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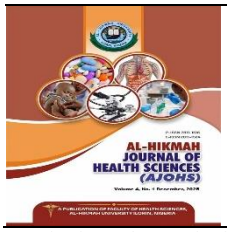

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Original Article

Assessment of Meat Safety and Hygiene: Knowledge, Attitude and Practices in Selected Abattoirs in Ilorin, Nigeria.

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ABSTRACT

This study investigates the safety and hygiene practices of meat processing in selected abattoirs in Ilorin, Nigeria. With meat serving as a significant protein source, ensuring its safety is crucial for public health. A mixed-method approach, including structured questionnaires, observations, and interviews, was employed to collect data from 170 participants, including butchers, regulatory officers, and veterinary personnel. The findings reveal a high level of awareness of regulatory requirements among participants 156 (91.18%), but there are significant gaps in compliance with safety protocols, particularly in the pre-slaughter handling and post-slaughter processes. Major concerns identified include inadequate training on Hazard Analysis and Critical Control Points (HACCP), insufficient cleaning and sanitizing of equipment, and the absence of proper waste management systems. This study highlights the critical need for improved training programs, regulatory enforcement, and infrastructure upgrades in abattoirs. Recommendations are made for government agencies to enhance compliance and for stakeholders to adopt best practices that ensure a high level of meat safety and hygiene. This research contributes to the body of knowledge on meat safety in Nigeria and emphasizes the need for collaborative efforts to improve public health outcomes through effective abattoir management.

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Introduction

Meat, the edible tissue of animals, is typically derived from muscles, fat, and other parts of animals such as mammals (cattle, pigs, sheep, goats), birds (chicken, turkey, duck, game birds), fish and seafood (salmon, tilapia, shrimp, lobster, catfish), and occasionally reptiles and amphibians (frog, alligator, crocodiles). Meat is generally classified into red meat (beef, lamb, pork), white meat (chicken, turkey, fish), organ meat (liver, kidney, tongue, intestines), and processed meat (sausages, bacon, ham). The safety and hygiene of meat in abattoirs are crucial for preventing the spread of zoonotic diseases and ensuring the quality of meat products for human consumption (Njoga et al., 2023; Agu et al., 2021). Abattoirs are key meat processing facilities, and their practices significantly influence the safety and quality of meat available in the supply chain (Ovuru et al., 2024). Ilorin, the capital city of Kwara State, Nigeria, has a population of 1,100,000 people (Abubakar, 2023). There is a high demand for meat products driven by its growing population and economic activities. However, concerns have been

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raised about meat safety and hygiene practices in local abattoirs, which pose potential risks to public health. Inadequate practices can result in contamination by pathogens such as *Salmonella*, *E. coli*, and *Campylobacter*, leading to foodborne illnesses (Niyonzima et. al., 2015). Additionally, poor practices may introduce physical and chemical hazards, including bone fragments, metal residues, and pesticides (Das et al., 2019).

Given that meat is a major source of protein for many communities in Nigeria, ensuring proper safety and hygiene in abattoirs is essential. Evaluating current practices in Ilorin abattoirs is therefore important to identify areas for improvement and enhance the production of wholesome meat products.

Objectives of the study.

To determine the level of compliance with meat safety and hygiene regulations in selected abattoirs

To assess the knowledge of abattoir workers regarding meat safety and hygiene practices.

Methodology

This study was guided by three theoretical frameworks. The Hazard Analysis and Critical Control Points (HACCP) framework (Motarjemi & Warren, 2023) emphasizes identifying and controlling hazards in the meat production process, focusing on critical control points to prevent contamination. The Health Belief Model (HBM) (Yenew et. al., 2023) explains health behaviors based on perceived susceptibility, severity, benefits, and barriers, which can be applied to understand abattoir workers' adherence to hygiene practices. The Theory of Planned Behavior (TPB) (Abou Kamar et. al., 2024) predicts behavior based on attitudes, subjective norms, and perceived behavioral control, offering insight into factors influencing hygiene practices among abattoir workers.

The study's conceptual framework included independent variables such as abattoir characteristics (infrastructure, worker training), worker behaviors (hygiene practices), and regulatory frameworks. Dependent variables were meat safety outcomes, including microbial contamination and chemical residues, while intervening variables included worker knowledge, attitudes, perceptions, management practices, and regulatory enforcement.

