



## ANALYSIS OF SAFETY STRATEGIES AMONG FRESH MEAT SELLERS IN MAIDUGURI METROPOLIS, BORNO STATE, NIGERIA

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### ABSTRACT

*This study examined the analysis of safety strategies among meat sellers in Maiduguri Metropolis, Borno State, Nigeria. A total of 50 respondents who are into meat selling were selected from four (4) markets within Maiduguri metropolis, using a multi-stage sampling approach. A Structured questionnaire served as the main instrument for the primary data while secondary data were obtained from journal papers, articles and the internet. The analytical techniques that were used include descriptive statistics and multiple regression analysis. The analysis of the socio-economic characteristics revealed that; majority of the respondents (50%) fall within the age group of 21-40 years, 100% of the respondents are male, all the respondents are literate and possess some formal education with the majority (64%) of respondents and the remaining (36%) had non-formal education (qur'anic). The safety strategies used by the meat sellers include refrigeration and cooling (46%), 54% of respondents used designated area for disposing of meat waste and half (50%) of the respondents use gloves and aprons as protective gear. The results of the multiple regression analysis indicated that the model, shows that an increase in the age and years of experience will result to significant increase in safety practices while change in sex and cost of safety will significantly decrease safety practices. The findings shows that 80% of respondents are of the opinion that implementing safety practices can improve the quality of their meat products in the area. The study concludes that majority of meat sellers in Maiduguri Metropolis are literate married men that are in their economically active years. They are moderately experienced and also they are low income earners and they are primarily butchers that deal majorly with beef. Age, sex, years of experience and cost of safety are the factors that influence the use of safety practices. The major constraints to safety practice include high cost of safety materials and difficulty in compliance with safety regulations. It is recommended that The National Environmental Standards and Regulations Enforcement Agency (NESREA) should enforce strict compliance to relevant guidelines, policies and regulations through the agency's routine compliance visit to the abattoir and meat shops.*

**Keywords:** Fresh Meat Sellers, Safety Strategies, Maiduguri Metropolis

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## INTRODUCTION

Meat selling is a significant economic activity in many parts of the world, including Nigeria. In Nigeria, meat sellers operate in a range of settings, from formal markets to informal street vendors. Meat is an important source of protein for many Nigerians, and the meat sector is a major contributor to the national economy. The livestock industry contributes about 3-4 percent to the Gross Domestic Product and 15 percent to the agricultural value added (Federal Ministry of Agriculture and Rural Development, 2016).

The safety of meat sellers is important both for individual health and for the broader economy. Ensuring that meat sellers follow appropriate safety and hygiene practices can reduce the risk of food borne illnesses, protect the health of consumers, and promote economic growth by increasing consumer confidence in the safety of meat products. The economic impact of contaminated foods is devastating. Developing countries with limited resources lose foreign exchange as a result of rejected food exports to developed countries (FAO/WHO 2011). The economy of a nation can suffer greatly from loss of confidence from trading partners.

Meat selling is also associated with several challenges, including concerns around safety and hygiene. Informal meat markets are often characterized by poor sanitation and hygiene practices, which can contribute to the spread of diseases and contamination of meat products. In addition, the lack of regulation and oversight in the meat sector can make it difficult to ensure the safety of meat sold in these markets (Whitney and Rolfes, 2005). Furthermore, victims of food borne illnesses suffer from physical and emotional distress and the cost of treatment and loss of wages are a burden to the people and the nation. Studies have found that unsafe food practices, including poor hygiene and sanitation, are common among meat sellers in Nigeria, and that there is a high prevalence of food borne illnesses in the country. For example, one study found that over 60% of meat samples collected from informal markets in Lagos, Nigeria was contaminated with bacteria such as *E. coli* and *Salmonella* (Fasina, 2006).

