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Working Conditions of Slaughterhouses and Meat Safety Practices of Slaughterhouse Workers in Mymensingh District, Bangladesh

Short title: Working conditions and practices in slaughterhouses of Bangladesh

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Abstract

Background: Personal hygiene and inadequate facilities at slaughterhouses can result in contamination of meat and occupational health hazards for workers.

Objective: The objectives of this study were to investigate the present status of working conditions in slaughterhouses and to assess the physical facilities and hygienic practices of slaughterhouse workers in Mymensingh district, Bangladesh.

Methodology: A total of 212 workers from 78 slaughter houses were included in the study area. The present study was carried out on-spot direct observation of slaughter house condition using a set check-list relating to infrastructure and facilities, and a standard questionnaire was used to gather data on physical facilities of slaughtering points and data on worker's hygienic practices.

Results: The survey results and personal observation indicated that the physical facilities and infrastructure had very poor and sanitary practices were not satisfactory in most of the slaughtering points. The slaughterhouse was cramped, with no separate spaces for the lairage, bleeding, or evisceration departments. There were no hygienic maintenance inspections performed on buildings, facilities, or carcasses. Solid waste disposal had totally filled the drainage systems, even though 69.23% of slaughterhouses had them. For the disposal of animal waste, 12.84% of slaughterhouses had disposal pits. In 94.87% of slaughterhouses, water was available, but it was never used to the required degree, leaving the region unsatisfactorily dirty. All the slaughterhouse workers were male, and they were neglected to use nose masks and other personal protective equipment. Furthermore, only 2.5 percent of employees wore gumboots without hand gloves. The cleaning procedure wasn't very successful; 88.21% of employees only used plain water to wash their hands. The finding that 11.53% of slaughterhouses have

easy access to dogs and cats is concerning since it could lead to meat contamination and the spread of zoonotic illnesses. But workers (97.17%) were not concerned with the zoonotic diseases.

Conclusion: This study contributes to understand the current situation in the slaughter houses of Mymensingh division in Bangladesh which does not in line with the recommendations of the "Animal Slaughter and Meat Inspection Act 2011 of Bangladesh". Current facilities and practices may increase occupational exposure to disease or injury and contaminated meat may enter the customer market. Veterinary inspection and training program should be ensured to workers. As it was our preliminary attempt, thus further exclusive surveillance is needed to assess the scenario of nationwide slaughterhouses.

Key words: Slaughterhouse; Slaughterhouse workers; Sanitary practice; Meat safety; Bangladesh.

Introduction

One of the healthiest diets for humans is meat, especially when it comes to providing important amino acids, essential minerals, and essential vitamins. This has a significant impact on global health, the economy, and culture. But because of bacterial loads and handling techniques, the majority of animal products, including meat, are extremely perishable (Kiani and Sun, 2011; Gebeyehu, 2018). A proper slaughter premise is required in order to provide hygienically prepared meat through the humane handling of the animal, employing hygienic practices for dressing and slaughtering. Qualified staff, cutting-edge machinery, lairage, a sufficient and transportable water supply, appropriate drainage, and an effective sanitary system are all necessary for a typical slaughterhouse. The demand is rising in terms of both quantity and quality. Producers, dealers, cooperatives, abattoirs, butchers, processors, and consumers are the primary players who affect the quality of meat (Alemayehu, 2011). However, in most developing countries standard and hygienic methods of handling and processing meat are given less attention even though in part/form of the country's rules and regulations on animal meat production and process (Adzitey *et al*., 2011).

In Bangladesh, most slaughterhouses are highly ill-managed, unhygienic, overcrowded, and staffed by unaware working personnel who carry out slaughtering. The infrastructure for hygienic meat processing and slaughtering facilities is insufficient to achieve the required basic standards of hygiene. Basic amenities such as water, electricity, ventilation, drainage, tile flooring, overhead rails, and waste disposal are absent from the majority of slaughterhouses. Animals are traditionally slaughtered on the open ground in most slaughterhouses, either with or without additional processing or floor dressing. Carcasses are exposed to heavy contamination from dung and soil. The meat produced in these current slaughterhouses is of low quality and has a lot of microbiological contamination. Large amounts of the byproducts generated in these slaughterhouses are not used profitably or efficiently. Furthermore, there is unlawful slaughter occurring in numerous areas of Bangladesh. When animals are slaughtered illegally, the laws are not enforced. These all lead to poor-quality meat. Another source of safety risk are diseased animals and birds. Consuming uncooked meat from these animals can result in food poisoning, and handling and processing them can expose workers to zoonotic infections (Das *et al*., 20226). This study was carried out to assess the sociodemographic status of slaughterhouse workers, the physical facilities of infrastructure, and the process operations of major slaughterhouses in Mymensingh district, Bangladesh.