The study was conducted in Ilorin, the capital city of Kwara State, covering Ilorin West, Ilorin East, and Ilorin South Local Government Areas. A mixed-method approach combining quantitative and qualitative techniques was employed. Data collection involved structured questionnaires, observations, and oral interviews to explore meat safety and hygiene practices in selected abattoirs, focusing on butchers, workers, regulatory officers, and veterinarians.

The study was carried out in selected approved abattoirs in Ilorin, including Olusola Saraki Abattoir (Akerebiata), Old Abattoir (Ipata Slab), Oja Tuntun Abattoir (New Market), Mandate Market Abattoir, Kasmeat Ventures (Balogun Slaughter House, Oloje), Omomeji Poultry Slaughter House, Mount-Olive Poultry Slaughter House (Zango), and Winners Pork Meat.

The sample size was determined using Slovin's formula:

n= N/1+Ne^2

Where n= sample size.

N= Population.

E = acceptable sampling error (0.05).

n = 302/1+302*0.05^2

n= 302/1+302*0.0025=172

The required sample size is 172.

Where N is the population (302) and e is the acceptable sampling error (0.05). This yielded a sample size of 172 participants. Stratified random sampling was used to select participants across the abattoirs.

Data were collected using structured questionnaires, observations, and interviews. The questionnaire comprised sections A to G, with Section A capturing socio-demographic variables and Sections B to G addressing meat safety, hygiene, and abattoir practices. Observations included 24 items rated on a four-point scale (excellent, very good, good, fair), while interviews consisted of 20 items organized into three sections. Additionally, relevant documents and records were reviewed, including 12 items related to abattoir operations.

Validity and reliability were tested in Ganmo, Idofian, and Ajase-Ipo, with Cronbach's Alpha values of 0.768 (acceptable reliability) and 0.877 (good reliability) based on standardized items. The target population included abattoir workers, regulatory officers, and veterinarians. Of the 172 distributed questionnaires, 170 were returned completed. Participants unable to write were assisted by trained research assistants.

Data analysis was performed using SPSS version 27. Descriptive statistics, including frequency counts and percentages, were used to summarize the data. Responses from the observation checklist, rated on a four-point Likert scale, were also analyzed using descriptive statistics. Additionally, ANOVA analysis was applied to assess relationships and enhance the interpretation of findings.

The approval to conduct this research was obtained from the ethical review committee of the Ministry of Livestock Development, Ilorin, Kwara State. Written/verbal informed consent was obtained from each participant after explaining the purpose of the study to them. Respondents were given the right to

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decline or withdraw from the study at any time. They were assured that refusal to participate or withdrawal will not attract any penalty.

Results

Table 1: Descriptive Statistics of Selected Respondents from Each Abattoir

Abattoirs	Frequency (N)	Percent (%)	Mean
Ojatuntun	15	8.82	1.27
Omomeji	15	8.82	1.27
Winner	5	2.94	1.40
Ipata	29	17.06	1.83
Saraki	51	30.01	1.28
Kasmeat	18	10.59	1.44
Mandate	21	12.35	1.48
Mt. Olive	16	9.41	1.19
TOTAL	170	100.00	

Table 2: Frequency Table for the Socio-demographic Data of the Respondents

Socio-demographic data	Frequency (n = 170)	Percentage (%)
Gender		
Male	101	59.40
Female	69	40.60
Marital Status		
Married	151	88.80
Single	19	11.20
Educational Qualification		
O' level	88	51.80
OND	18	10.60
NCE	33	19.40
HND	12	7.10
First Degree	14	8.20
Second Degree	3	1.80
Third Degree	2	1.20
Working Experience		
1-10 years	37	21.8
11-20 years	50	29.4
21-30 years	53	31.2
31-40 years	19	11.2
41-50 years	11	6.5
Role of Respondents		
Veterinarian	5	2.9
Animal Scientist	5	2.9
Butcher	138	81.2
Regulatory Officer	8	4.7
Cleaner	14	8.2

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Table 3: Descriptive Analysis on the Pre-Slaughter Handling of the Respondents

