

Ismail A. Odetokun,^{1*} Ibraheem Ghali-Mohammed,¹
Nma B. Alhaji,² Aliyu A. Nuhu,¹ Habeeb A. Oyedele,¹
Saliu A. Ameen³ and Victoria O. Adetunji⁴

¹Dept. of Veterinary Public Health and Preventive Medicine, University of Ilorin, P.M.B. 1515, 240272, Ilorin, Nigeria

²Public Health and Epidemiology Dept., Niger State Ministry of Livestock and Fisheries, Bosso, 920211, Minna, Nigeria

³Dept. of Veterinary Medicine, University of Ilorin, P.M.B.1515, 240272, Ilorin, Nigeria

⁴Dept. of Veterinary Public Health and Preventive Medicine, University of Ibadan, 200005, Ibadan, Nigeria



Occupational Health and Food Safety Risks in Ilorin, Northcentral Nigeria: A Cross-sectional Survey of Slaughterhouse Workers

ABSTRACT

Occupational health and food safety risks are persistent challenges in food processing settings of most developing countries. This study assessed work-associated injuries and food safety risk perception among slaughterhouse employees. Workers ($n = 203$) were sampled randomly from five slaughterhouses and assessed with use of a structured questionnaire. On the basis of a numeric scoring method, data on occupational health and food safety risks were evaluated, using descriptive statistics, univariate tests, and a multivariate logistic regression model. The majority (87.7%) reported work-associated injuries, affecting predominantly workers' hands. About 17% of workers reported injuries on >3 body parts. About 25% of respondents had inadequate knowledge about zoonosis and pathogen spread. Respondents had not been exposed to training on safety at work or enrolled in occupational health services. Scores on a test of knowledge of food safety risk ranged from 0 to 10, with 87.2% of participants obtaining unsatisfactory scores.

The use of PPE (OR = 9.0; 95% CI: 3.5–22.9; $P < 0.001$) among workers tends to have a positive influence on practices that reduce food safety risks. Slaughterhouse workers in the Ilorin metropolis have a low risk perception with regard to occupational health and food safety issues. These findings could stimulate the development of policies and interventions to mitigate occupational health and food safety risks in Nigerian slaughterhouses.

INTRODUCTION

The processing of food animals along the “farm to fork” continuum could involve significant safety, health and ergonomics hazards (12, 25, 27). Slaughterhouses provide environments for the slaughtering, dressing, and packaging of processed meat for sale and for other uses (9). The process is labor-intensive, involving personnel handling carcasses at different stages (28) while interacting with various hand-held tools and other types of equipment; thus, workers are usually at risk of injuries and accidents in the slaughterhouses. These workers could also be exposed to

*Author for correspondence: Phone: +234 803.088.6018; Email: odetokun.ia@unilorin.edu.ng

infectious diseases that have serious effects on their health status. Zoonotic infections can be easily transferred from slaughterhouse workers to processed meat and vice versa. This is of serious public health concern.

The drive to strengthen standards in food quality and safety among animal processing industries is gaining increasing interest worldwide. However, the health management system seen in most slaughterhouses in developing countries still suffers inadequacies. Although slaughterhouse operations are known to be hazardous, with high numbers of cases of occupational injuries and hazards experienced in recent times, they employ a huge workforce (24). Several factors account for the poor conditions of the slaughterhouses that lead to a poor working environment and increased risks of foodborne diseases (4, 17, 30).

Occupational health risk is a persistent challenge in most developing countries and could be heightened by being associated with food safety risks in food processing settings such as the slaughterhouse. Slaughterhouse workers could be exposed to both infectious and non-infectious occupational hazards. The cattle slaughterhouse is regarded as the most dangerous slaughterhouse, with work-related injuries occurring at any point during slaughter and meat processing (15). Slaughterhouse operations are expected to be guided by occupational health management laws. The International Labor Organization (ILO) encourages and supports national structures and guidelines in occupational health and safety among member nations. Nigeria is expected to uphold such laws by applying occupational health frameworks and policies on a national level across various occupational sectors, including slaughterhouses. However, strict adherence to this directive from ILO has not been observed in Nigeria. It is therefore imperative to survey the status of occupational health systems in Nigerian slaughterhouses. The objectives of this study were therefore to assess work-associated injuries/accidents and responses of slaughterhouse workers, determine knowledge and awareness of slaughterhouse workers with regard to sanitation, personal hygiene and meat inspection, and assess associations between demographic factors and knowledge about food safety risk in the slaughterhouse in relation to work injuries in Ilorin, Northcentral Nigeria.

