.9	1.80	1.37	1.28	1.48
Cost	2.8	5.2	92	2.90	2.97	2.88	2.89

Table 6b: Distribution of respondents based on level of factors that influence consumption pattern

Senatorial district	constraints category	F	%	Mean	SD	Min	Max
				13.149	2.011	9	21
Katsina Central	High	96	100				
Katsina North	High	96	100				
Katsina South	High	96	100				
Total	High	288	100				

Analysis of Variance on Protein Food Consumption across Senatorial Districts

Table 7a presents ANOVA results on protein food consumption. The result indicates significant differences among the three senatorial districts (Katsina central, Katsina north, and Katsina south). The model includes two degrees of freedom for the senatorial districts and 285 degrees of freedom for the residuals. The total variation in protein consumption explained by the senatorial districts is 464.583, while the unexplained variation (residuals) is 18561.417. The mean squares for senatorial districts and residuals are 232.292 and 65.128, respectively. The F value is 3.567, with a p-value of 0.030, indicating a statistically significant difference in protein consumption across the districts at the 5% significance level. Duncan's multiple range tests as

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

shown in Table 7b elucidates these differences. The results show that Katsina Central has significantly higher protein consumption (43.271) compared to Katsina north (40.354) and Katsina south (40.875). The standard errors for these estimates are consistent at 0.824 across the districts. The grouping information reveals that Katsina central (group 'a') differs significantly from Katsina north and Katsina south (group 'b'), which do not differ significantly from each other. This indicates that while there is a general difference in protein consumption, the primary distinction is between Katsina central and the other two districts.

Table 7a: ANOVA on protein consumption

Model	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Senatorial District	2	464.583	232.292	3.567	0.030
Residuals	285	18561.417	65.128		

Table 7b: DUNCAN results for differences in protein consumption across the senatorial districts

Comparison	Protein consumed sum	Std	Se	groups
Katsina Central	43.271	9.170	0.824	A
Katsina North	40.354	7.926	0.824	B
Katsina South	40.875	6.962	0.824	c

Analysis of Awareness of Protein Sources across Senatorial Districts

The ANOVA results as shown in Table 8a reveals that significant differences exist on awareness among the senatorial districts. The F value is 15.677, with a highly significant p-value of 0.000, indicating that awareness of protein sources differs significantly across the districts. Duncan's multiple range tests as shown in Table 8b provide a detailed comparison of these differences. The results show that Katsina north has the highest awareness of protein sources (9.552) compared to Katsina central (7.646) and Katsina south (7.323). The grouping information shows that Katsina North (group 'b') has significantly higher awareness compared to Katsina central and Katsina south (group 'a'), which do not differ significantly from each other. This suggests that the main difference in awareness is due to the higher level of awareness observed in Katsina north.

Table 8a: ANOVA results on differences in awareness across senatorial districts

Model	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Senatorial District	2	278.632	139.316	15.677	0.000
Residuals	285	2532.688	8.887		

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

African Journal of Agriculture and Food Science
ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)

www.abjournals.org

Table 8b: DUNCAN results for differences in awareness of protein sources across the three senatorial districts

Comparison	Awareness sum	SD	Se	Groups
Katsina Central	7.646	3.149	0.304	A
Katsina North	9.552	2.779	0.304	B
Katsina South	7.323	3.003	0.304	C

The ANOVA result as shown in Table 9a indicates significant differences in the scores of the influencing across the groups. The F value is 106.1, with a p-value of 0.000, indicating a highly significant difference in the scores across the groups. This suggests that the variation in scores among the groups is not due to random chance. Duncan's multiple range tests in Table 9b further breaks down these differences. The test results show three distinct groups based on the scores. The highest score is 12.895 with a standard deviation of 3.378 and a standard error of 0.343, categorized as group 'a'. The next highest score is 11.299 with a standard deviation of 3.391 and a standard error of 0.363, categorized as group 'b'. The lowest score is 5.387 with a standard deviation of 2.582 and a standard error of 0.404, categorized as group 'c'. The grouping indicates that each group's influencing factors' scores are significantly different from each other, with group 'a' having the highest scores, followed by group 'b', and group 'c' having the lowest. These results highlight clear and significant differences in the level of factors experienced by the groups, which could be crucial for understanding and addressing the specific challenges faced by each group.

