



Awareness of Food Nutritive Value and Eating Behaviors Among Peri-Urban Vegetable Farmers: Implications for Extension Services and Rural Education

Uzoh Victor Nwagbo¹, David John Okoronkwo^{*2} & Chimagbanwe Esther Mbah³

¹Department of Agricultural Extension, Faculty of Agriculture, University of Nigeria, Nsukka.

²Department of Sustainability in Agriculture, Food Production and Food Technology, Hungarian University of Agriculture and Life Sciences

³Department of Animal Science, Faculty of Agriculture, University of Nigeria, Nsukka.

*Corresponding Author Email: okoronkwodavid005@gmail.com

Abstract

This study sought to investigate the awareness of food nutritive value and eating behaviors among peri-urban vegetable farmers in Southeastern Nigeria. The study adopted a cross-sectional descriptive survey design. Multistage sampling procedure was used to select 300 vegetable farmers. Data were collected using semi-structured interview schedule. Descriptive (mean, frequency and percentage) and inferential (*t* tests) statistics were employed for data analysis. Results showed that peri-urban vegetable farmers were aware that nutrients are transported to cells in the body by water; water supports the removal of waste materials from the body and also help to maintain stable internal body temperature. But were unaware that fat and oils provides energy for the body; blood sugar levels can be raised by carbohydrates; and that production of insulin is supported by glucose. Eating practices commonly adopted included skipping breakfast, eating in between meals, and buying snacks as lunch, among others. There were no significant differences between male and female vegetable farmers in mean responses on food nutritive value or in eating practices adopted. Good eating habits will help farmers not only to improve their nutritional well-being, but also to prevent nutrition-related diseases.

Keywords:

Food nutrition,
Eating behavior,
Peri-urban,
Vegetable
Farmers

1. Introduction

Recently, the field of public health has been expanding its focus to promote sustainable health and nutrition, resulting in a growing interest in the nutritive value of consumed foods and eating practices among extension service providers and rural education professionals worldwide (Mbwana et al., 2016). Adequate and proper nutrition is crucial for maintaining a healthy lifestyle, and it is important to educate individuals on the nutrients in foods and their roles in human reproduction, disease prevention, body maintenance, health, and growth (Mbwana et al., 2016; Nti, 2008). Optimal cardiovascular function, respiratory ventilation, wound healing, muscle strength, protection from infection, and psychological well-being are all dependent on adequate nutrition (Awosan et al., 2014; Olaitan et al., 2018). A balanced diet consisting of the appropriate amounts of carbohydrates, fats, minerals, proteins, vitamins, and water is necessary for regulating bodily functions, supplying energy, building and defending the body, and preventing nutrition-related diseases.

In developing countries such as Nigeria, individuals' nutritional intake is shifting from low-protein diets with low calories and high fiber to high-protein diets with high calories and low fiber (Eze et al., 2017; Olubanjo-Olufowobi, 2020). This trend, particularly with regards to carbohydrate intake, has contributed to the increased prevalence of obesity, which is a significant risk factor for several non-communicable nutrition-related diseases, such as diabetes mellitus, hypertension, cardiovascular diseases, stroke, and nutrition-induced cancer (Olubanjo-Olufowobi, 2020). According to the World Health Organization (WHO), nutrition-related diseases account for approximately 60% of the global burden of disease and 73% of all deaths, and unhealthy eating practices are caused by misinformation and inadequate knowledge about health and nutrition (UNECE & WHO, 2021; WHO, 2018).

When individuals consume qualities of food that are not commensurate with their body requirements, they may be at risk of malnutrition, which can manifest as either undernutrition or overnutrition (Awosan et al., 2014). Therefore, it is crucial for professionals such as extension personnel, home economists, dieticians, and educationists to prioritize education about nutrition and diet, given the importance of nutrients in promoting optimal functioning and good health in humans. Agricultural extension and rural education play a vital role in helping farmers improve their standards of living and elevate the educational and social standards of rural life through educational procedures. This includes educating rural individuals on the importance of nutrition and encouraging the adoption of healthy eating habits. The primary goal is to motivate rural dwellers to consume healthy and sustainable diets (Jäckering, 2018; Shimali et al., 2021). In this regard, the aim of agricultural extension and rural education is to educate farmers and farm households about proper and adequate nutrition, promote essential teaching skills for dietary changes, provide psychoeducational materials that reinforce healthy eating skills, and offer information on sustaining eating behavior change (Oyegbami et al., 2020).