MATERIALS AND METHODS

Study area

This survey was carried out in five slaughterhouses in Ilorin, in the Northcentral geo-political region of Nigeria. Ilorin, located in the Savannah agro-ecological zone called the derived savannah, was selected owing to the intense animal slaughter at its various slaughterhouses; for instance, cattle slaughtered daily in the various slaughterhouses sampled are usually in the range of 200 to 250 (unpublished data). Typically, Nigerian slaughterhouses are licensed by the government and constructed with a de-

sign that allows mainly for the floor dressing of carcasses, especially in cattle processing. The facilities provided for slaughter operations are usually at a sub-optimal level and are further stressed by the high number of slaughterhouse workers using them. The slaughterhouse workers have unrestricted access to every part of the slaughterhouse premises and are usually in contact with the slaughtered animals. The main food animals processed at the Ilorin slaughterhouses are cattle, sheep, and goats. Current population data shows that Ilorin has a population of 814,192 inhabitants and is ranked among the most densely occupied cities in the country (see: <http://worldpopulationreview.com/countries/nigeria-population/>).

Study design and targeted populations

A cross-sectional survey was conducted from December 2018 to March 2019. The targeted populations were butchers (animal slaughterers and processors at the slaughterhouses), meat traders (traders who buy and sell slaughtered food animals and animal products at the slaughterhouses), cleaners (those who help during the slaughter process as well as cleaning the slaughterhouse and environment), and drivers (workers who transport live animals, processed carcasses, and meat to and from the slaughterhouses). These categories of workers were targeted because they are mostly involved in the carcass processing line at the slaughterhouses (from the market, through transportation to slaughter and processing). Thus, the same survey questions were administered to them all.

Sample size and sampling

The size of the sample used was derived according to the random sampling formula for cross-sectional studies (35). For the survey, power was set at 88.2% (22), and a precision of 5% was used at the 95% confidence level (1.96) to attain a sample size of 160. A contingency of 25% was allocated to account for the possibility of non-response, to give a sample size of 200. Five slaughterhouses were randomly selected from the eight available in the Ilorin metropolis. At least 30 slaughterhouse workers were randomly selected from each of the five slaughterhouses. A total of 260 questionnaires were distributed between December 2018 and March 2019. At least 50 respondents were approached within each month for questionnaire administration.

Design of survey instrument, administration and data collection

The survey instrument used was comprised of structured questions partitioned into seven parts. These questions were developed after a literature search (4, 6, 8, 11, 23). The first section consisted of questions on the demographic characteristics of participants (gender, pregnancy status, age, marital status, education, job type, years of experience and name of slaughterhouse). The second part asked about

the availability of the following slaughterhouse facilities: fence, roof, lairage, water, electricity and waste disposal system. Questions on work-associated injuries and accidents and responses to these injuries were contained in parts three and four. In sections five and six, questions on sanitation and personal hygiene of the slaughterhouse workers were asked. Lastly, questions were asked about meat inspection and zoonoses, as well as food safety knowledge. The questions in the various sections of the survey instrument were designed to investigate occupational health in relation to food safety risk at the slaughterhouses.

Before administration, the questionnaire was translated into Yoruba for respondents opting to respond in this language. Yoruba is the major dialect used for communication by most of the workers at the slaughterhouses. To pretest the questionnaire, 10 butchers were recruited at the Iyata slaughterhouse. The questionnaire was revised on the basis of feedback obtained from the pretest prior to final administration (randomly) to the targeted population. The inclusion criteria include the requirement that participants have at least one year of work experience at a slaughterhouse and be above 18 years old. Meat processors and other workers in slaughter slabs were excluded from the study. Two trained enumerators administered the questionnaire. Permission was sought from the Butchers' Associations of the slaughterhouses. Oral consent was given by respondents, participation was voluntary and respondents were allowed to withdraw at any point during the study without prejudice, in agreement with the ethical protocol stipulated by the World Medical Association Declaration of Helsinki (38). All data collected were maintained with strict confidentiality. The Ethical Review Committee of the Faculty of Veterinary Medicine, University of Ilorin, Ilorin granted approval (FVER/003/2019) for the study.