Methodology

Study site, time and population recruitment

This cross-sectional study was conducted in different slaughterhouses/slaughtering points in Mymensingh district between the periods from July to October 2021 and April to June 2022. A total of 212 workers were participated from 78 slaughterhouses in the study area from 10 upazillas (Mymensingh sadar, Bhaluka, Fulbaria, Ishaworganj, Gouripur, Muktagacha, Haluaghat, Fulpur, Tarakanda, Trishal) in Mymensingh district. The location of slaughterhouses in the study area was obtained from the upazillas livestock officers and veterinary surgeons, as well as from other office staff of those selected upazillas. Two data collectors were surveyed the slaughtering points and collected data.

Sampling procedure

All slaughterhouses in the study area were visited once, at least 5-7 days before data collection. During the visit to the slaughterhouse, the people of the respective slaughterhouse were informed of the purpose of the study so that the participants could give informed consent. Participants were informed by the data collector that they would be asked questions about themselves and their work. All workers were assured that their identities would be kept confidential.

At all times, workers at the slaughterhouse had the opportunity to clarify questions and add personal information and remarks. Interviews were conducted in the mother tongue (Bengali). On the day of data collection, on-site observation was done in the slaughterhouse, and verbal consent was obtained from all participants individually. From each slaughterhouse, a random selection of 2–3 willing participants (aged over 18) from the workers present on the day was sampled. This restriction was imposed due to the time required to collect data each day and also considered the business of workers, as they are not interested in talking about their tasks in slaughterhouses.

Questionnaire data

A structured questionnaire for slaughterhouse workers and direct observation of slaughterhouse condition was used to conduct the study. A total of 212 workers from 78 slaughterhouses were interviewed individually using a structured questionnaire. The questionnaire consisted of two parts. Part I consisted of socio-demographic information of the workers, such as sex, gender, marital status, educational level, and so on, while in Part II of the questionnaire, the questions were directed toward gaining information regarding the infrastructure facilities, hygienic practices done by the workers during carcass processing and waste disposal, and knowledge of workers about the transmission of zoonotic diseases.

Observation of slaughterhouses

This section had an observation checklist. It was a nonparticipant observation, meaning the researcher watched from a distance and did not participate in the group's activities. As a result, the researcher does little more than analyze what has been observed before drawing conclusions. When conducting the interview, the interviewer made notes about the infrastructure, amenities, and procedures of the slaughterhouse where the killing was taking place. Absence or presence of observations, an ante-mortem inspection, a latrine within the compound with designated hand washing facilities and soap, a pit for disposing of carcass waste, dogs near the slaughterhouse, the cleanliness of the slaughter area, and whether or not workers wore boots or protective clothing and were observed eating were all noted.

Data analysis

Questionnaire and observational data were recorded in excel data sheet. Microsoft® Access databases were used to manage data. The data collected was analyzed using descriptive statistics and the results presented in the form of percentage (%) for different variables in tables.

Results

Of the 78 slaughterhouses included in the study, 71 were mixed ruminant (cattle, sheep, goat, and buffalo), and only 7 were goat slaughterhouses. The total employment at these slaughterhouses was 407 workers. Among them, only 23 were female workers employed for washing and cleaning the slaughterhouse. Females were not interested in the interview. Workers less than 18 years old were excluded from this study. A questionnaire was administered to willingly participate 212 male workers at all 78 slaughterhouses.

Sociodemographic characteristics of slaughterhouse worker (Table 1)

The demographic characteristics of slaughterhouse workers are presented in Table 1. Two hundred twelve male workers participated in our study; among them, the active productive age groups were 25–35 years (44.81%). Among the workers, 91.04% were married. The education level of workers in the categories of literate (84.93%) and no education was 14.07% in all slaughterhouses included in this study. Their average work experience with people involved in the service was greater than 5 years. The majority of the workers had no work satisfaction (89.63%) and had no training (94.81%) on carcass handling and dressing. Regarding work experience, people's age between 3-5 years involved in the service was 41.48%, whereas the least percentage (8.89%) of workers had 8 to 12 years of working experience in slaughterhouses (Table 1).

Infrastructures of animal slaughtering points (Table 2)

In the district of Mymensingh, 78 slaughterhouses were surveyed. Table 2 shows that of the 78 slaughterhouses in our study area, 3 are owned by the government and the other 75 are privately run. The majority of the slaughterhouses (73.48%) were brick half-buildings with concrete-cemented floors (79.48%). Each of the slaughterhouses was appropriately connected to the road to allow for easier vehicle traffic. Many aspects of dressing, slaughtering, and producing safe and appropriate meat for human consumption are significantly impacted by the state of the slaughterhouse. However, it was noted that the slaughterhouse flooring and walls were in disrepair. There were numerous apparent cracks and holes in the walls as well as the roofs, and the plaster was flaking off of them.