Extension services and rural education play a crucial role in raising awareness and promoting societal health through practical aspects of nutritional knowledge. The goal is to develop a nutrition plan for rural households that will provide them with the necessary and appropriate nutrition to remain physically prepared, healthy, and lead a healthy life (Adeyanju, 2014). Therefore, in promoting healthy living among rural people, it is essential for extension personnel to raise awareness of proper dietary practices and the nutritive value of foods to encourage good eating habits. According to Biesta and Osberg (Michel, 2019), awareness refers to an individual's ability to notice things and be completely conscious of what they have learned or know. Nutritional awareness appears to be linked to nutritional attitudes, knowledge, and actions, which impact people's eating practices (Eze et al., 2017). Additionally, nutritional awareness is related to knowledge of the interconnections between nutritional matters and human life, which can have a significant impact on a person's life (Lunterova et al., 2019).

This study defines nutritional awareness as having knowledge of the types of food one consumes and understanding why they are beneficial. By increasing awareness, people are more likely to make informed decisions about their food choices that promote their overall health, even if their occupation affects their daily diet. However, there are suggestions that one's profession can impact their nutritional awareness and eating habits (Michels et al., 2018). For example, in a study conducted in peri-urban settlements in the southeast region of Nigeria, Nnadi et al. (2018) observed that many farmers wake up as early as 4-5 am to travel to city markets or meet with middlemen to sell their freshly harvested vegetables before sunrise.

As a result of their occupation and busy schedules, many farmers often have limited food options and may go for long periods without eating until they return home later in the day. While food canteens are available in markets, they often sell mostly carbohydrate-rich foods and drinks. A study by Adeyanju found that 98% of rural households in Nigeria, whose main occupation is farming, consume foods that are deficient in important nutrients such as niacin, riboflavin, iron, calcium, and protein. This is a concern, particularly for women farmers who make up the majority of the labor force on smallholder farms and are often expectant or nursing mothers. Proper nutrition is crucial for their well-being and the care of their children, as poor dietary intake can affect their ability to care effectively for their children.

These women farmers also tend to have a very active lifestyle, (Olowogbon et al., 2019b) and those who engage in such lifestyles tend to burn more calories and wear out sooner than sedentary individuals; thus, they might need corresponding nutritional intake to replenish their body consumption. According to Olaitan (Olaitan et al., 2018), persons who do not consume sufficient nutrients risk fatigue and the inability to engage in their activities actively. A recent study in Nigeria revealed that farmers experience fatigue and other behavioral problems, (Olowogbon et al., 2019b) which may be traced to malnutrition. According to Olowogbon, (Olowogbon et al., 2019a) malnutrition can make farmers lethargic, mentally and physically, increasing farm accidents. It is possible that being aware of good eating habits and the nutritive value of foods could enable farmers to adopt good eating practices and make informed nutritional choices.

Women farmers tend to lead very active lifestyles (Olowogbon et al., 2019b), which can cause them to burn more calories and become fatigued more quickly than sedentary individuals. This means they may require a corresponding increase in their nutritional intake to replenish their body's energy consumption. According to Olaitan et al. (2018), individuals who do not consume sufficient nutrients are at risk of fatigue and reduced ability to engage in their activities actively. Furthermore, Olowogbon et al., (2019b) found that farmers often experience fatigue and other behavioral problems, which may be attributed to malnutrition. Malnutrition can make farmers feel lethargic, both mentally and physically, and increase the likelihood of farm accidents. Being aware of good eating habits and the nutritional value of foods could help farmers adopt better eating practices and make informed nutritional choices.

According to the WHO,(WHO, 2018) good nutrition knowledge is the main factor associated with good eating habits. Most food consumed in rural households of developing countries is home-produced or purchased locally or gathered; hence, diets are usually monotonous and simple since they are dictated by what foods are available in the home or local markets and the prices of those foods. Furthermore, educational facilities, health care, and other services are limited or absent in some areas. Thus, data on awareness of foods' nutritive value and eating practices can document particular situations for which programs and services to improve conditions can be developed, introduced, monitored, and evaluated. This study investigated the awareness of food nutritive value and eating practices among peri-urban smallholder households in Southeastern Nigeria. It is hypothesized in this study that there would be no significant differences between female and male-headed households regarding eating practices adopted or their awareness of food nutritive value.

2. Materials and Methods

2.1 Study area

This study was carried out in Southeastern Nigeria, between latitudes $4^{\circ} 20'$ and $7^{\circ} 25'$ North and longitudes $5^{\circ} 25'$ and $8^{\circ} 51'$ East. It covers a land area of about 109,524KM², or 11.86 percent of the total land area of Nigeria. The area lies mainly on plains under 200M above sea level. It is made up of five states, namely Abia, Anambra, Ebonyi, Enugu, and Imo. The region is predominantly inhabited by the Igbo people, who are known for their rich cultural heritage and entrepreneurial spirit. The region covers a land area of approximately 29,388 square kilometers and has a population of over 40 million people, making it one of the most densely populated regions in Nigeria. The major cities in the region include Aba, Awka, Enugu, Owerri, and Umuahia. Southeast Nigeria is known for its diverse natural resources, including fertile farmland, minerals, and oil reserves. Agriculture is the primary economic activity in the region, with crops such as yam, cassava, rice, and maize being major staples. Other economic activities in the region include trading, manufacturing, and small-scale businesses.