	Always = 4 Sometimes = 3 Rarely = 2 Not at all = 1							
S/N	ITEMS	4	3	2	1	MEAN	S. D	REM
1	Are slaughtered animals handled gently to minimize stress?	149	21	0	0	3.88	1.98	Always
2	Do you conduct inspections for diseases in animals before slaughter?	111	46	11	2	3.56	1.92	Always
3	Do you plan to schedule Slaughter to minimize animal waiting time?	80	73	10	7	3.33	1.87	Rarely
4	Is your animal holding pens clean and well-ventilated?	112	44	14	0	3.58	1.92	Always
5	Do you provide water and feed to animals before slaughter?	85	59	6	20	3.23	1.88	Rarely
6	Do you use animal identification or tracking system to identify different animals slaughtered?	95	42	6	27	3.21	1.89	Rarely
7	Do personnel wear protective gear during animal slaughtering and processing?	81	61	27	1	3.31	1.86	Rarely
8	Do you use Stunning methods to minimize animals suffering during slaughtering?	22	65	29	54	2.32	1.67	Never
9	Slaughter equipment is regularly cleaned and sanitized.	101	52	17	0	3.50	1.90	Always
10	Veterinary supervision is present during slaughter and processing	111	8	35	16	3.26	1.90	Rarely

Analysis of the Pre-Slaughter Handling Processes

A cut-off mean score of 3.50 was used as the baseline for determining participants' responses since the questionnaire items were structured in a four-response type. Therefore, items found with a mean score equal to 3.50 or above were remarked 'Always', while pre-slaughtering handling items with mean scores below 3.50 were remarked 'Rarely' and mean scores below 3.00 were remarked 'Never.'

.

Table 4: Descriptive Analysis for Responses on Slaughtering and Evisceration

	Always = 4 Sometimes = 3 Rarely = 2 Not at all = 1							
S/N	ITEMS	4	3	2	1	MEAN	S.D	REM
1	Is slaughtering performed by trained personnel?	146	10	0	14	3.69	1.97	Always
2	Is evisceration done promptly and meticulously to prevent contamination	83	73	0	14	3.32	1.88	Rarely
3	Organs are removed and handled hygienically	116	54	0	0	3.68	1.93	Always
4	Carcasses are cleaned and washed	121	43	5	0	3.69	1.94	Always
5	Equipment's are cleaned between each animal	67	75	28	0	3.23	1.84	Rarely
6	Personnel follow proper hand-washing procedures before slaughtering and processing	61	102	7	0	3.32	1.85	Rarely
7	Protective clothing's are changed regularly	96	46	28	0	3.40	1.89	Rarely
8	Ventilation systems prevent airborne contamination	80	68	8	14	3.26	1.87	Rarely
9	Temperature control measures prevent bacterial growth in the abattoir.	33	89	31	17	2.81	1.75	Never
10	Carcasses are stored in refrigerated cold rooms	80	38	18	34	2.96	1.85	Never

Respondents' responses on the Process of Slaughtering and Evisceration

A cut-off mean score of 3.50 was used as the baseline for determining participants' responses since the questionnaire items were structured in a four-response type. Therefore, items found with mean score equals or above 3.50 were remarked 'Always' while slaughtering and evisceration items with mean scores below 3.50 were remarked 'Rarely' and mean score below 3.00 were remarked 'Never'

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Table 5: Descriptive Analysis on Post-Slaughtering Handling of the Respondents

Always = 4	Sometimes = 3	Rarely = 2	Not at all = 1					
S/N	ITEMS	4	3	2	1	MEAN	S.D	REM
1	Meats are handled hygienically and stored in cold-room to prevent cross-contamination	107	20	14	29	3.69	1.97	Always
2	Cutting and packaging areas are properly clean	120	41	9	0	3.21	1.90	Rarely
3	Meat products are often labelled with safety information	35	80	17	38	3.65	1.93	Always
4	Do you have Pest control measures in place?	35	83	25	27	2.66	1.75	Never
5	Good waste disposal systems prevent environmental contamination	117	15	38	0	2.74	1.75	Never
6	Do you have cleaning schedules which are promptly followed?	86	61	9	14	3.46	1.91	Rarely
7	Are the Sanitizing chemicals used effective?	101	49	11	9	3.29	1.88	Rarely
8	Does personnel training programs include meat safety?	103	50	16	1	3.42	1.90	Rarely
9	Are the quality control checks regular?	127	23	19	1	3.50	1.91	Always
10	Do you consider Customer feedback?	109	41	20	0	3.62	1.94	Always

Analysis on the Post-Slaughter Handling Processes

A cut-off mean score of 3.50 was used as the baseline for determining participants' responses since the questionnaire items were structured in a four-response-type. Therefore, items found with mean score equals or above 3.50 were remarked 'Always' while post-slaughtering handling items with mean scores below 3.50 were remarked 'Rarely' and mean score below 3.00 were remarked 'Never

Table 6: Regulatory Compliance of the Respondents

Are you aware of the regulatory requirements for meat safety and hygiene?		
	Frequency (n)	Percentage (%)
Yes	155	91.18
No	15	8.82
TOTAL	170	100.00
Have you ever received a warning or penalty for non-compliance with meat safety and hygiene?		
Yes	33	19.41
No	137	80.59
TOTAL	170	100.00

Table 6 as shown above revealed that 155 of the respondents representing 91.18% are aware of the regulatory requirements for meat safety and hygiene while 15 (8.82%) claimed that they do not have any awareness on regulatory requirements for meat safety and hygiene. As revealed, majority of the respondents (137) confessed that they have in time received warning and penalty for non-compliance with meat safety and hygiene regulations while only 33 (19.41%) respondents say that they have never been penalized or warned on account of non-compliance to meat safety and hygiene regulations.