Table 9a: Level constraints

Df	Sum_Sq	Mean_Sq	F_value	Pr(>F)
2	2152	1076.2	106.1	0.000
222	2251	10.1		

Table 9b: Duncan constraints' scores

Constraints scores	SD	se	constraints scores	groups
12.895	3.378	0.343	12.895	A
11.299	3.391	0.363	11.299	B
5.387	2.582	0.404	5.387	C

The Determinants of Protein Food Consumption Using Multiple Regression Model

The regression analysis in Table 10 provides insights into the factors influencing protein consumption in Katsina State. The intercept of the model, at 33.709, represents the baseline level of protein consumption when all other variables are held at zero. Age has a positive and statistically significant effect on protein consumption, with an estimate of 0.065 and a p-value of 0.048. This indicates that as individuals age, their protein consumption increases, albeit slightly. However, household size does not significantly impact protein consumption, as evidenced by its negligible estimate of 0.003 and a high p-value of 0.968. The effect of formal education on protein consumption is positive but not statistically significant in this model. The

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

estimate of 1.441 and p-value of 0.181 suggest that while there may be some influence of education, it is not strong enough to draw conclusions.

Marital status shows a significant positive effect on protein consumption. Married individuals tend to consume more protein, with an estimate of 3.031 and a p-value of 0.009, highlighting that being married is associated with higher protein intake. Religion, specifically being Muslim, does not significantly affect protein consumption, as indicated by an estimate of -1.472 and a p-value of 0.616. This suggests that religious affiliation, in this context, is not a determinant factor. Awareness of protein sources is a strong and significant predictor of protein consumption with an estimate of 1.076 and p-value of 0.000. This shows that increased awareness substantially boosts protein intake. Conversely, perception has a significant negative impact with an estimate of -0.270 and a p-value of 0.000. This indicates that negative perceptions towards protein consumption reduce intake. Information scores also play a crucial role with an estimate of 0.504 and a p-value of 0.000. The result implies that better information leads to higher protein consumption. Constraint scores similarly have a significant positive impact, with an estimate of 0.510 and a p-value of 0.009. This suggests that reducing constraints can increase protein consumption. Monthly income, however, does not show a significant effect on protein consumption, as indicated by an estimate close to zero and a p-value of 0.166. This suggests that within the scope of this study, income variations do not significantly alter protein intake. The overall model is statistically significant, with an F-statistic of 6.25 and a corresponding p-value indicating that the regression model reliably explains the variation in protein consumption. The R-squared value of 0.43 means that 43% of the variance in protein consumption is accounted for by the independent variables in the model, and the adjusted R-squared of 0.42 confirms the model's robustness by accounting for the number of predictors.

Table 10: Regression analysis on determinants of protein food consumption

Regression Model	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	33.709	4.989	6.756	0.000
Age	0.065	0.033	1.989	0.048
Household size	0.003	0.062	0.041	0.968
Education	1.441	1.073	1.342	0.181
Marital status	3.031	1.153	2.628	0.009
Religion	-1.472	2.926	-0.503	0.616
Awareness	1.076	0.132	8.154	0.000
Perception	-0.270	0.052	-5.146	0.000
Information scores	0.504	0.093	5.415	0.000
Constraints scores	0.510	0.194	2.631	0.009
Monthly income	0.000	0.000	-1.389	0.166

F = 6.25, R2 = 0.43, adjusted R2 = 0.42

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

African Journal of Agriculture and Food Science
ISSN: 2689-5331
Volume 7, Issue 3, 2024 (pp. 284-302)

DISCUSSION OF RESULTS

The result of the the majority were within the age of 21-30 years is an indication that they were old enough to understand the relative importance of protein food in children's lives. The possession of Qur'anic educational qualification by the majority implies that the respondents were illiterates. This corroborated the findings of Amao (2013) on the determinants of protein consumption among households in Ila LGA of Osun State. That the respondents were married and each had a household size of more than 8 people implied a large household size and in line with the a priori assertion as the area is known for polygamy, which could necessitate such a scenario. This contradicts the finding of Olasunkanmi (2011) that the Remo area of Ogun State had respective household sizes of 5 people. The religious affiliation (Islam) of the majority was also expected and must have necessitated the large household size. The gender result which revealed that the majority were females was also in contradiction with that of Amao (2013) who found households in Ila LGA of Osun State to be mostly males. The result on respondents' occupation (farming) was in line with the a priori assertion as field experience buttressed that the majority were engaged in farming at distinctive scales. This explains why groundnut, soymilk and beans were consumed by most households. The income earned of ≤ ₦500,000 monthly means that the respondents were low income earners and may have prevented them from consuming relatively high quality and costly protein food. The high awareness level of most respondents was not expected given their low educational and information levels. This result, however, is in consonance with the finding that awareness of the need of adequate protein in human diet has greatly increased in developing regions in the world (Ajayi & Chukwu, 2008).