Data management and statistical analysis

Data were summarized with the Microsoft Office Excel package, version 2019. Statistical analyses were performed with the Open Source Epidemiologic Statistics for Public Health (OpenEpi), version 3.01 (13). In this study, a major outcome variable – respondents' knowledge of food safety risk in relation to work-associated injuries – was developed. To evaluate this outcome variable, a previously established numerical scoring pattern was used (31). Knowledge scores obtained by respondents ranged from 0 to 10 points (mean: 2.75 ± 1.63). The knowledge scores were evaluated by setting a cut-off point as a score below the mean + standard deviation. These scores were then expressed as binary variables (satisfactory/unsatisfactory). Respondents whose knowledge scores were above the specified cut-off point were deemed to have satisfactory knowledge of food safety risk associated with work injuries. Gender, pregnancy status, age, marital status, education, job type, years of experience and the slaughterhouse (name/location) were

used as independent variables in the analyses. Descriptive and inferential statistics were used to analyze the data. The chi-square test and Fisher's exact test for binary variables were used to test for significance of the association between demographic characteristics and knowledge of food safety risk associated with work injuries, at the 0.05 level. Further analyses were performed using the step-wise backward likelihood multivariate logistic regression while controlling for confounders and effect modifiers.

RESULTS

Demographic information

Of the 260 workers approached to participate in the study, 203 consented to give a response rate of 78.1%. The age of the participants was 36.7 ± 9.3 years. The majority (55.2%) of the respondents were male, and over three-quarters (81.3%) were married. The highest number (81) of participants had completed the primary level of education. Regarding job category, the majority (52.2%) of the respondents were butchers, while few respondents (6.4%) were drivers. The majority (65.5%) of these workers had less than 11 years of work experience (Table 1).

Work-associated injuries/accidents and responses of slaughterhouse workers

Work-associated injuries/accidents

Surveyed slaughterhouse workers usually worked for 5.7 ± 2.2 hrs/day and 5.8 ± 0.6 days/week, although the majority (179; 88.2%) work 6 days per week (Table 2). The majority (178; 87.7%) reported having had injuries in the course of their work in the slaughterhouse, with 143 (70.4%) respondents having more than one of such injuries. Usually, these injuries occurred on the slaughterhouse premises 109 (61.2%) and during active work hours (119; 66.9%) rather than on the roads (13; 7.3%).

Body parts affected

Of the 178 respondents who reported having had injuries, 65, 22, 11 and 10 slaughterhouse workers reported the feet, lower back, knee, and face, respectively, as the body parts most commonly affected (Fig. 1). However, some respondents (34; 16.7%) reported injury of three or more body parts, while injuries of the feet and hands were reported by a few (15; 7.4%) of the respondents.

Sources of injuries

Apart from animals as the cause of injuries (52; 28.1%), hand equipment was reported by the majority of slaughterhouse workers (145; 71.4%) as the source of injuries sustained during work (Table 2). Other injury sources reported by respondents were the slaughterhouse floor (18; 8.9%); fire (11; 5.4%); transport vehicle (10; 4.9%); and heavy equipment (3; 1.5%).

TABLE 1. Associations between demographic characteristics and knowledge about food safety risk in the slaughterhouse in relation to work injuries, December 2018 – March 2019

Demographic	n (%)	Knowledge level		P-value
		Unsatisfactory	Satisfactory	
Gender				
Male	112 (55.2)	92	20	0.017*
Female	91 (44.8)	85	6	
Age				
< 21 years	15 (7.4)	15	0	0.543
21–30 years	43 (21.2)	38	5	
31–40 years	84 (41.4)	73	11	
41–50 years	53 (26.1)	44	9	
> 50 years	8 (3.9)	7	1	
Marital status				
Single	30 (14.8)	26	4	0.542
Married	165 (81.3)	143	22	
Separated/Divorced	8 (3.9)	8	0	
Education				
No education	34 (16.7)	26	8	0.125
Non-formal	23 (11.3)	20	3	
Primary	81 (39.9)	73	8	
Secondary	63 (31.0)	57	6	
Tertiary	2 (1.0)	1	1	
Job type				
Butcher	56 (27.6)	45	11	0.068
Meat trader	106 (52.2)	98	8	
Cleaner	28 (13.8)	22	6	
Driver	13 (6.4)	12	1	
Years of job experience				
< 11 years	133 (65.5)	119	14	0.373
11–20 years	62 (30.5)	51	11	
>20 years	8 (3.9)	7	1	
Slaughterhouse				
Ipata	59 (29.1)	53	6	0.05
Akerebiata	46 (22.7)	36	10	
Oloje	31 (15.3)	30	1	
Mandate	30 (14.8)	30	0	
Oja tuntun	37 (18.2)	28	9	