Fig. 1: How often do regulatory officials inspects the abattoir?

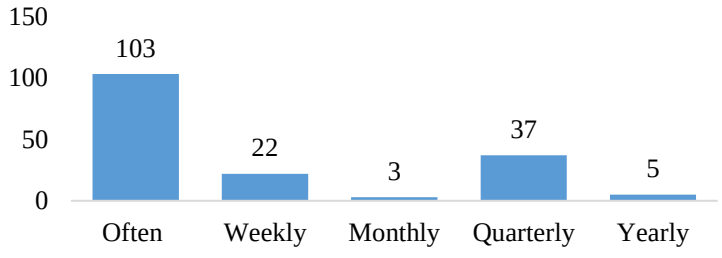

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Figure 1 shows the respondents' response on regulatory officer's inspection of the abattoir before, during or after slaughtering activities. Meanwhile, 103 respondents claimed that regulatory officers do come often while 37 (21.77%) and 22 (12.94%) claimed that they do come for inspection quarterly and weekly respectively. Few respondents said that regulatory officers do come once in a month and sometimes once per annual.

Fig. 2: Respondent's Compliance to Abattoir Regulations

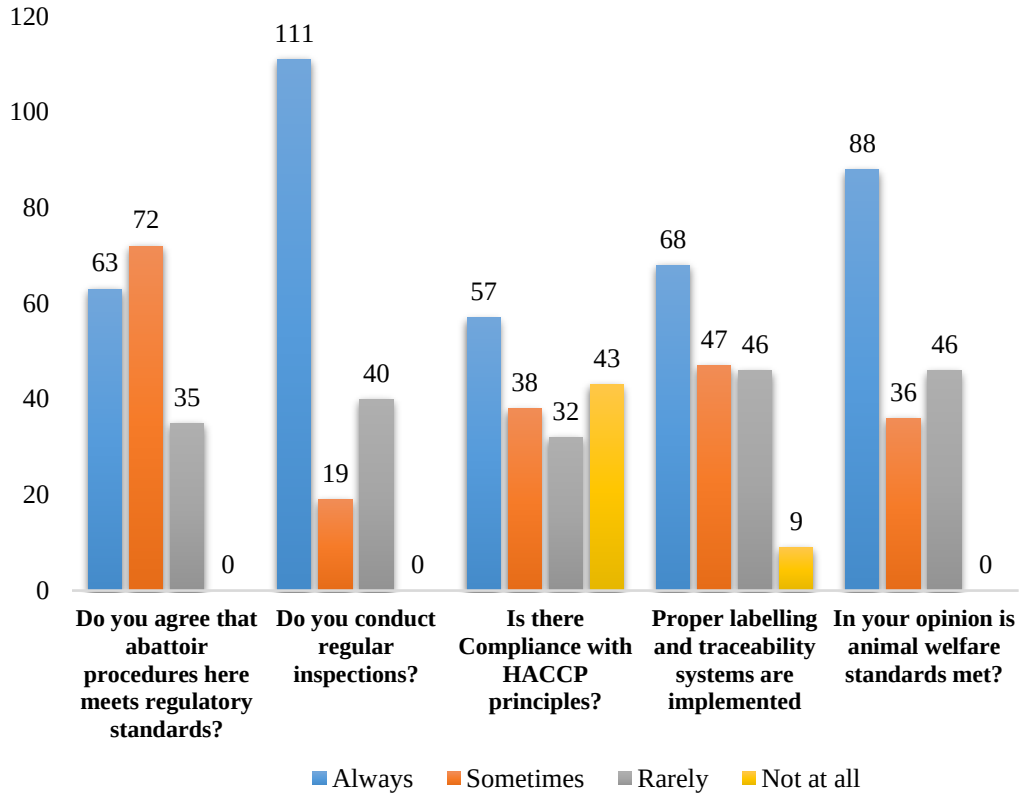

Figure 2 above shows that majority (72) of the respondents agreed that sometimes abattoir procedures do meet regulatory standards while 63 (37.06%) agreed that they always meet up abattoir regulatory standard procedures. 111 (65.29%) confirmed that they do always conduct inspections while 40 (23.53%) said inspections are rarely conducted at the abattoir. Majority of the respondents (57) agreed that there is compliance with HACCP principles while 38 and 32 respondents said that compliance is sometimes and rarely respectively and 43 (25.29%) said there has never been compliance with HACCP principle. 68 (40%) confirmed that proper labelling and traceability systems are implemented while 47 (27.65%) said that implementation of labelling and traceability systems are done often sometimes and 46 (27.06%0) said it is rarely done. Only 88 respondents representing 51.77% believes that animal welfare standards were always met at the abattoir while 46 said welfare standards were rarely met at the abattoir.

Response on Training and Awareness Engagement of the Respondents

Fig. 3: Training and Awareness of Respondents on Meat Hygiene & Practices

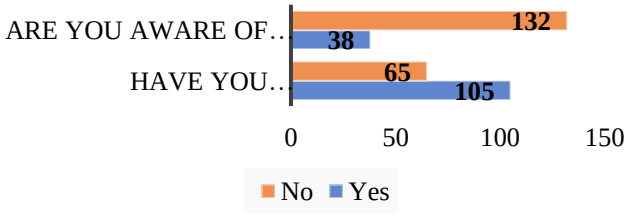