That beans, groundnut and soymilk were the most frequently consumed protein food was in tandem with the a priori assertion as these protein foods may not have emanated from their income but from their farms, whereas respondents' yearly, monthly and fortnight protein food consumption pattern was inadequate among most households as the majority also perceived it as being unfavourable. This implies that a household's high level of awareness did not translate into an adequate level of consumption pattern. This must have been brought about by the households' low income earning capacity. This is in conformity with the finding that low pattern and deficiency of protein intake in Nigeria is more prevalent in northern Nigeria due to fewer available financial resources (Judith, Adedotun, Steijns, Urszula & Alida, 2020). The high level of constraint with income, cost and availability of protein food as major constraints were further expected. This could be attributed to banditry and kidnapping that have ravaged the area, restricting access to farms and causing loss of crops and livestock.

The ANOVA tests elucidated show that Katsina central has a significantly higher protein consumption compared to Katsina north and Katsina south. The grouping information further reveals that Katsina central (group 'a') differs significantly from Katsina north and Katsina south (group 'b'), which do not differ significantly from each other. This indicates that while there is a general difference in protein consumption, the primary distinction is between Katsina central and the other two districts.

The ANOVA results for awareness of protein food also show significant differences among the senatorial districts. Duncan's multiple range test results show that Katsina north has the highest awareness of protein food compared to Katsina central and Katsina south. The grouping information further shows that Katsina north (group 'b') has significantly higher awareness compared to Katsina central and Katsina south (group 'a') which do not differ significantly from

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each other. This suggests that the main difference in awareness is due to the higher level of awareness observed in Katsina north. The ANOVA results also indicate significant differences in the constraints' scores across the groups. This suggests that the variation in constraints' scores among the groups is not due to random chance. Duncan's multiple range test further breaks down these differences in constraints' scores. The grouping indicates that each group's constraints' scores are significantly different from each other, with group 'a' having the highest constraints scores, followed by group 'b', and group 'c' having the lowest. These results highlight clear and significant differences in the level of constraints experienced by the groups, which could be crucial for understanding and addressing the specific challenges faced by each group.

Age, marital status, income, awareness, perception, information scores, and constraints scores were key determinants of pattern of consumption. This implies that increasing awareness and information sources and addressing constraint levels can significantly enhance protein consumption, while negative perceptions need to be mitigated to improve dietary habits. This analysis underscores the importance of targeted educational and informational interventions to promote better nutrition. The result contradicted the finding of Amao (2013) that other than age, income, marital status, awareness, perception, information scores, and constraints did not determine protein consumption pattern in Ila LGA of Osun State.

CONCLUSION/RECOMMENDATIONS

Based on the findings, the study concluded that age, marital status, awareness, perception, information, and constraint scores were key determinants of protein food consumption pattern in State. Overall, beans, groundnut, beef and soymilk were protein foods that households mainly consumed. This could be attributed to the high level of awareness across the three senatorial districts in the State. It is further concluded that radio, health workers and friends ranked as major information sources which did not translate into households having a high level of information. Pattern of protein food consumption was however inadequate with an unfavorable level of perception. Level of constraint was high with cost, income and availability of protein food constituting major areas of concern.

It is therefore recommended that:

1. Agencies saddled with the responsibility of creating awareness on protein food consumption should include the imperatives of households' income generation diversification as means of improving their earning capacities and protein food consumption particularly of animal origin.

2. Government and non-governmental agencies should explore the scaling up of information sources other than radio, health workers and friends.

3. Governments should endeavour to tame the tide of cost by exploring protein food price control mechanisms that will make prices of important children protein foods affordable for households.

4. Since age, marital status and availability also showed direct effect on the pattern of protein consumption, an awareness forum should be facilitated by the government and

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD

non-governmental agencies to enlighten households on the implications of these factors in their children's protein consumption pattern.

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Acknowledgement: The paper is the outcome of a study sponsored by Tertiary Education Trust Fund (TETFUND) Nigeria under its Institutional Based Research grant (IBR). We are grateful.

Article DOI: 10.52589/AJAFS-J1V07RJD
DOI URL: https://doi.org/10.52589/AJAFS-J1V07RJD