Figure 1. Geographic map of Southeastern Nigeria

2.2 Population and Sampling procedure

The study's population included all peri-urban vegetable growers in southeast Nigeria who are actively engaged in vegetable production. The sample for this study was chosen using a multistage sampling technique. In the first stage, 3 states (Anambra, Enugu, and Imo) out of the five states (Abia, Anambra, Ebonyi, Enugu, and Imo) in southeast Nigeria were randomly selected for the study. In the second stage, 2 town communities each were selected from the 3 states to give a total of 6 town communities. The town communities were Emene and Nike in Enugu State, Ogidi and Umuawulu in Anambra State, and Amakohia and Akwakuma in Imo State. In stage three, accidental and snowball sampling procedure were used to select 100 respondents from each respective state to give a total of 300 respondents for the study.

2.2.1 Power estimation

Power analysis was conducted to evaluate the suitable sample size for the present study. The test's statistical power was estimated using GPower software (version 3.1.9.4.). The study had an estimated power of 0.90, with a non-centrality parameter (δ) of 3.29.

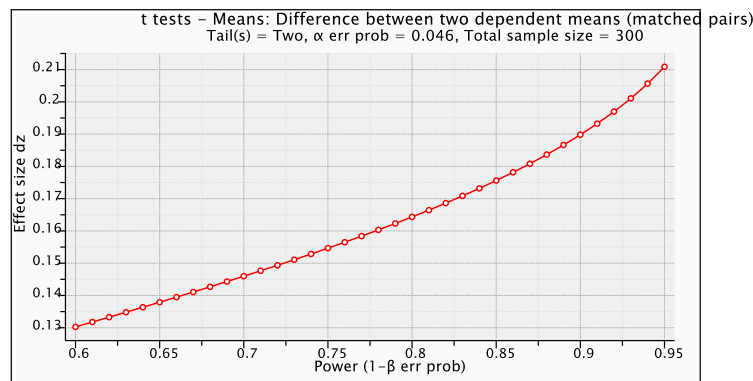


Figure 2. Sample size determination of 300 smallholder households from 6 peri-urban town-communities in Southeastern Nigeria participating in a study on awareness of foods' nutritive value and eating practices using G*power software.

2.3 Method of data collection and measurement of variables

This study relied on primary data. A standardized questionnaire was used to collect data, which was supplemented by an interview schedule. Strict inclusion and exclusion criteria were used to admit household heads as participants of the study. The inclusion criteria included having a household head ready to provide informed consent and complete the questionnaire. The exclusion criterion was implied when a household did not meet the inclusion criteria. In this study, households referred to farm families who utilize less than a hectare, use crude implements, use household labor, and produce mostly for household consumption. Household heads were selected to ensure that the respondents were fully involved in the daily provision of food for the household and thus, could give an informed account of the households' eating practices and nutritional awareness. Table 1 shows the study participants' demographic characteristics.

Information on the sex was collected by asking respondents to tick male or female on the questionnaire. Data on the awareness of food nutritive value of food items were collected by providing the respondents with a list of statement on food nutrition such as protein helps in the repair and building of body tissues, calcium homeostasis is maintained by Vitamin D, water supports the removal of waste materials from the body, among others. Respondents requested to rate their response on a 4-point likertype scale (Not Aware [NA] = 1, Slightly Aware [SA] = 2, Moderately Aware [MA] = 3, and Extremely Aware [EA] = 4). The EPSHNAQ (awareness of food nutritive value) were interpreted using

purposively set benchmark mean values this way: Not Aware (NA) = 1.00–2.49; Slightly Aware (SA) = 2.50–2.99; Moderately Aware (MA) = 3.00–3.49; and Extremely Aware (EA) = 3.50–4.00.

Information on the eating practices of households were collected by providing the respondents with a list of eating behavioral practices such as having dinner at 6pm daily, carrying prepared breakfast from home to farm/market, consuming soft drinks daily, among others. Respondents requested to rate their response on a 4-point likertype scale (Do Not Adopt [DNA] = 1, Slightly Adopt [SA] = 2, Moderately Adopt [MA] = 3, and Extremely Adopt [EA] = 4). Variables were categorized according to their mean values: Do Not Adopt (DNA) = 1.00–2.49; Slightly Adopt (SA) = 2.50–2.99; Moderately Adopt (MA) = 3.00–3.49 and Extremely Adopt (EA) = 3.50–4.00. The Cronbach alpha reliability indices of the first and second clusters of section B of the EPSHNAQ were 0.89 and 0.86, respectively, while the overall index was 0.88.