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Table 7: How often do you receive training or updates on meat safety and hygiene?

	Frequency (n)	Percentage (%)
Monthly	105	61.76
Quarterly	38	22.35
Yearly	0	0.00
Not at all	27	15.88
TOTAL	170	100.00

Table 7 revealed that majority (105) of the participants representing 61.76% confirmed that they do receive training on meat safety and hygiene and claimed that they have in time received training on meat safety and hygiene practices. Meanwhile, majority of the respondents representing 77.65% confessed that they are not aware of the abattoir HACCP plans and procedures

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Respondent's Satisfactory Response on Facilities and Equipment's

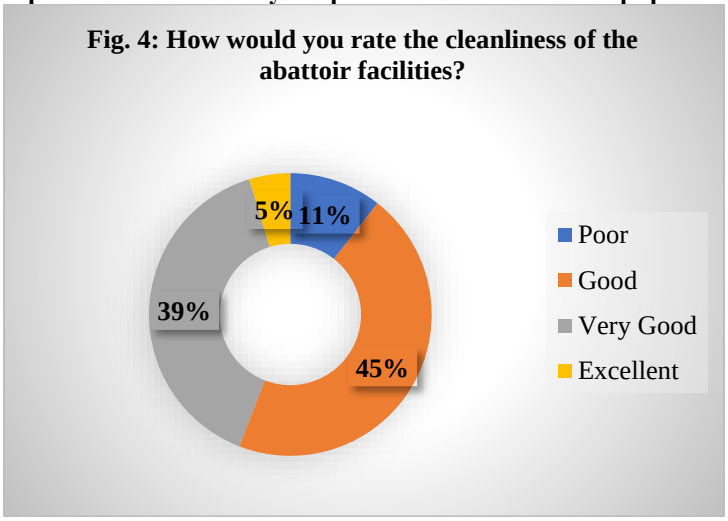

Figure 4 revealed above present the level of cleanliness in the abattoir and also the cleanliness of the abattoir facilities. 77 respondents representing 45% said that the cleanliness level is good to some extent while 66 (39%) said the cleanliness is very good and only 19 (11%) of the respondents claimed that the abattoir facilities are poor.

Table 8a: Are the equipment and utensils properly cleaned and sanitized?

	Frequency (n)	Percentage (%)
Yes	167	98.24
No	3	1.76
TOTAL	170	100.00

Table 8a show the response of respondents on the maintenance and cleanliness of the equipment's and facilities used at abattoir for slaughtering and dressing of meat. Majority of the respondents representing 98.24% confirmed that the equipment's and utensils used for meat handling are properly cleaned and sanitized before and after use.

Table 8b: Are there any sign of pest infestation in the abattoir?

Yes	61	35.88
No	109	64.12
TOTAL	170	100.00

Table 8b shows that 109 (64.12%) attested that there is no sign of pest infestation in the abattoir and this response can be supported with the fact that the level of cleanliness at the abattoir is moderate and under control.