*significant at $P < 0.05$

TABLE 2. Work associated injuries/accidents, source of injury and awareness regarding sanitation reported by slaughterhouse workers from five slaughterhouses in Ilorin, Nigeria

Questions	Yes n (%)	No n (%)
Work associated injuries/accidents		
Have you ever had injuries at work?*	178 (87.7)	25 (12.3)
Have you experienced more than one injury?	143 (70.4)	35 (17.2)
Injury occurred on road	13 (7.3)	165 (92.7)
Injury occurred within the slaughterhouse premises	109 (61.2)	69 (38.8)
Injury occurred during active work	119 (66.9)	59 (33.1)
Do you work alone?	51 (28.7)	127 (71.3)
Source of injury		
Animal	57 (28.1)	121 (59.6)
Hand equipment	145 (71.4)	33 (16.3)
Processing equipment	3 (1.5)	175 (86.2)
Slips and floors	18 (8.9)	160 (78.8)
Transport vehicle	10 (4.9)	168 (82.8)
Chemicals	0 (0.0)	178 (100)
Contact a hot surface	11 (5.4)	167 (82.3)
Awareness on sanitation		
Do you use toilets within the slaughterhouse?	90 (50.6)	88 (49.4)
Do you use a piped water supply during processing?	107 (60.1)	71 (39.9)
Do you use a designated place for handwashing?	12 (6.7)	166 (93.3)
Are stray dogs present within the slaughterhouse?	29 (16.3)	149 (83.7)
Are there rats in the slaughterhouse?	43 (24.2)	135 (75.8)
Are there hot water facilities in the slaughterhouse?	176 (98.9)	2 (1.1)
Do you separate clean from dirty operations?	128 (71.9)	50 (28.1)

A total of 178 respondents provided answers to the questions asked.

*203 slaughterhouse workers responded to this question.

Responses to sustained injuries

Less than half of the respondents (81; 45.5%) visited the hospital after sustaining a work injury, while 50 and 27 respondents reported that they resorted to first aid and self-medication only, respectively (Fig. 2). Few workers reported working when they had open wounds (28/178; 13.8%), and almost all the respondents (177/178; 99.4%) reported having had neither access to occupational health services nor training on hazards and safety at work.

Knowledge and awareness of slaughterhouse workers on sanitation, personal hygiene and meat inspection

Sanitation

The majority of respondents (71.9%) reported having access to toilets within the slaughterhouse. Over half of

respondents (> 50%) reported having access to a piped water supply and a place for handwashing, but less than a quarter (24.2%) of respondents reported availability of hot water facilities in the slaughterhouse (Table 2). The presence of rats and stray dogs was reported by 16.3% and 6.7% of respondents, respectively. Almost all respondents 176 (98.9%) reported separating clean from dirty operations while working in the slaughterhouse.

Personal protective equipment (PPE) and personal hygiene

Only 58 (32.6%) respondents reported regular use of PPE, of which only (3; 1.7%), (6; 3.4%), (1; 0.6%), (35; 19.7%), (6; 3.4%), and (19; 10.7%) reported regular use of working helmets, gloves, goggles, safety boots, nose masks, and aprons, respectively (Fig. 3). However, the majority of