2.3.1 Data analysis

Descriptive statistics were used in analyzing data. Sex was the independent variable, while item scores were the dependent variable. The Student *t*-test examined the differences between females and males at a 0.05 level of significance. Prior to the *t*-tests, the Shapiro-Wilks normality test evaluated the normality of the data distribution and found it normally distributed ($P=0.30$). In performing the *t*-tests, sex was used as the grouping variable, whereas item scores were treated as test variables. The numerical value of 1 was coded for male-headed households, while the value of 2 was coded for female-headed households.

3. Results and Discussion

3.1 Demographic characteristics

Results in Table 1 showed that the majority (80.3%) of the household heads were females while 19.7% of the respondents were male headed households.

Table 1. Participants' demographic characteristics

Peri-urban town-town-town communities	N	(%)	Male N	(%)	Female N	(%)
Emene	54	16.7	9	13.7	41	86.3
Nike	46	16.7	11	13	39	87
Ogidi	33	10.0	8	7.3	22	92.7
Umuawulu	67	23.3	12	19.3	58	80.7
Amakohia	48	13.3	6	11.3	34	88.7
Akwakuma	52	20.0	13	15.7	47	84.3
Total	300	100	59		241	

3.2 Households' Awareness Levels of Food Nutritive Value

The results in Table 2 reveal peri-urban smallholder households' awareness levels of food nutritive value. Smallholder households in this study were highly aware that nutrients are transported to cells in the body by water (total mean [Mt] = 3.39), water supports the removal of waste materials from the body (Mt = 3.68), water helps to maintain stable internal body temperature (Mt = 3.25), and carbohydrates are major sources of energy for the body (Mt = 3.94). The smallholder households were moderately aware that protein helps in the repair and building of body tissues (Mt = 3.65), for healthy teeth and bones, milk and other dairy products are needed (Mt = 3.61), and protective foods are major sources of vitamins and minerals (Mt = 3.63), and scurvy can be prevented using vitamin C rich foods (Mt = 3.57). Furthermore, the results in Table 2 indicate that the smallholder households were slightly aware that calcium homeostasis is maintained by Vitamin D (Mt = 3.14), strong bones and teeth are built and maintained by calcium (Mt = 3.73), and excess energy in the body is stored as fat or adipose tissue (Mt = 3.42). However, the households were not aware that fat and oils provide energy for the body (Mt = 3.94), blood sugar levels can be raised by carbohydrates (Mt = 3.69), and the production of insulin is supported by glucose (Mt = 3.47).

According to results in Table 2, it was found that there were no significant differences between male and female smallholder households in their awareness of food nutritive value, given that the *P* values for all *t*-tests ranged from 0.15 to 0.91 at 249 degrees of freedom and were, thus, higher than the chosen significance level (0.05). The implication is that both male and female smallholder households in the investigated area are equal in their extent of awareness of the nutritive value of consumed foods.

Table 2. Mean response and t-test analysis of food nutritive value of male and female-headed households.

N	Statement on nutritive value of food	M ₁	SD ₁	M ₂	SD ₂	M _t	Aw.	Sig.	Dec
1	Nutrients are transported to cells in the body by water	3.40	0.93	3.38	0.76	3.39	MA	0.72	NS
2	Protein helps in the repair and building of body tissues	3.64	0.90	3.66	0.91	3.65	EA	0.50	NS
3	Water supports the removal of waste materials from the body	3.67	0.91	3.68	0.83	3.68	EA	0.33	NS
4	Calcium homeostasis is maintained by Vitamin D	3.14	0.87	3.13	0.91	3.14	MA	0.92	NS
5	For healthy teeth and bones, milk and other dairy products are needed	3.67	0.84	3.66	0.99	3.61	EA	0.75	NS
6	Water helps to maintain constant internal body environment	3.24	0.88	3.26	0.90	3.25	MA	0.25	NS
7	Protective foods are major sources of vitamins and minerals	3.64	0.89	3.66	0.98	3.63	EA	0.47	NS
8	Carbohydrates are major sources of energy for the body	3.95	1.01	3.97	0.96	3.94	EA	0.34	NS
9	Fat and oils provide energy for the body	3.90	0.89	3.95	0.86	3.94	EA	0.34	NS
10	Strong bones and teeth are built and maintained by calcium	3.76	0.74	3.77	0.75	3.73	EA	0.13	NS
11	Fat or adipose tissue stores excess energy in the body	3.44	0.93	3.41	0.76	3.42	MA	0.36	NS
12	Carbohydrates can raise blood sugar levels	3.69	0.85	3.68	0.84	3.69	EA	0.82	NS
13	Scurvy can be prevented using vitamin C rich foods	3.55	0.84	3.54	0.81	3.57	EA	0.22	NS
14	Production of insulin is supported by glucose	3.44	0.98	3.46	0.99	3.47	MA	0.64	NS