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Discussion of Findings

Socio-demographic Data of the Respondents

Slaughtering and abattoir work require physicality, energy and strength to confine animals for slaughter, dressing, and hashing meat for human consumption. As revealed in table 2, majority of the respondents representing 59.4% were male while other sixty-nine (40.6%) were female. This is consistent with other studies carried out by Edward & Akpabio (2024) and the study conducted by Okoli, et. al. (2025). This also corroborate with the findings of Njoga et al. (2023), who reported that 100% participants surveyed for a similar study in Southeast Nigeria were all males. Considering the marital status of the participants, majority of the respondents representing 88.8% are married while only nineteen (11.2%) were single. This outcome is similar to the report from the research conducted by Izunobi, et. al. (2023) in which 69.6% of the participants were married.

Eighty-eight respondents in this study representing the larger percent (51.8%) of the total respondents have secondary school certificate while thirty-three (19.4%) have National Certificate in Education (NCE) and eighteen (10.6%) of the respondents have Ordinary National Diploma (OND) certificate. This finding is consistent with the finding conducted by Izunobi, et. al. (2023) where 59.8% of the participants are secondary school graduates while in the report of Yimana & Hassen (2024), the educational level of the participants is inconsistent with this current study as minority of those that participated in their research representing 32% have secondary education. Other respondents in this study have higher certificates as revealed in table 2 above. Fourteen respondents (8.2%) have first degree while twelve (7.1%) have Higher National Diploma (HND) certificate.

Regarding the working experience of the participants, fifty-three respondents representing 31.2% of the respondents have between 21-30 years of experience as abattoir personnel while fifty (29.4%) and thirty-seven (21.8%) have between 11-20 years and 1-10 years of experience respectively. Nineteen respondents have experience between 31-40 years and only eleven respondents representing 6.5% have above 40 years working experience as abattoir personnel. This finding is dissimilar to the working experience of the participants surveyed in the research carried out in Owerri West, Imo State, Nigeria by Izunobi, et. al. (2023) in which majority of the participant (69.6%) had less than 10 years of working experience in the abattoir. During this study, it is evident as revealed in table 2 that majority of the participant work at the abattoir as a butcher. 81.2% of the total respondents are butchers while fourteen (8.2%) work as a cleaner. Other participants are elite professionals in which five (2.9%) of them are veterinarian and eight (4.7%) work as a regulatory officer and the remaining five (2.9%) of the respondents are animal scientist.

Pre-Slaughter Handling Processes

Regarding the measures taken during pre-slaughtering processes, table 3 revealed that respondents confirmed that slaughtered animals are handled gently to minimize stress. A mean score of 3.56 also confirmed that regular inspections are conducted to check if there is any diseases or infections before slaughtering to reduce the risk of contamination to human. Also, respondents agreed that scheduled plans are rarely implemented on slaughtering of animal which stands as a bad practices on meat safety and hygiene as plan schedule protocol can help to minimize animal waiting time and prevent exposure to disease or infections.

Respondents confirmed that the animal holding pens are always clean and well-ventilated and that all slaughtering equipment's are regularly cleaned and sanitized to improve meat safety for human consumption. Meanwhile, a mean score of 3.23 and 3.21 as revealed in table 3 proves that water and feed are rarely provided for animals before slaughtering and that they rarely make use of animal identification or tracking system to identify different animals slaughtered which in some cases may be difficult to identify animals with certain diseases if discovered before the time of slaughtering. Also, respondents confirmed that veterinary supervision are rarely present during slaughtering and processing of meat at the abattoir which is inconsistent with the finding of Yimana & Hassen (2024); Okoli, et. al. (2025), stating that training of meat handlers on the elementary concept of good practice, safety and meat hygiene is vivacious in safeguarding, protecting and ensuring good quality of meat to consumers.

Slaughtering and Evisceration

Table 4 presented a descriptive analysis on the slaughtering and evisceration processes of meat by handlers and a mean score 3.50 was used as the baseline for determining participants' responses. A mean score of 3.69 revealed that majority of the respondents confirmed that slaughtering of animal is performed by expertise and that organs in the animal slaughtered are always removed and handled hygienically. It is also confirmed that carcasses are always cleaned and washed. This finding corroborates with the report of the finding conducted in South-eastern part of Nigeria in which majority of the participants (77.2%) believes that regular cleaning and washing of hands plays a crucial role in reducing the risk of contamination and 91.3% agreed that carcass can be contaminated in an uncleansed environment therefore there is need to always wash and clean them. (Izunobi, et. al. 2023).

