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Original research paper

FOOD SAFETY KNOWLEDGE AND PRACTICES ON RED AND WHITE MEATS AMONG NIGERIAN FARMING HOUSEHOLDS

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Abstract: The relationship between farming households' knowledge and food safety practices on white and red meats is well documented in the existing scientific literature. Despite that, the population is still neutral on the knowledge and food safety practices related to white and red meats. This study intended to gain insight into the knowledge and food safety practices of the Nigerian farming households' population about white and red meat handling through a questionnaire survey. A survey was administered to a sample of selected 125 farming households' heads (42% female and 58% male) through a multi-stage sampling technique in the Wase Local Government Area, Plateau State, Nigeria. Topics covered by the questionnaire included their characteristics, knowledge and food safety practices on white and red meats. The farming households had basic knowledge of food safety (3.12) and they sometimes engaged in food safety practices on red and white meats (3.33). This survey revealed that farming households' knowledge of food safety on red and white meats was in significant positive correlation with their frequency of food safety practices on red and white meats ($r = 0.297$; $p < 0.05$). However, an advanced extension of prevailing information will help sustain farming households' lives and promote good health in the studied area.

Key words: *hygiene, food wholesomeness, contamination, food handling, health*

INTRODUCTION

Food handling is a fundamental piece of safety and it is characterized as safeguarding the food from microbial compounds and actual perils that might happen during all phases of food creation to forestall foodborne sicknesses (Ghosh, Sarkar & Chakraborty, 2021). Many Africans are only concerned with satisfying their hunger and pay little attention to food safety because there is insufficient food to meet the demand. This public anxiety has prompted different examinations of where and how food is produced and the related implications for our current environment (Awoyemi, Ajiboye, Adesiji & Kayode, 2019). Food safety refers to the handling, preparation, and storage of food in a manner that minimizes the risk of foodborne illness (Udoh, 2020). One person in ten contracts the food-borne

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illness. Each year, approximately 137,000 people die from food-borne illnesses, affecting over 91 million people, including those in Africa (Cissé, 2019; Udoh, 2020; Aimienrovbiye, 2022; Chepkosgei et al*.,* 2023). Additionally, food-borne illnesses are more likely to occur in developing nations, which has a direct impact on public health and, by extension, economic growth (Madaki & Bavorova, 2019; Udoh, 2020).

Poor food safety practices and the consumption of unwholesome food are linked to up to 70% of diarrheal infection cases in developing nations, which could lead to food-borne illnesses (Cudjoe, Balali, Titus, Osafo & Taufiq, 2022). In Nigeria, food safety is a significant and growing public health issue (Gizaw, 2019). Despite the efforts of the government and bilateral and multilateral organizations, national food safety control systems still suffer from deficiencies. Policies that can be enforced, regulatory mechanisms, resources, and coordination appear to be lacking in the fight against this problem (Aworh, 2021).

There are numerous environmental sources of contamination, and contaminants may enter the food during production, harvest, storage, retail, and preparation for consumption (Ezeudu, Agunwamba, Ezudu, Ugochukwu & Ezeasor*,* 2021). To get the most out of the limited available food, food safety must always be a concern. Unsafe food can not only harm one's health, but it can also hurt the economy in the form of hospital bills and losses in international trade (Awoyemi et al*.,* 2019; Allen, 2021). When households are better informed and educated about food safety, which will influence their attitude toward better safety practices, the significance of health in promoting economic development cannot be overstated (Birke and Zawide, 2019). Unsafe foods also pose a problem for consumers in terms of their health (Imathiu, 2020). Food safety is impacted by several important factors, including improper cooking techniques, a lack of knowledge about proper hygiene, such as washing one's hands before and after exposing food to vectors like flies, and improper handling of food as a result of exposure to an unhygienic environment (Kamboj, Gupta, Bandral, Gandotra & Anjum*,* 2020; Tuglo, 2021).