Dec=decision; EA=extremely aware; M₁=mean of male headed households; M₂=mean of female headed households, MA=moderately aware, M_t=total mean, NS=not significant, SD₁=standard deviation of male headed households, SD₂=standard deviation of female headed households. Degrees of freedom=246; P=0.05

3.3 Household's Frequently Adopted Eating Practices

Table 3 shows that buying food at canteens on the farm/market (M_t = 3.65) was extremely adopted by smallholder households as an eating practice. In addition, eating breakfast on the farm/market (M_t = 3.42), skipping breakfast and having only lunch and dinner (M_t = 3.35), eating in between meals (M_t = 3.23), and carrying prepared breakfast from home to the farm/market (M_t = 3.37) were moderately adopted as eating practices by the smallholder households. The results also show that the smallholder households slightly adopted the following eating practices: buying food from fast foods vendors and restaurants (M_t = 2.87), buying breakfast or lunch from food vendors (M_t = 2.74), buying snacks as lunch (M_t = 2.62), and skipping lunch (M_t = 2.59). Additionally, it was found that the smallholder households did not adopt eating balanced meals three times daily (M_t = 1.87), eating breakfast at home before going to the farm/market (M_t = 1.79), or having dinner at 6 pm daily (M_t = 1.32).

Again, the results in Table 3 showed no significant differences between male and female-headed households regarding their frequently adopted eating practices, as the P values for all t-tests ranged from 0.24 to 0.58 at 249 degrees of freedom and were, therefore, higher than the chosen level of significance (0.05). The implication is that both male and female smallholder households in the investigated area adopt similar eating practices irrespective of their sex.

Table 3. Mean response and t-test analysis of eating practices of 300 male and female-headed.

N	Items on eating practices	M ₁	SD ₁	M ₂	SD ₂	M _t	Aw.	Sig.	Dec
1	Having dinner at 6pm daily	2.97	1.15	2.50	0.88	1.32	DNA	0.54	NS
2	Carrying prepared breakfast from home to farm/market	3.36	0.96	3.34	0.78	3.37	MA	0.43	NS
3	Consuming soft drinks daily	3.21	1.01	3.18	1.03	3.19	MA	0.45	NS
4	Eating breakfast in farm/market	3.57	1.12	3.90	1.16	3.42	MA	0.43	NS
5	Buying breakfast or lunch from food vendors	2.18	1.02	2.41	1.15	2.74	SA	0.44	NS
6	Buying snacks as lunch	3.02	1.06	2.60	1.13	2.62	SA	0.35	NS
7	Skipping lunch	3.50	1.05	3.78	1.14	2.59	SA	0.49	NS
8	Eating balanced meals three times daily	2.86	0.99	3.18	0.07	1.87	DNA	0.47	NS
9	Buying food from fast foods vendors and restaurants	3.23	1.18	3.53	1.12	2.87	SA	0.36	NS
10	Eating breakfast at home before going to farm/market	2.82	1.03	3.13	0.09	1.79	DNA	0.36	NS
11	Eating in between meals	3.78	1.08	3.87	1.15	3.23	MA	0.58	NS
12	Skipping breakfast and having only lunch and dinner	3.33	0.97	3.36	0.85	3.35	MA	0.24	NS
13	Buying food at canteens in farm/market	2.96	1.17	3.46	1.19	3.65	EA	0.44	NS

Dec=decision; EA=extremely aware; M₁=mean of male headed households; M₂=mean of female headed households, MA=moderately aware, M_t=total mean, NS=not significant, SD₁=standard deviation of male headed households, SD₂=standard deviation of female headed households. Degrees of freedom=246; P=0.05

3.4 Discussion

The purpose of this study was to investigate the awareness of food nutritive value and eating practices among peri-urban smallholder households in Southeastern Nigeria. The study found that smallholder households were aware of the nutritive value of foods, and there were no significant differences between male and female-headed households in terms of their awareness of food nutritive value. The participants had knowledge that carbohydrates provide energy to the body and increase blood sugar levels. According to Brouns (2018), foods rich in carbohydrates are considered energy-giving foods. Additionally, Ludwig et al. (2018) stated that carbohydrates tend to raise blood glucose levels.

Furthermore, this study revealed that smallholder households were aware that glucose promotes insulin production in the body. The American Dietetic Association (Wilhelm & Association, n.d.) reported that carbohydrate digestion raises blood glucose, stimulating insulin production in the human body. The present study also indicates that smallholder households knew that protein is required for bodybuilding and repairs. According to Wu (Wu, 2016), every meal should contain proteins, and Hermann (Hermann, 2019) also highlighted that proteins are required to grow and maintain muscles and tissues.