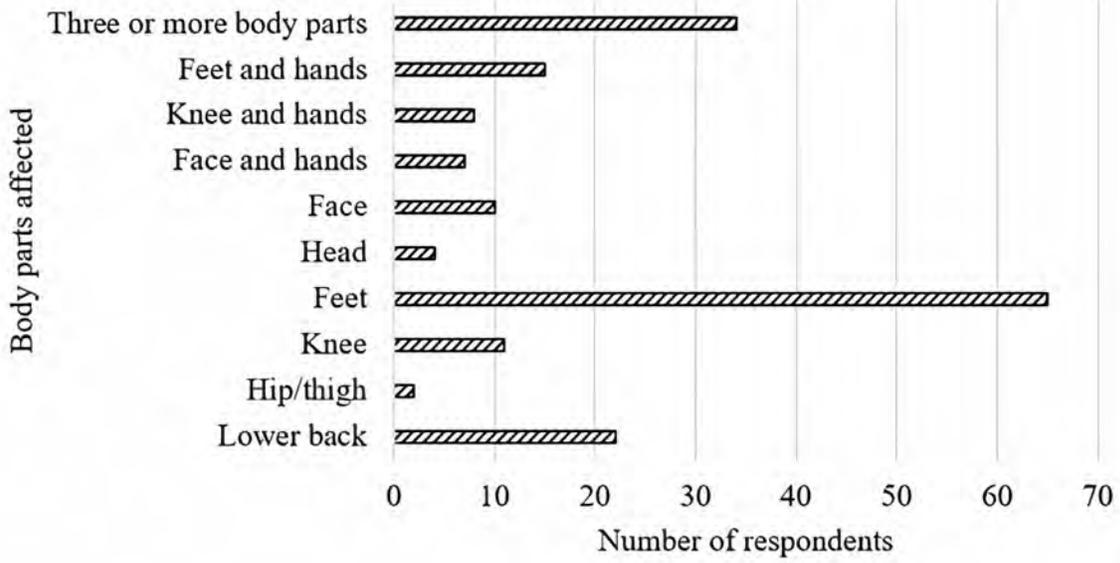


FIGURE 1. Body parts of slaughterhouse workers affected by injuries.

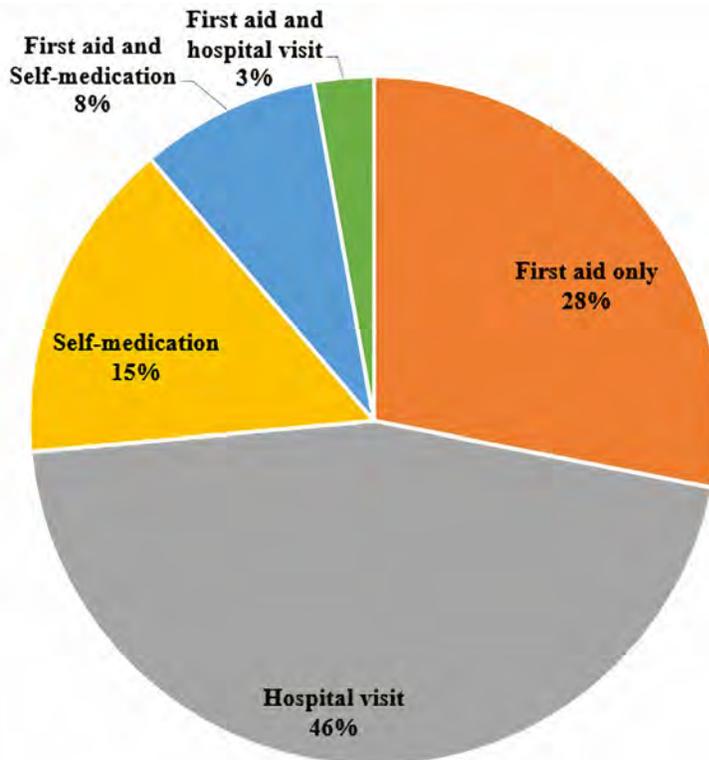


FIGURE 2. Response of slaughterhouse workers to sustained injuries.