Thus, this study sought to assess knowledge and food safety practices on white and red meats among the farming household populace. The specific objectives were to describe the characteristics of the farming households and assess their knowledge and frequency of food safety practices on white and red meats. The hypothesis is stated in its null form as follows:

H_{01}: There is no significant relationship between food safety knowledge and the frequency of food safety practices on red and white meats among farming households.

MATERIALS AND METHODS

The study was conducted in Wase Local Government Area, Plateau State, Nigeria, which is on coordinates 9°6′N 9°58′E, and its land area is 4,306 km2 in size. The Local Government Area is comprised of four major districts (Wase, Bashar, Lamba, and Kadarko), twelve wards, and numerous villages under the major districts. The major crops grown are food and cash crops such as maize, sorghum, rice, groundnut, cotton, vegetables and beans. The major livestock reared are cattle, sheep, goats, and poultry. The target population for the survey were the farming households.

A three-stage sampling technique was used in selecting the households that are solely engaged in farming activities.

Stage 1: Three districts (Kadarko, Lamba and Wase) were randomly selected.

Stage 2: Forty-five farming households were purposively selected from each selected three districts in the Local Government Area. Thus the sample size was 135 farming households.

Stage 3: Thereafter, only 125 farming household heads were selected for interviews and used for the survey due to incomplete responses to participation in the survey exercise of the other 10 selected farming households. The selected farming household head thus represented the selected farming household for the survey.

A descriptive and causal research survey design was used in the survey research. To conduct an effective survey, the following steps were followed:

1. The participants (the farming households represented by the farming household heads) were determined in the survey.
2. The type of survey (household/in-person) was decided.

3. The survey questions and the layout were designed.
4. The survey was administered to the respective selected participants.
5. The responses from the survey were analysed.
6. The write-up of results from the analysis was carried out.

The research instrument used for this study was adopted and modified from the scale of Salihu, Adesiji, Ibrahim, Umar and Muhammed (2018) and was a well-structured questionnaire consisting of three sections as presented in the appendix with open and closed-ended questions. A paper questionnaire was administered by trained enumerators to the selected participants for the study. The reasons that led to the adoption of the paper survey were that the majority of respondents believed that printed surveys are more anonymous than online surveys, which resulted in the belief that respondents were more honest on printed surveys. In addition, the research study area does not have widespread access to the technology of the Internet. Thus, the majority of participants lacked an internet connection. However, it was discovered during a pre-survey exercise that respondents were far more receptive and at ease with paper surveys than with Internet surveys.

Experts in the fields of agricultural administration from the Federal University of Agriculture, Abeokuta and Agricultural Economics, and Joseph Sarwuan Tarka University, Makurdi were consulted to validate the research instrument which was subjected to face and content validity. This was done to ensure the degree to which an instrument measures what it is supposed to measure. Items found to be ambiguous and lacking clarity were eliminated and all necessary corrections were effected for the approval of the research instrument. Modus operandi and questionnaire were approved by the Forestry Research Institute of Nigeria-Federal College of Wildlife Management Research Review Board.

Cronbach's Alpha tests of internal consistency were employed to determine the reliability of study variables. This was done to ascertain the degree of consistency with which an instrument measures the attributes it is supposed to measure. Coefficients of Cronbach's Alpha above 0.70 were accepted as adequate for the scale (Balgiu et al., 2022; Adeniran, 2019; Barati, Taheri-Kharameh, Farghadani & Rásky, 2019). These coefficients for the scale in the survey instrument were 0.81 for knowledge of food safety among farming households and 0.88 for food safety practices on red and white meats among the farming household populace.