The smallholder households in this study were aware that fat and oils are energy sources and that surplus energy is stored as adipose tissue or fat in the body. Consistent with this finding is that of Baltić et al. (Baltić et al., 2017), who reported that fat and oils are sources of energy stored as fat in the body. Again, smallholder households were aware that protective foods are sources of vitamins and minerals; vitamin C and D help prevent scurvy and maintain calcium homeostasis, respectively, and calcium helps build and maintain strong teeth and bones. These views support the opinion of Gelli (Gelli et al., 2019), who submitted that calcium is required to build strong bones and teeth, particularly in childhood and adolescence stages. Again, Ritchie (Ritchie & Roser, 2017) argued that vitamins are considered micronutrients, and any deficiency may result in different forms of nutrient-deficiency diseases. Also, smallholder households were aware that water helps remove body wastes, helps maintain homeostasis, and conveys nutrients to body cells. The European Food Safety Authority (Authority (EFSA), 2020) reported that water is required to convey nutrients around the body and maintain body homeostasis.

The findings on eating practices revealed that smallholder households commonly adopted the following practices: skipping breakfast and lunch, eating breakfast in the farm/market, carrying breakfast from home to farm/market, buying food from canteens, eating in between meals, buying snacks to eat as lunch, buying food from fast food outlets, and buying breakfast or lunch from food vendors, among others. These findings support Bonis-Profumo et al. (Bonis-Profumo et al., 2022), who noted that smallholder s' eating practices involve fast food consumption, skipping meals, especially breakfast, frequent snacking, and other unhealthy dietary behaviors. To further support the current findings, Koppmair et al. (Koppmair et al., 2017) stated that snacks account for 23% to 31% of the daily energy intake of smallholders, and Okunade (Okunade, 2020) asserted that fast food consumption and patronizing food vendors are common eating practices among smallholder households in peri-urban communities in Nigeria. Furthermore, Ahouéfa et al. (Ahouéfa et al., 2021) noted that skipping meals is one of peri-urban farmers' most commonly adopted eating practices. By implication, smallholder households in peri-urban communities eat outside their homes daily, thus spending less time at home. The present study found that the consumption of soft drinks was one of the eating practices adopted by smallholder households. This finding supports Nwouzuke et al. (Nwouzuke et al., n.d.) who reported that an average market woman in cities across the southeast does not have a snack without a soft drink.

Lastly, there were no significant differences between male and female-headed households regarding adopted eating practices. Therefore, the sex of the household head did not significantly affect the eating practices of the household. Hence, nutritional information charts can be developed and displayed on walls of marketplaces and around farms to enable smallholder households, irrespective of the sex of the household head, to increase their consciousness of food nutritive value and eating practices. Nutrition awareness can be improved by collaborating with organizations, health officials, various sectors, and government agencies to support nutrition intervention programs. Extension outreach and rural education intervention programs could be organized as nutritional education symposia, workshops, and nutrition seminars. Nutrition education and extension outreach programs could be organized for smallholder households interested in healthy eating practices and the nutritional aspects of foods.

3.5 Limitations

The current study has some limitations. First, the contribution made by the study can be limited since it considered only one variable (gender). The study did not include demographic characteristics such as marital status, ethnicity, educational background, and religious orientation, which may reduce the generalizability of the study outcomes. Other limitations include the lack of data on variables such as years of farming experience and age which could have provided a broader platform to describe the awareness of food nutritive value and eating practices among peri-urban smallholder households. It is recommended that subsequent studies assess these demographic characteristics of peri-

urban smallholder households to describe better the awareness of food nutritive value and eating practices of this group of persons in Nigeria and beyond.

Again, the study has a small sample size, and as such, the present findings may not be fully generalizable to the entire population of peri-urban smallholder households in Nigeria. It is hoped that subsequent studies will cover a broader study area and include larger samples. Researchers are also encouraged to carry out similar studies on this population outside Nigeria. Lastly, nutrition experts might argue that the item statements of the questionnaire (glucose stimulates the production of insulin, and carbohydrates raise blood sugar) would be relevant had the study centered on diabetic patients. However, these statements were included to reveal the respondents' overall understanding of food nutritive value in the Nigerian context. An individual might be aware of this information even without being a diabetic and could utilize such information in managing future health concerns associated with diabetes in his/her household. Thus, seeking such knowledge is essential for future studies on food nutritive value and awareness of eating practices, especially in developing countries such as Nigeria.