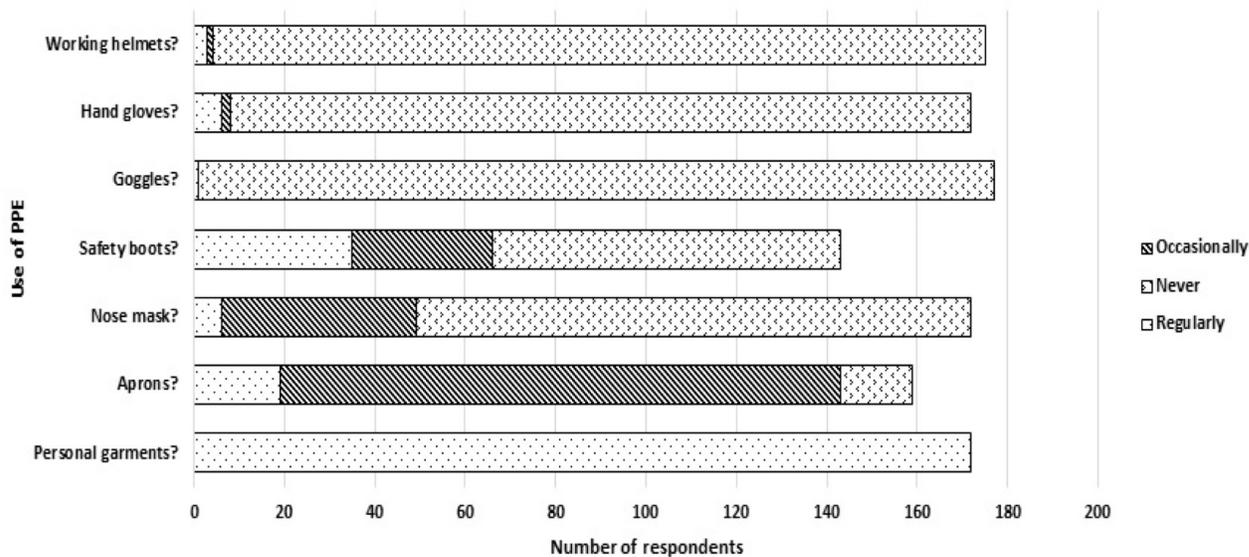


FIGURE 3. Practices of respondents on the use of personal protective equipment (PPE).

the respondents (172; 96.6%) reported habitual use of personal garments during work or slaughterhouse operations. Some of these respondents reported occasionally washing these personal working clothes.

Meat inspection and zoonoses

About 69% and 3% of respondents reported that veterinarians perform an inspection after slaughter and before slaughter, respectively. A few respondents (51; 28.7%) reported being aware of veterinarians carrying out animal and meat inspection both before and after slaughter. The majority (> 70%) are aware that slaughterhouse workers can get diseases from animals, from the slaughterhouse environment and from meat. Most respondents (112; 62.9%) do not rest animals for at least 24 hours prior to slaughter, while over half (93; 52.2%) slaughter and process sick animals in the slaughterhouse despite being aware of the risk of zoonoses (Table 3).

Association between demographic factors and knowledge about food safety risk in the slaughterhouse in relation to work injuries

The majority of respondents (82.2%) had unsatisfactory knowledge levels. However, more male respondents (20/112) than female respondents (6/91) had satisfactory knowledge levels ($P = 0.017$) (Table 1). The level of satisfactory knowledge in relation to the age of respondents was not significant ($P = 0.543$); only 5.4% of slaughterhouses' workers age 31–40 years had satisfactory knowledge of food safety risk, for example. Other demographic factors —

marital status, education, job type, years of experience on the job and slaughterhouse location — had no significant association with satisfactory knowledge scores on the test of food safety risk at the slaughterhouse.

Factors associated with satisfactory knowledge about food safety risk in the slaughterhouse in relation to work injuries

Significant associations exist between gender and PPE usage and respondents' knowledge levels of food safety risk in relation to work injuries in the slaughterhouse. Furthermore, female slaughterhouse workers were only one third as likely as male workers (OR = 0.3; 95% CI: 0.1 – 0.8; $P = 0.026$) to have a satisfactory knowledge level of food safety risk in the slaughterhouse in relation to work injuries. Slaughterhouse workers reporting usage of PPE while working in the slaughterhouses were more likely than non-PPE users (OR = 9.0; 95% CI: 3.5 – 22.9; $P < 0.001$) to have satisfactory knowledge of food safety risk in the slaughterhouse in relation to work injuries.