The meat selling business in Nigeria can be quite hazardous, and meat sellers face a variety of safety hazards daily. These hazards can be categorized into physical, chemical, and biological hazards. Physical hazards in meat selling include sharp knives, meat cleavers, and other cutting tools that can cause cuts, bruises, and other injuries if not handled properly. Meat sellers also work in cramped and congested spaces, which increases the risk of falls and other accidents (WHO, 2007). Chemical hazards can also be a concern for meat sellers in Nigeria, as meat can become contaminated with harmful chemicals such as pesticides, antibiotics, and hormones. These chemicals can pose serious health risks to both the sellers and the consumers (Public Health Agency, 2017). Biological hazards are perhaps the most significant safety concern for meat sellers in Nigeria. These hazards include the potential spread of diseases like tuberculosis, anthrax, and other infections that can be transmitted from animals to humans (WHO, 2007).

In addition to these hazards, meat sellers in Nigeria also face challenges related to the lack of proper sanitation facilities and hygiene practices. The lack of access to clean water and soap can increase the risk of infection and disease transmission (Public Health Agency, 2017).

To address these challenges, there have been efforts to promote good hygiene practices and improve the safety of meat sellers in Nigeria. For example, the Nigerian government has developed guidelines for the safe handling and sale of meat products and has established a

regulatory framework for meat inspection and testing by examining the impact of food safety interventions. NGOs and other organizations have also provided training and support to meat sellers, helping them to adopt safer practices and reduce the risk of contamination (WHO, 2010).

Overall, the safety of meat sellers is an important concern both for individual health and for the broader economy. By promoting good hygiene practices, improving regulatory oversight, and increasing public awareness of the risks of consuming contaminated meat, it may be possible to reduce the risk of food borne illnesses and protect the health of consumers while also supporting the economic benefits of the meat sector (WHO, 2010)

To address these safety concerns, meat sellers in Nigeria must implement proper hygiene practices and invest in protective equipment and tools, such as gloves and cutting boards. They should also undergo regular training to ensure they are aware of the latest safety protocols and best practices for handling meat products (FAO, 2018).

The prevalence of food borne illnesses and the potential health risks associated with contaminated meat are of significant concern in Nigeria, and particularly in Maiduguri, Borno State. Many meat sellers in the city operate in informal, unregulated markets, where hygiene and sanitation practices may be poor and there may be limited oversight of food safety.

While it is known that many meat sellers in Maiduguri do not follow appropriate safety and hygiene practices, there is a need for more detailed research into the factors that contribute to this behaviour. For example, what are the barriers that prevent meat sellers from adopting safer practices, and what are the incentives that might encourage them to change their behaviour?

There have been several initiatives aimed at improving the safety of meat products in Nigeria, including regulatory efforts, training programs, and awareness campaigns. However, there is a need for more rigorous evaluation of the effectiveness of these interventions in reducing the prevalence of food borne illnesses and promoting safer meat-selling practices. Therefore, due to the importance of safety of meat-selling, the study analysed safety among meat sellers in Maiduguri Metropolis, Borno State, Nigeria. The study examined the socio-economic characteristics of meat sellers, identified the safety practices among meat sellers, examined the socioeconomic factors that influence the use of safety practices and identified of constraints to safety strategies of meat marketing among the sellers.

## **MATERIALS AND METHODS**

The study area is Maiduguri Metropolis, the capital city of Borno State, Nigeria. It lies within latitudes 10°-14N 11°30'E, and longitude 14°45'E. It occupies a total landmass of 50,778sq km (Ministry of Land and Survey Maiduguri, 2008). Maiduguri has a projected population of 845,000, at 2.8% increase from 2022 (Wikipedia, 2023).

It shares boundaries with Konduga Local Government Area to the West, Jere to the south and Mafa to the north. The climate of the study area is characterized by dry and hot seasons, with mean annual temperature of 25°C. The hottest months are March and April with maximum temperature of 40-43°C, while the coldest months are December and January with temperature of 19-25°C. Average rainfall is about 500 - 700mmper annum. The vegetation is tropical Sahel Savannah consisting of mainly grasses with few drought resistant trees like *Acacia albida*, neem trees and Boabab (Nigeria Meteorological Agency, 2008).