Primary data were obtained on farming households' head characteristics, their knowledge and food safety practices on white and red meats. The knowledge of food safety among farming households (11 items) was measured on a 5-point Likert-type scale which ranged from very adequate knowledge (5), adequate knowledge (4), basic knowledge (3), minimal knowledge (2) and no knowledge (1) while the frequency of food safety practices on red and white meats among the farming households (21 items) was measured on a 5-point Likert-type scale and ranged from always (5), often (4), sometimes (3), rarely (2) and never (1), consequently, multiple responses were not allowed during the survey exercise (Ozkan, Gemec & Gurbuz, 2023; Lunner-Kolstrup, & Ssali, 2016; Kennedy, et al., 2005).

The retrieved data of participants who gave their consent to participate were analyzed using descriptive statistics and the Pearson Product-Moment Correlation Coefficient.

The descriptive statistics included the use of measures of dispersion in means, percentages, frequencies and tables (Kaliyadan & Kulkarni, 2019). This was used to present the personal characteristics of respondents. Likewise, the Pearson Product-Moment Correlation Coefficient measured the strength and relationships between the two major study variables (food safety knowledge and practices on red and white meats among farming households). It is also referred to as the Pearson r test. This was used to determine and test the significance of the relationship between the major study variables among the farming households in the study area (Pandey, 2020).

The data collected was coded in the Microsoft Excel 2013 which was afterward imported into the IBM SPSS Statistics package. The IBM SPSS Statistics® version 25 (IBM Corp., Armonk, NY, USA) program was used to analyse the data.

RESULTS AND DISCUSSION

The study revealed that the majority (57.6%) of the respondents were male, while 42.4% were female. This showed that there are more male farming household heads than female farming household heads in the study area (Moyegbone et al., 2023). The majority of the respondents (60%) were below the age of 50 years while the mean age was 51.2 years. This implied that most of the respondents were away from their energetic ages (Awoyemi et al., 2019). The majority of the respondents (58.4%) were married, while 41.6 % were not married. Therefore, any interventions aimed at families in the pursuit of food safety practices would favour households' ability to reduce food contamination (Udoh, 2020). Most respondents had a family size of more than 11 persons, while the average family size was 15. This indicated that the households' size was large and that the family members may not holistically abode by the regular food safety practices due to crowded households (Vihi, Daudu & Anonguku, 2020). The majority of the farming household heads (64.8 %) earn a monthly income of ≤ 200,000 Nairas (NGN).

The average monthly income of the farming household heads was 184,603.67 NGN. All the household heads were literate, with a majority having a postsecondary education (42.4%). This suggested that the household heads were likely to have the knowledge and appreciation for food safety and, consequently, better food safety behaviour to influence other family members due to their educational attainment (Orivri & Ogwezzy-Ndisika, 2023).

As regards the knowledge of food safety practices, the farming households had adequate knowledge on food safety, such as that of importance of washing cooking utensils with water and soap after usage (3.97), using covering that protects food from flies and animals (3.90) and washing cooking utensils with water only after usage (3.84). The farming households had basic knowledge of food safety on issues such as that protection of foods from insects, rodents or other animals reduces the incidence of food-borne diseases (3.42) or that washing of cooking utensils before and after eating reduces the incidence of food-borne diseases (3.34), or that the water used for cooking and other household purposes should always be separated (3.03), that food should be covered during and after cooking (3.02), that covering of food keep the food safe from contamination (2.88), and that the contact between raw foodstuffs and cooked foods can cause contamination (2.53).

On the other hand, farming households exerted minimal knowledge related to food safety issues such as that using safe water for cooking/drinking will reduce the incidences of food-borne diseases (2.29) and that food should be thoroughly always cooked (2.10). Generally, collected information inferred that the farming households had a basic knowledge of food safety (3.12) in the studied region that coincides to the findings of Awoyemi et al. (2019) and Udoh and Udoh (2020).

Table 3 shows the frequency of food safety practices on red and white meats among the farming household populace.