DISCUSSION

The majority of the respondents were male and reported having had injuries due to their work in the slaughterhouse, with such injuries commonly occurring more than once in the same person and mostly to the feet, lower back, knee, and face. Apart from animals as the cause of injuries, the hand equipment was reported by the majority of slaughterhouse workers as the source of injury experienced during work. Only (32.6%) respondents reported regular use of

TABLE 3. Responses of participants to questions on meat inspection and zoonosis from five slaughterhouses in Ilorin, Nigeria

Meat inspection and zoonoses	Yes n (%)	No n (%)
Are there veterinarians attached to this slaughterhouse?	176 (98.9)	2 (1.2)
Are the animals rested for at least 24 hours before slaughter in the slaughterhouse?	66 (37.1)	112 (62.9)
Are sick animals slaughtered in the slaughterhouse?	93 (52.2)	85 (47.8)
Are dead animals processed?	1 (0.6)	177 (99.4)
Have you ever had your animal (whole/part) condemned by a meat inspector?	24 (13.5)	154 (86.5)
Were you compensated for the condemned carcass?	56 (31.5)	122 (68.5)
Do you know that slaughterhouse workers can get diseases from animals?	129 (72.5)	49 (27.5)
Do you know that slaughterhouse workers can get diseases from the slaughterhouse environment?	151 (84.8)	27 (15.2)
Do you know that workers and consumers can get disease from meat?	135 (75.8)	43 (24.2)

PPE. We also found that the majority of respondents had unsatisfactory knowledge levels significantly associated with gender. Gender and PPE usage were significant factors in knowledge of food safety risk in the slaughterhouse, which in turn was related to workers' injuries. This is the earliest report in Nigeria, to our knowledge, that presents an assessment of food safety knowledge of slaughterhouse workers and the risk of occupational injuries and accidents among these workers.

The occurrence of work-associated injuries depends on factors such as the frequency of the work performed, the effort required for the work, and the duration of the operation (20). In this study, surveyed slaughterhouse workers usually work for 5.7 ± 2.2 days per week. This predisposes these workers to work-associated injuries. The high frequency of slaughterhouse workers reporting work injuries in the course of their work is comparable to reports of other studies (36). Most slaughterhouse operations are physically demanding, which raises the possibility of injury (29).

Respondents have reported injuries affecting their feet, lower back, knee, and face. By comparison, workers in poultry slaughterhouses have reported more bodily discomfort in the shoulders and neck (32, 36, 37). A Dutch national survey of general practice showed that the neck and shoulder are usually affected (6). The Nigerian meat processing industry is usually described as a "hot-meat market." This is because, in most Nigerian slaughterhouses, meat processing is poorly organized, leading to an increased incidence of bruises, cuts, lacerations, and infections among slaughterhouse workers (8). Slaughtered animals are processed on the floor in all surveyed slaughterhouses, which could be the reason that the feet were so commonly injured, as reported in this study. Floor processing positions also force workers into awkward postures and movements. The high processing frequency during slaughter operations has been identified as a major reason for cuts and lacerations (26), with increased tendencies in large processing plants (9).

The majority of slaughterhouse workers reported hand equipment such as knives as the source of injury experienced during work. In a previous study, using a knife during slaughter operations predisposes the body to distress and injuries (36). The finding that some reported injuries were caused by animals is expected, as most settings observed at Ilorin slaughterhouses are disorganized, leading to disorderly animal handling. Some surveyed respondents visit the hospital after work injuries occur; those who resort to first aid and self-medication only should be discouraged. Workers processing meat with exposed wounds on their hands may be more susceptible to zoonotic infections from animals (5, 8). These wounds, when infected, could be sources of pathogen spread and food safety risk.

In line with international best practices, slaughterhouse workers should undergo training on occupational health hazards and safety at work. Almost none of the workers reported being exposed to occupational training. Fasanmi et al. (14) emphasized that slaughterhouse workers in Nigeria should undergo training in operational hygiene and occupational zoonoses. Professional training for meat handlers is mandatory in most developed countries (11, 19).

The lack of sanitation facilities observed in our study is similar to reports elsewhere. About 30% of respondents do not have access to toilets within the slaughterhouses; over 50% have access to a piped water supply and a place for handwashing, but < 25% reported the availability of hot water facilities in the slaughterhouse. Comparably, 60%, 60%, and 20% of slaughterhouse workers in a survey of Kenyan abattoirs have access to water from boreholes, latrines and handwashing facilities, respectively (5). In some slaughterhouses in Ibadan, Nigeria, 71.7% of slaughterhouse workers have access to a facility for washing hands (14). The availability of handwashing facilities, including hot and cold water sources, is a requirement of international specifications for cleaning operations and prevention of meat contamination and pathogen spread (7, 10, 16, 18).