Most of the inhabitants are farmers, fisher men, traders or civil servants. The major ethnic group is Kanuri, others include Shuwa Arabs, Babur/Bara, Marghi, Fulani and Hausa, and many immigrant settlers from within and outside Nigeria, and English is the official language (Borno State Agricultural Development Programme, BOSADP, 2006). Major crops produced in the area include millet, sorghum, maize, groundnuts and cowpea while animals kept include goats, sheep, cows and fish (Nigeria Meteorological Agency, 2008). The data were collected from meat sellers in Maiduguri Metropolis in November, 2023.

Both primary and secondary data were used for the study. Primary data were generated using structural questionnaires that were administered to the respondents. Demographic information of the meat sellers such as household size, primary occupation, weekly income and safety strategies employed formed the major components of the questionnaire. Secondary information were collected from referenced publications such as, journals, seminar paper, conference papers and text books.

Five (4) markets with a considerable number of meat sellers were purposively selected. These are *Gidan Madara*, Monday market, *Kasuwan Shanu*, *Gamboru* market and *Baga road* market. Then 10 meat sellers were randomly selected from each market, making a total of 50 respondents.

The analytical tools that were used include descriptive and inferential statistics. Descriptive statistics such as mean, frequency distribution and percentages were used to examine the socio-economic characteristics of the respondents, identify safety practices and constraints associated with the use of safety practices. Multiple regression analysis was used to examine influence of socio-economic factors affecting the safety of meat. The binary logistic model was used and it is specified in the explicit form as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \epsilon \dots\dots\dots (1)$$

Where:

Y = Safety practices (Use safety strategies =1, otherwise = 0; safety practices include washing of hands, insect prevention methods, use of wire graze)

X<sub>1</sub> = Age (years)

X<sub>2</sub> = Sex (M/F)

X<sub>3</sub> = Educational qualification (years)

X<sub>4</sub> = Monthly income (₦)

X<sub>5</sub> = Type of meat (Mutton/Beef)

X<sub>6</sub> = Quality of meat (binary 1,0)

X<sub>7</sub> = Years of experience (years)

X<sub>8</sub> = Cost of safety in handling (₦)

e = Error term

### ***A priori* Expectation**

It is expected *a priori* that the coefficients of age, years of education, monthly income will be positive while the coefficients of sex and cost of safety in handling will be negative.

## **RESULTS AND DISCUSSION**

### **Socio-Economic Characteristics of the Respondents**

The result on Table 1 shows that majority of the respondents are aged between 21-40 years (50%). This shows that the meat sellers are in their active years. This is in lie with the findings of Tiri, Ekpa and Akinyemi (2015) who revealed that the marketers had a mean age of 38 years. The result further shows that all (100%) of the respondents are male. The higher representation of men is due to factors such as cultural and religious nature of the study area, which does not allow women to participate in meat selling. This is similar to the findings of Akinro, Ologunagba and Yahaya (2009) who revealed that (94%) of the respondents in Sokoto state, Nigeria, were male.

The result also revealed that 64% of the respondents are formally educated while 36% have no formal education, but possess Qur'anic education thereby making all the respondents literates. This is contrary to the findings of Ademosun, Okunola and Adewumi (2012) who revealed that majority of the butchers in some part of South-western Nigeria, are illiterate or possess very low level of education which affects meat selling standards in general. Also the result revealed that 50% of the respondents are mainly butchers, 10% are engaged in trading, 20% are students, and 20% are farmers. This shows that butchering is the main occupation of the respondents.