3.6 Implications

Poor eating habits and deficits in nutrition knowledge may adversely affect health and raise healthcare costs. To encourage good eating habits among peri-urban smallholder households in Nigeria, extension professionals can collaborate with local communities and women groups to develop dietary frameworks to guide the eating behaviors of smallholder households. Through nutritional education, extension professionals can help farm families and rural households to master one of the essential prerequisites of good health, a balanced diet. In turn, farmers could benefit by preventing health issues emanating from energy and nutrient deficiencies, such as low body weight and anemia, due to insufficient food supply and unbalanced dietary habits when their eating practices and knowledge of food nutritive value are improved.

Using educational procedures, extension service providers can guide people toward reaching nutrition-related goals by starting a nutrition plan suitable for developing healthy and adequate eating practices. The researchers implore extension service providers to receive proper cognitive-behavioral skills training for nutritional education and counseling. These techniques are crucial in helping individuals to make successful adjustments in their dietary practices. Finally, there are possibilities that the adoption of healthy diets facilitated by extension service providers may help in the prevention and avoidance of known nutritional health problems affecting people of all ages by peri-urban smallholder households.

4. Conclusion and Recommendation

The study found that smallholder households in peri-urban Southeastern Nigeria were generally aware of the nutritive value of foods, but their eating practices were often unhealthy. There were no significant differences between male and female-headed households regarding awareness of food nutritive value and eating practices. To improve nutrition awareness, there is a need for nutrition intervention programs, extension outreach, and rural education programs to educate smallholder households on healthy eating practices and the nutritional aspects of foods.

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References:

1. Adeyanju, A. (2014). Consumption of leafy vegetables in rural households in Ijebu-Igbo, Ogun state, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 14(1), 8518–8528.
2. Ahouéfa, N. L., Cissé, I., Soro, L. C., Yépié, A. H., Diagou, J. J., Yao, J.-B. K., & Atchibri, L. A. (2021). Associated Risk Factors of Non-Communicable Disease in Three Sites across Ivory Coast: An Urban (Cocody), Peri-Urban (Abobo) and Rural (Yocoboué) Area. *Food and Nutrition Sciences*, 12(5), 462–478.
3. European Food Safety Authority (EFSA). (2020). Outcome of a public consultation on the draft update of the risk assessment of nickel in food and drinking water. Wiley Online Library.
4. Awosan, K. J., Ibrahim, M. T. O., Essien, E., Yusuf, A. A., & Okolo, A. C. (2014). Dietary pattern, lifestyle, nutrition status and prevalence of hypertension among traders in Sokoto Central market, Sokoto, Nigeria. *International Journal of Nutrition and Metabolism*, 6(1), 9–17.