Though the presence of rats and stray dogs within the slaughterhouse premises were reported by few respondents, such presence is common in most slaughterhouses in developing countries (11). The presence of these roaming animals in slaughterhouses could promote meat contamination and spread of meat-borne and occupational diseases among workers (7). Although most respondents (98.9%) reported separating clean from dirty operations while working in the slaughterhouses, the possibility of meat contamination and the spread of zoonotic pathogens is very likely, as slaughter and carcass processing are usually done on the floor (17).

The use of PPE is important in protecting meat from contamination during processing and in protecting meat handlers from zoonotic diseases during work. However, only 32.6% of respondents reported regular usage of PPE, with workers demonstrating poor personal hygiene. Comparably, only half of workers in a Kenyan slaughterhouse were reported to use PPE (11). Non-use of PPE during slaughter operations is common in most abattoirs in Nigeria (30). This explains why the majority (96.6%) of the slaughterhouse workers reported habitual use of personal garments during work or slaughterhouse operations. Some of these respondents rarely wash these personal working clothes, as it has been reported in a previous study (28), although work clothes should be washed after each day of a slaughter operation (28). In an earlier study, slaughterhouse workers demonstrated poor personal hygiene, and such practices facilitate food contamination and spread of foodborne diseases (1, 8, 30).

Most meat-borne and occupational diseases could be detected early by an antemortem. Animals destined for slaughter should be rested for at least 24 hours. However, the majority of the respondents reported non-adherence to this rule. Similarly, meat inspection procedures are inadequate, especially at antemortem, in most poorly resourced African countries (11, 14, 23, 34). Antemortem inspection could be carried out adequately on animals that have been rested in the lairage for 24 hours.

Although, the majority of the respondents (> 70%) were aware that slaughterhouse workers can get diseases from animals, from the slaughterhouse environment and from meat, the effect of this awareness was not seen in the practice of hygiene and work-related ergonomics. In another study, most slaughterhouse workers had unsatisfactory knowledge levels of zoonoses, predisposing them to associated health risks (2, 3). However, low knowledge of zoonoses was found in only 31% of workers in Kenyan slaughterhouses (11), and in Romania, meat handlers were found to possess

good knowledge levels with regard to food safety and personal hygiene practices (21), in contrast to the unsatisfactory knowledge level demonstrated by respondents to our survey. About 78% of respondents had unsatisfactory knowledge levels on personal hygiene, sanitation, and causes and spread of foodborne pathogens in the slaughterhouses in the town of Jijjiga, in Ethiopia (33).

Significant associations exist between gender and PPE usage and knowledge of food safety risk in the slaughterhouse in relation to work injuries. Female slaughterhouse workers were only one-third as likely as male workers to have a satisfactory knowledge level of food safety risk in relation to work injuries. Slaughterhouse workers reporting usage of PPE while working were nine times more likely to have a satisfactory knowledge level of food safety risk in the slaughterhouse in relation to work injuries than non-PPE users. These results further emphasize that in the event of any intervention, female workers and non-PPE users should be targeted.

The major limitation associated with this study is the use of a questionnaire for this research. However, we pretested the questionnaire to ensure a record of high-quality information from respondents. Also, we cannot confirm the information supplied by the respondents. Hence to mitigate this risk, we employed trained questionnaire administrators, and certain questions were asked in different sections of the test to confirm previously supplied responses and discard discrepancies (31).

In conclusion, slaughterhouse workers in the Ilorin metropolis have low risk perception of occupational health and food safety issues. These important findings provide an empirical basis for stimulating establishment of policies and interventions to mitigate occupational health and food safety risks in Nigerian slaughterhouses. Education of slaughterhouse workers on proper sanitation and hygienic practices in the slaughterhouses should be emphasized. The training of slaughterhouse workers on safety and health practices and occupational hazards is imperative.

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DISCLOSURE STATEMENT

We declare no conflict of interest.

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