Table 1.
Characteristics of the farming household populace

Variables		Frequency	Percentage
Gender	Female	53	42.4
	Male	72	57.6
Age of household head (Years) [Mean = 51.2 Years]	<40	27	21.6
	40-49	23	18.4
	50-59	40	32
	>59	35	28
Marital status	Not married	52	41.6
	Married	73	58.4
Household size (Persons) [Mean = 15 persons]	<11	54	43.2
	≥ 11	71	56.8
Monthly household income (NGN) [Mean = 184,603.67 NGN]	≤ 200,000	81	64.8
	>200,000	44	35.2
Education	Primary	36	28.8
	Secondary	36	28.8
	Post-secondary	53	42.4

Table 2.
Knowledge on food safety among farming households

Knowledge of food safety	Mean	Decision
Cooking utensils should be washed with water and soap after usage.	3.97	Adequate knowledge
Covering of food protects from flies and animals.	3.9	Adequate knowledge
Cooking utensils should be washed with water only after usage.	3.84	Adequate knowledge
Protection of foods from insect, rodents and other animals reduce the incidence of foodborne diseases.	3.42	Basic knowledge
Washing of cooking utensils before and after eating reduces the incidence of foodborne diseases.	3.34	Basic knowledge
Water used for cooking and other household purpose should always be separated.	3.03	Basic knowledge
Food should be covered during and after cooking.	3.02	Basic knowledge
Covering food keeps the food safe from contamination.	2.88	Basic knowledge
Contact between raw foodstuffs and cooked foods can cause contamination.	2.53	Basic knowledge
Using safe water for cooking/drinking will reduce the incidences of food-borne diseases.	2.29	Minimal knowledge
Always cook your food thoroughly.	2.1	Minimal knowledge
Grand Mean	**3.12**	**Basic knowledge**

Table 3.
Frequency of food safety practices on red and white meats among the farming household populace

Food safety practices on red and white meats	Mean	Decision
Use separate water for cooking	3.97	Often
Dogs, cats, pigs and cockroaches are not found around the kitchen	3.96	Often
Red and white meats are thoroughly cooked before consumption	3.94	Often
Different knives are used for cutting raw meat, vegetables and cooked food	3.90	Often
Wash hands before feeding children	3.88	Often
Knives are washed immediately after usage	3.72	Often
Wash hands before food preparation or cooking	3.65	Often
Wash hands with soap/ash before preparing food	3.64	Often
Cooking utensils are washed before and after use with soap and water	3.43	Sometimes
Wash hands with soap immediately after eating	3.43	Sometimes
Red and white meats should be fried in boiling oil	3.26	Sometimes
Cook food thoroughly	3.14	Sometimes
Cooked food is separated from food preparation areas	3.14	Sometimes
Separate the water used for cooking and other household purposes	3.09	Sometimes
Cover foods during and after cooking	3.08	Sometimes
Wash hands after changing the baby's wears	3.04	Sometimes
Wash fruit and vegetables before eating	2.38	Rarely
Wash hands immediately after coughing / sneezing	2.35	Rarely
Wash hands after handling raw meat or vegetables	2.34	Rarely
Wash hands before eating	2.24	Rarely
Wash hands immediately after defecating	2.16	Rarely
Grand Mean	**3.33**	**Sometimes**

Table 4.
Relationship between food safety knowledge and practices on red and white meats among farming households

Variable	Knowledge of food safety	Food safety practices
Knowledge of food safety	1	
Food safety practices	0.297**	1

The farming households agreed that they often use separate water for cooking (3.97), animals and insects are not found around their kitchen (3.96), thoroughly cook red and white meats before consumption (3.94), use separate knives for cutting raw meat, vegetables and cooked food (3.90), wash their hands well before feeding children (3.88), wash knives immediately after usage (3.72), wash their hands before food preparation or cooking