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The level of hygienic conditions reported from this study is inconsistent with the findings in a survey carried out by Edward & Akpabio (2024) in Uyo, Nigeria where it is reported that abattoirs in this regional part is unhygienic and it is also in agreement with reports of other studies about the bad state of hygiene in abattoirs in other parts of the country (Onyeaka et al., 2024). Previous studies on the same hand also reported a poor level of meat cleanness practices among butchers (Miner et al., 2020).

It is evident in table 4 that evisceration is rarely done promptly and meticulously to prevent contamination. A mean score of 3.23 and 3.32 substantiate that equipment's used during slaughtering are rarely cleaned between each animal and that personnel rarely follow proper hand washing procedures before slaughtering and processing. It is also revealed that protective clothes are rarely changed and disagreed that good ventilation system can prevent airborne infections. In terms of carcass storage, a mean score of 2.96 as revealed in table 4 implies that they do not store carcass in the refrigerated cold rooms. This finding disagreed with the study conducted by Miner, et. al. (2020) on the knowledge and practices of meat hygiene among meat handlers and microbial profile of meat in the Jos Abattoir, Plateau, Nigeria.

Post-Slaughter Handling Processes

Meat represents a nutrient-rich food source, delivering protein, fat, and essential minerals to people's diets. In its unprocessed state, it creates a favourable setting where diverse microorganisms can rapidly multiply and develop. Acting as an intermediary, butchers connect customers with meat that has been processed and made ready for purchase, hence post-slaughter handling is important. It is evident in table 5 that participants confessed that butchered meats are always handled hygienically and stored in cold-room to prevent cross contamination and are often labelled with safety information.

In relation to cleaning and packaging, a mean score of 3.21, 3.46 and 3.29 revealed in table 5 described that cutting and packaging areas are rarely clean and that cleaning schedule plans are rarely followed and the effective use of sanitizing chemicals are rare during post-slaughtering processes. This document bore a strong resemblance to research conducted in Ethiopia and Uganda, which indicated that the majority of butcher shops used only cold water for hand washing. This situation is quite worrying, and it highlights the fact that oversight from the relevant authorities is insufficient.

Respondents portray a sense of reliability in table 5 regarding the availability of quality control personnel during the post-slaughtering processes. A mean score of 3.50 indicates that quality control checkers are always regular and also a mean score of 3.62 implies that there is usual consideration for customer feedback.

Regulatory Compliance

Considering the compliance to abattoir regulations and compliance, table 6 revealed that one hundred and fifty-five respondents representing 91.18% are aware of the regulatory requirements for meat safety and hygiene while fifteen (8.82%) claimed that they do not have any awareness on regulatory requirements for meat safety and hygiene. Majority of the respondents (137) confessed that they have in time received warning and penalty for non-compliance with meat safety and hygiene regulations while only thirty-three (19.41%) respondents say that they have never been penalized or warned on account of non-compliance to meat safety and hygiene regulations. This finding is inconsistent with the report of Edward & Akpabio (2024). When facilities are not well-maintained and are used too much, they can fall into disrepair, which then hinders the slaughterhouse's capacity to guarantee meat safety (Onyeaka et al., 2023). This situation may play a role in abattoir employees failing to adhere to cleanliness and sanitary protocols. Furthermore, the regularity of regulatory officers on inspection to the abattoir before, during or after slaughtering activities is revealed in figure 1. One hundred and three respondents claimed that regulatory officers do come often while thirty-seven (21.77%) and twenty-two (12.94%) claimed that they do come for inspection quarterly and weekly respectively. Few respondents said that regulatory officers do come once in a month and sometimes once per annual. This finding is in support of the report in Okoli, et. al. (2025) on the assessment of safety awareness and practices among workers and the sanitation standards of contact surfaces in selected abattoirs in Abuja, Nigeria.

Figure 2 revealed that majority (72) of the respondents agreed that sometimes abattoir procedures do meet regulatory standards while sixty-three (37.06%) agreed that they always meet up abattoir regulatory standard procedures. One hundred and eleven (65.29%) confirmed that they do always conduct inspections while forty (23.53%) alleged that inspections are rarely conducted at the abattoir. Majority of the respondents (57) agreed that there is compliance with HACCP principles while thirty-eight and thirty-two respondents said that compliance is sometimes and rarely respectively and forty-three (25.29%) supposed that there has never been compliance with HACCP principle. This is in relation with the report carried out in Ethiopia by Yimana & Hassen, (2024). Sixty-eight (40%) confirmed that

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proper labelling and traceability systems are implemented while forty-seven (27.65%) said that implementation of labelling and traceability systems are done often sometimes and forty-six (27.06%0) alleged that it is rarely done. Only eighty-eight respondents representing 51.77% believes that animal welfare standards were always met at the abattoir while forty-six said welfare standards were rarely met at the abattoir. This finding corroborates with the study conducted by Izunobi, *et. al*. (2023) in Southeast, Nigeria.