5. Baltić, B., Starčević, M., Đorđević, J., Mrdović, B., & Marković, R. (2017). Importance of medium chain fatty acids in animal nutrition. *IOP Conference Series: Earth and Environmental Science*, 85(1), 012048.
6. Bonis-Profumo, G., do Rosario Pereira, D., Brimblecombe, J., & Stacey, N. (2022). Gender relations in livestock production and animal-source food acquisition and consumption among smallholders in rural Timor-Leste: A mixed-methods exploration. *Journal of Rural Studies*, 89, 222–234.
7. Brouns, F. (2018). Overweight and diabetes prevention: Is a low-carbohydrate–high-fat diet recommendable? *European Journal of Nutrition*, 57(4), 1301–1312.
8. Eze, N. M., Maduabum, F. O., Onyike, N. G., Anyaegunam, N. J., Ayogu, C. A., Ezeanwu, B. A., & Eseadi, C. (2017). Awareness of food nutritive value and eating practices among Nigerian bank workers: Implications for nutritional counseling and education. *Medicine*, 96(10).
9. Gelli, R., Ridi, F., & Baglioni, P. (2019). The importance of being amorphous: Calcium and magnesium phosphates in the human body. *Advances in Colloid and Interface Science*, 269, 219–235.
10. Hermann, J. R. (2019). Protein and the Body. Oklahoma Cooperative Extension Service. Retrieved from <https://extension.okstate.edu/fact-sheets/protein-and-the-body.html>
11. Jäckering, L. (2018). Communication Networks and Nutrition-sensitive Extension in Rural Kenya: Essays on Centrality, Network Effects and Technology Adoption [PhD Thesis]. Niedersächsische Staats- und Universitätsbibliothek Göttingen.
12. Koppmair, S., Kassie, M., & Qaim, M. (2017). Farm production, market access and dietary diversity in Malawi. *Public Health Nutrition*, 20(2), 325–335.
13. Ludwig, D. S., Hu, F. B., Tappy, L., & Brand-Miller, J. (2018). Dietary carbohydrates: Role of quality and quantity in chronic disease. *Bmj*, 361.
14. Lunterova, A., Spetko, O., & Palamas, G. (2019). Explorative visualization of food data to raise awareness of nutritional value. *International Conference on Human-Computer Interaction*, 180–191.
15. Mbwana, H. A., Kinabo, J., Lambert, C., & Biesalski, H. K. (2016). Determinants of household dietary practices in rural Tanzania: Implications for nutrition interventions. *Cogent Food & Agriculture*, 2(1), 1224046.
16. Michel, M. (2019). The mismeasure of consciousness: A problem of coordination for the Perceptual Awareness Scale. *Philosophy of Science*, 86(5), 1239–1249.
17. Michels, N., Vynckier, L., Moreno, L. A., Beghin, L., De La O, A., Forsner, M., Gonzalez-Gross, M., Huybrechts, I., Iguacel, I., & Kafatos, A. (2018). Mediation of psychosocial determinants in the relation between socio-economic status and adolescents' diet quality. *European Journal of Nutrition*, 57(3), 951–963.
18. Ngozika, E. B., & Ifeanyi, O. E. (2018). A review on fast foods and family lifestyle. *International Journal of Current Research in Biology and Medicine*, 3(4), 26–30.
19. Nnadi, O. I., Liwenga, E. T., Lyimo, J. G., & Madukwe, M. C. (2019). Impacts of variability and change in rainfall on gender of farmers in Anambra, Southeast Nigeria. *Heliyon*, 5(7), e02085.
20. Nti, C. A. (2008). Household dietary practices and family nutritional status in rural Ghana. *Nutrition Research and Practice*, 2(1), 35–40
21. Nwouzuke, A. I., Jeremiah, Z. A., & Hamza, B. (n.d.). Two hours postprandial effect of commonly used soft drink (Coke) on plasma glucose level in Nigeria.
22. Odebode, S. O. (2012). Gender issues in agricultural extension and rural development in Nigeria. In S. D. Sharma & S. D. Sharma (Eds.), *Rural Development-Contemporary Issues and Practices* (pp. 116–132). Citeseer. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.432.9612&rep=rep1&type=pdf>
23. Okunade, O. O. (2020). Adults and social supports for older parents in peri-urban Ibadan, Nigeria. *Journal of Caring Sciences*, 9(2), 65–74.
24. Olaitan, O. O., Fadupin, G. T., & Adebisi, A. A. (2018). Dietary pattern, lifestyle and nutritional status of hypertensive outpatients attending University College Hospital, Ibadan, Nigeria. *African Journal of Biomedical Research*, 21(1), 29–36.
25. Olowogbon, T. S., Yoder, A. M., Fakayode, S. B., & Falola, A. O. (2019). Agricultural stressors: Identification, causes and perceived effects among Nigerian crop farmers. *Journal of Agromedicine*, 24(1), 46–55.

26. Olowogbon, T. S., Yoder, A. M., Fakayode, S. B., & Falola, A. O. (2019). Taming occupational stress among farmers in developing nations. In M. A. Rahman, M. S. Rahman, & M. A. Hossain (Eds.), *Effects of stress on human health* (pp. 229-244). Springer.
27. Olubanjo-Olufowobi, O. (2020). FOOD AND PLEASURE IN NIGERIA: A PRAGMATIC APPROACH TO EPICURUS' PHILOSOPHY OF GOOD LIFE. *AMAMIHE Journal of Applied Philosophy*, 18(2).
28. Oyegbami, A., Fadairo, A. O., & Oyedokun, M. O. (2020). Women's knowledge of the nutritional benefits and perceived constraints in soybean utilization in Oyo State, Nigeria. *South African Journal of Agricultural Extension*, 48(2), 166–175.
29. Ritchie, H., & Roser, M. (2017). Micronutrient deficiency. *Our World in Data*.
30. Shimali, F., Najjingo Mangheni, M., & Kabahenda, M. (2021). Nutrition education competencies of agricultural extension workers in Uganda. *The Journal of Agricultural Education and Extension*, 27(4), 535–552.
31. UNECE, U., & WHO, W. (2021). Regional Overview of Food Security and Nutrition in Europe and Central Asia 2020. World Health Organization. https://www.euro.who.int/__data/assets/pdf_file/0008/486533/Regional-Overview-Food-Security-Nutrition-Europe-Central-Asia-2020.pdf?ua=1
32. WHO. (2018). Noncommunicable diseases. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>
33. Wilhelm, H. J., & Association, A. D. (n.d.). Nutrition Press Releases. National Nutrition Week. 1975. Records of the Western Dairy Council. Series 2: Promotional Correspondence, Press Releases, and Speeches, 1973-1979. Finding Aid: <https://lib2.colostate.edu/archives/findingaids/agriculture/awdc.html>
34. Wu, G. (2016). Dietary protein intake and human health. *Food & Function*, 7(3), 1251–1265