(3.65) and also wash their hands with soap/ash before preparing food (3.64). The farming households agreed that they sometimes wash their cooking utensils before and after use with soap and water (3.43), wash their hands with soap immediately after eating (3.43), fry red and white meats in boiling oil (3.26), cook food thoroughly (3.14), separate cooked food from food preparation areas (3.14), separate water used for cooking and other household purposes (3.09), cover foods during and after cooking (3.08) and wash their hands after changing the baby wears (3.04). On the contrary, farming households rarely wash their fruits and vegetables before eating (2.38), nor wash their hands immediately after coughing/sneezing (2.35) or after handling raw meats or vegetables (2.34). In summary, the surveyed farming households sometimes engage food safety practices when handling n red and white meats (3.33), and this finding complements the previously published reports on this issue (Omemu & Aderoju, 2008; Olayemi, 2012; Nordhagen et al., 2022).

The results in Table 4 showed the correlation between the knowledge of farming households on food safety and the frequency of their safety practices on red and white meats in Wase Local Government Area, Plateau State, Nigeria. As seen from the tabulated data, farming households' knowledge of food safety related to red and white meats was significantly positively correlated with their hygienic practices while handling red and white meat ($r = 0.297$; $p < 0.05$). This suggests that individuals in farming households who prepare food from red and white meat will likely adopt positive food safety practices if they have the previous knowledge and positive attitudes towards it. This finding is supported by Mihalache, Dumitraşcu, Nicolau and Borda (2021) who looked at the positive correlation between food safety knowledge, food shopping attitude and safe kitchen practices among Romanian consumers.

CONCLUSIONS

This study allowed relating farming households' knowledge and food safety practices on white and red meats. The results showed that most of the farming household heads were male, middle-aged adults, married, well-educated, and had a large family size. From the study results, it can be concluded that the farming households' knowledge of food safety on red and white meats correlates well with their food safety practices on red and white meats. As the farming households' knowledge of food safety on red and white meats increases, they tend to exhibit better food safety practices during red and white meat handling, sustaining their life and promoting good health.

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ZNANJA I PRAKSE O BEZBEDNOSTI HRANE OD CRVENOG I BELOG MESA U NIGERIJSKIM POLJOPRIVREDNIM DOMAĆINSTVIMA

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Sažetak: Veza između znanja poljoprivrednih domaćinstava i prakse bezbednosti hrane na belom i crvenom mesu dobro je dokumentovana u postojećoj naučnoj literaturi. Uprkos tome, stanovništvo i dalje ima neutralan stav po pitanju znanja i u vezi sa bezbednosti hrane od belog i crvenog mesa. Ova studija je imala za cilj da kroz anketu dobije uvid u znanje i praksu bezbednosti hrane populacije nigerijskih poljoprivrednih domaćinstava prilikom rukovanja belim i crvenim mesom. Anketa je sprovedena na uzorku od 125 poljoprivrednih domaćinstava (42% žena i 58% muškaraca) kroz višestepenu tehniku uzorkovanja u oblasti lokalne samouprave Vase, država Plato, Nigerija. Teme obuhvaćene upitnikom uključivale su demografske karakteristike domaćinstava, nivo znanja i higijenske prakse u vezi sa bezbednosti, prilikom pripreme hrane od belog i crveng mesa. Poljoprivredna domaćinstva su imala neutralan stav u pogledu znanja o bezbednosti hrane (3.12) i higijenskih praksi kod pripremanja crvenog i belog mesa (3.33). Ovo istraživanje je potvrdilo da je informisanost poljoprivrednih domaćinstava o važnosti bezbednosti hrane od crvenog i belog mesa bila u značajnoj pozitivnoj korelaciji sa njihovim higijenskim praksama prilikom pripreme hrane od crvenog i belog mesa ($r = 0.297$; $p < 0.05$). Međutim, dalje unapređenje preovlađujućih saznanja je neophodno za održivost poljoprivrednih gazdinstava i promovisanje dobrog zdravlja u proučavanom području.

Ključne reči: *higijena, celovitost hrane, kontaminacija, rukovanje hranom, zdravlje*

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