Facilities, Training and Awareness Engagement

Table 7 revealed that majority (105) of the participants representing 61.76% confirmed that they do receive training on meat safety and hygiene and claimed that they have in time received training on meat safety and hygiene practices. Meanwhile, majority of the respondents representing 77.65% confessed that they are not aware of the abattoir HACCP plans and procedures. Figure 4 revealed the rate level of cleanliness in the abattoir and also the cleanliness of the abattoir facilities. 77 respondents representing 45% said that the cleanliness level is good to some extent while 66 (39%) said the cleanliness is very good and only 19 (11%) of the respondents claimed that the abattoir facilities are poor.

Table 8 contribute to the maintenance and cleanliness of the equipment's and facilities used at abattoir for slaughtering and dressing of meat. Majority of the respondents representing 98.24% confirmed that the equipment's and utensils used for meat handling are properly cleaned and sanitized before and after use. Also, one hundred and nine (64.12%) attested that there is no sign of pest infestation in the abattoir and this response can be supported with the fact that the rate level of cleanliness at the abattoir is moderate and under control. This finding is consistent with the study conducted by Miner, et. al. (2020) and also in relation to the report of study conducted in South-western part of Nigeria. (Okoli, et. al. 2025). ANOVA analysis revealed in table 9 shows that there is significant difference in meat safety and hygiene practices among all the selected abattoirs in Ilorin.

Conclusion

This study assessed the safety and hygiene practices of meat handlers. The abattoir plays a vital role within the food production system because the activities of butchering and handling meat are highly vulnerable to the introduction of microbes and the propagation of illnesses transmitted through food, thereby jeopardizing the integrity of the food supply. The health dangers faced by individuals who consume meat stem from the pollution of meat caused by abattoir personnel, the animal itself, and the surrounding area in which the meat undergoes processing.

It is substantiated in this study that regular inspections are conducted to check if there is any diseases or infections before slaughtering to reduce the risk of contamination to human and that scheduled plans are rarely implemented on slaughtering of animal which stands as a bad practices on meat safety and hygiene as plan schedule protocol can help to minimize animal waiting time and prevent exposure to disease or infections. This study also confirmed that animal holding pens are always clean and well-ventilated and that all slaughtering equipment's are regularly cleaned and sanitized to improve meat safety for human consumption.

It is evident that slaughtering of animal is performed by expertise and that organs in the animal slaughtered are always removed and handled hygienically. Evisceration is rarely done promptly and meticulously to prevent contamination. Furthermore, equipment's used during slaughtering are rarely cleaned between each animal and that personnel rarely follow proper hand washing procedures before slaughtering and processing.

This study also described that butchered meats are always handled hygienically and stored in cold-room to prevent cross contamination and are often labelled with safety information. Also, cutting and packaging areas are rarely clean and that cleaning schedule plans are rarely followed and the effective use of sanitizing chemicals are rare during post-slaughtering processes. It is also evident that majority of the respondents established that regulatory officers do come often to check the condition of the abattoir facilities and ensures proper safety and hygiene of the abattoir. It is also established that majority of the participants do receive training on meat safety and hygiene and claimed that they have in time received training on meat safety and hygiene practices. As a result of this notion, proper labelling and traceability systems are implemented meanwhile low level of compliance with HACCP principles is recorded by meat handlers due to their poor awareness of the HACCP plans and principles. Despite this, majority of the participant confirmed that the equipment's and utensils used for meat handling are properly cleaned and sanitized before and after usage.

Recommendations

This study provides the following recommendations:

Government intervention in the slaughterhouse activities is of paramount importance in standardizing the activities. This should be in the area of construction of new standard slaughterhouses and renovation of existing ones to meat standard regulation.

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Provide simple food safety educations, check on slaughterhouses and butcher shops to make sure they are following the rules, and fix any problems right away when needed.

It should still be required to strictly follow the rules set out in the Nigerian Meat Edict of 1988 and the Animal Disease (Control) Act of 2004.

To ensure public health and safety, the government should hire more skilled and qualified animal health professionals, particularly veterinarians, to work with the current animal health staff.

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