Result from Table 1 shows that 74% of the respondents have about 10 years of experience in meat selling, this shows that the butchers are well experienced. This is contrary to a study conducted by Adzitey, Sulleyman and Mensah (2018) who revealed that 98.0% of the respondents in Ghana had work experience of only three years and above. The result also shows that 60% of the respondents have an average monthly income of ₦60,000. Thus, an increase in monthly income will increase the use of safety practices among the respondents. Income helps to check and ensure the safety and quality of the meat they sell. The result further shows that majority of the respondents (40%) sell both beef and mutton, while 38% sell beef only and 22% sell mutton only. This is similar to the findings of Adewale, Ogunbanjo and Akinseye (2018) in the South West, Nigeria where 58% of the respondents sell both beef and mutton.

**Table 1: Socio-Economic Characteristics of the Respondents**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age</b>		
< 20	7	14
21-30	10	20
31-40	15	30
41-50	8	16
>50	10	20
<b>Gender</b>		
Male	50	100
Female	0	0
<b>Educational level</b>		
Primary	7	14
Secondary	10	20
Tertiary	15	30
Qur'anic	18	36
<b>Primary Occupation</b>		
Butchers	25	50
Traders	5	10
Students	10	20
Farmers	10	20
<b>Years of experience</b>		
1-5	23	46
6-10	14	28
11-15	03	6
16-20	10	20
<b>Monthly income</b>		
< - 50,000	19	38
51,000 -70,000	11	22
71,000-90,000	09	18
>90,000	11	22
<b>Type of meat</b>		
Beef	19	38
Mutton	11	22
Beef/Mutton	20	40

Source: Field Survey, 2023.

### **Types of Safety Strategies Employed by the Respondents**

The result on safety strategies employed by the respondents is presented in Table 2. The result revealed that refrigeration and cooling are used by a significant portion of the respondents (46%). It helps keep the meat at an appropriate temperature and avoids spoilage. This demonstrates a commitment to maintaining proper hygiene and food safety standards.

Also, half of the respondents (50%) use gloves and aprons as protective gear, emphasizing the importance of personal safety during meat handling. This is similar to the findings of Adzitey et al. (2018) in Kumasi, Ghana that only about half (56%) of the meat sellers used aprons and gloves before handling meat. Additionally, the respondents conduct regular inspections and quality checks to ensure the safety and quality of the meat they sell. Also half (54%) respondents have a designated area for disposing of meat waste, showcasing responsible waste management practices. Yenealem, Yallew, and Abdulmajid (2020) in Gondar, Ethiopia also found out that majority (91.6%) of respondents washed their hands after disposing garbage.

Majority of the respondents (84%) ensured that they washed their hands properly with soap and cleaning water before handling meat so as to reduce the risk of contamination. This is similar to the findings of Adzitey *et al.* (2018) in Kumasi, Ghana that almost all (99.3%) the meat sellers washed their hands while handling meat. Use of insect prevention methods is acknowledged among the respondent (40%) but seen as a potentially lesser priority among the meat sellers.

**Table 2: Types of Safety Practices**

Variable	Frequency	Percentage
Refrigeration and cooling	23	46
Protective gear and quality assurance	25	50
Proper waste disposal	27	54
Washing of hands with soap and cleaning water before meat handling	42	84
Insect prevention methods (Use of wire graze)	20	40

Source: Field Survey, 2023.

### Socio-Economic Factors influencing the Use of Meat Safety Strategies

The results on Table 3 shows the multiple regression analysis indicating that the model, which seeks to understand the socio-economic factors influencing safety practices is well-suited for explaining the variability in the dependent variable, that is, safety practices, because the  $R^2$  is high. The  $R^2 = 0.75$ , which means the model explains approximately 75% of the variability in safety practices. The overall model is statistically significant (F-statistic = 75.45, p-value < 0.05), suggesting that the included variables collectively contribute to explaining the variance in safety practices.

**Table 3: Socio-Economic Factors influencing Meat Safety Strategies**

Independent variable	Coefficient	Standard error	t- value	p-value
Age (years)	0.1507	0.065	2.321*	0.023
Sex (M/F)	-3.2005	1.217	-2.627*	0.010
Years of education	0.0032	0.002	1.429	0.157
Monthly income	5.6213	3.450	1.629	0.107
Type of meat (Mutton/Beef)	0.0124	0.008	1.559	0.123
Quality of meat	2.5901	1.845	1.404	0.164
Years of experience	3.2000	1.500	2.133*	0.035
Cost of safety	-1.5000	0.800	-2.875*	0.072
Constant	-25.0192	20.132	-1.241	0.218
$(R^2 = 0.750)$				
$(F\text{-stat.} = 75.45)$		p-value < 0.05		

Source: Field Survey, 2023

The result on Table 3 shows that an increase in the age, sex (change in), years of experience and cost of safety are statistically significant and thus influence the use of safety practices

which results to significant increase in safety practices since they have positive coefficients. A change in sex and increase in the cost of safety will significantly decrease safety practices due to the negative coefficients. This is contrary to the findings of Yenealem, Yallel, and Abdulmajid (2020) in Gondar, Ethiopia who discovered that knowledge and level of attitude were the main factors that influenced meat selling safety practices.

### Constraints to Safety Strategies of Meat Selling

The result for the constraints to the use of safety measures by meat sellers is presented on Table 4. The results shows a significant proportion (46%) of the respondents were constrained by space or layout issues, potentially impacting their ability to implement effective safety strategies. This contradicts the findings of Obasi & Emenam (2014) in Umuahia, Abia state, Nigeria, where only 13% were constrained by the lack of space. Table 4 also shows that a very large number of the respondents (92%) express diverse worries, including training and education costs, equipment purchase, and compliance with regulations, taxation and insurance.

**Table 4: Constraints to Safety Strategies of Meat Marketing (n = 50)**

Variables	Frequency *	Percentage
Inadequate space/layout	23	46
High costs of safety materials	46	92
External Factors(supply and demand, subsidies and Economic Impact)	25	50
Inadequate waste disposal channels	24	48
Difficulty in compliance with safety regulations	41	82
Lack of collaborative effort with other meat sellers	19	38

Source: Field Survey, 2023 \* Multiple responses existed

The result from Table 4 shows a balanced representation is observed in responses related to external economic conditions, where 50% of the respondents were constrained by such conditions, an equal percentage perceived no significant impact. Interestingly, the respondents believe that economic conditions reduce available funds for safety, emphasizing the financial challenges faced by some respondents. This is consistent with the findings of Mohammed & Musa (2016) in Sokoto State, Nigeria, where 52% of the respondents were constrained by the economic impact.

From the findings on Table 4, only 48% of the respondents have access to proper waste disposal channels thereby making meat safety less effective. This is similar to the findings of Oyeyemi *et al.* (2018) in Ibadan, Nigeria, where only 35% of the respondents have access to proper waste disposal channel. According to the findings on Table 4, 82% of the respondents find it difficult comply with the safety regulations imposed by the relevant authorities. This suggest that the respondents do not adhere to safety regulations and this may affect their safety standards.

Result from Table 4 shows that only 32% of the respondents have considered collaborative efforts with other meat sellers to overcome safety constraints, showcasing a less potential avenue for collective problem-solving, thereby expressing dissatisfaction with their ability to implement effective safety strategies.

### CONCLUSION AND RECOMMENDATIONS

The study concludes that the majority of meat sellers in Maiduguri Metropolis are literate married men that are in their economically active years. They are moderately experienced and



also they are low income earners and deal majorly with beef and are primarily butchers. Age, sex, years of experience and cost of safety are the factors that influence the use of safety practices. The major constraints to safety practice include high cost of safety materials and difficulty in compliance with safety regulations.

It is recommended that The National Environmental Standards and Regulations Enforcement Agency, (NESREA) should enforce strict compliance to relevant guidelines, policies and regulations through the agency's routine compliance visit to the abattoir and meat shop. Also the government should make effort to provide cold rooms in the markets and check the maintenance of equipment used in meat processing to prevent contamination.

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