Table 1. Sociodemographic characteristics of slaughterhouse worker (n=212)

Variables and Attributes	Workers number	Percentage (%)
Gender: Male	212	100
Age (years)		
20- 25	36	16.98
25 - 35	95	44.81
35 - 45	60	28.30
>45	21	9.91
Marital status		
Single	19	8.96
Married	193	91.04
Educational status		
Primary	87	41.48
High School	80	38.52
College	10	5.93
No education	35	14.07
Work satisfaction		
Yes	21	9.91
No	191	90.09
Training received		
Yes	11	5.19
No	201	94.81
Work experience on carcass handling and dressing (Year)		
1- 3	43	20.29
3 - 5	87	41.04
5 – 8	61	28.77
8 - 12	21	9.90

Table 2. Infrastructures of animal slaughtering points (n=78)

Components	Slaughter house	Percentage
Type of slaughtering points		
Govt.	3	3.84
Private	75	96.16
Type of house		
Building	14	17.94
Half-building/pacca	57	73.07
Kacha	7	8.97
Type of floor		
Concrete	62	79.48
Brick made	9	11.53
Soil	7	8.97
Type of wall		
Brick	14	17.94
Bamboo	2	2.56
Absent	62	79.48

Basic facilities of animal slaughtering points (Table 3)

The slaughterhouse was cramped, lacking distinct areas for the lairage, bleeding, and evisceration departments, as well as chambers for waste collection and freezing. Thus, it was common to witness instances of reversal, intersection, or overlap between the meat and living animals, as well as between the meat and waste or byproducts, undermining the idea of producing meat in a hygienic manner. Animal soiling and cross-contamination with food-borne diseases were at their highest risk under these circumstances. Despite the fact that 69.23% of slaughterhouses had drainage systems, solid waste disposal had completely clogged them. Water was accessible in slaughterhouses (94.87%), but it was not used to the necessary extent, so the area was never satisfactorily cleaned. Government power was provided to 44.87% of slaughterhouses; however, none of the slaughterhouses had refrigerators. Just 12.84% of slaughterhouses had a pit for the disposal of animal waste.

Veterinary inspection is vital for hygienic meat, but this facility was not available at any slaughterhouse. Workers are reluctant to keep data; in our study, we found only 8.97% of slaughterhouses had a well-maintained data recording system (Table 3). On the other hand, there was easy access to dog cats in 11.53% of slaughterhouses, which is significant for contamination of meat and the spread of zoonotic diseases. As evident from Table 3, no sanitary facilities like toilets, washbasins, and bathrooms were available at slaughterhouses. These important facilities to maintain personal hygiene were lacking and created a risk for hygienic meat production.

Table 3. Basic facilities of animal slaughtering points (n=78)

Facilities of slaughtering points	No. of Present	Percentage (%)
Lairage – sufficient space	00	00
Bleeding and evisceration section	00	00
Chilling and waste collection room	00	00
Disposal pit	10	12.82
Drainage system	54	69.23
Water supply	74	94.87
Hot water supply	00	00
Electricity supply	35	44.87
Refrigerator	00	00
Veterinary inspection	00	00
Data recording system	7	8.97
Dog, cat/others	9	11.53
Other facilities		
Toilet facilities	00	00
Cloth changing room for meat handlers	00	00
Possibility for bathing/showering	00	00

Hygiene practices of workers in animal slaughtering points (Table 4)

There are numerous ways that unclean slaughterhouses, workers' quarters, and equipment can cause serious meat contamination. Out of all the workers in slaughterhouses, only 11.79% used soap to wash their hands, while 88.21% only used water to maintain proper hygiene. Just 3.77% of the workers wore gumboots, but none of them had on-hand gloves or a nasal mask. While eating at the slaughterhouse was not a routine for any of the workers, smoking was a habit in every slaughterhouse. Table 4 shows that the cleaning of slaughterhouses was limited to the conclusion of the working day and had minimal effect on the quality of cleaning procedures. The removal of solid waste, including blood clots, visceral contents, and trims of meat and fat, was not done with enough care. Although butchers were meticulous in cleaning their tools before beginning work and afterward, none of them bothered to clean them in between killing several animals. All the infrastructure of the slaughterhouse was not cleaned, with the exception of the floors. Plain water was used to clean the infrastructure and equipment of the slaughterhouse. Details are provided in Table 4 below.

Table 4. Hygiene practices of workers in animal slaughtering points (n=212)

Variables	Frequency	Percentage (%)
Personal hygiene of workers		
Wear protecting cloth	00	00
Wear gum boots	8	3.77
Use hand gloves	00	00
Use musk	00	00
Covered head	00	00
Hand wash with water	187	88.21
Hand wash with soap	25	11.79
Cleaning of equipment & infrastructure with plain water	212	100
Cleaning before slaughtering	00	00
Cleaning after slaughtering	212	100
Eat at slaughterhouse	00	00
Smoking habit	212	100

Knowledge of risk during working at slaughter house

The maximum workers 97.17% are not concerned with the zoonotic diseases. Only 11.32% workers were informed about the transmission of disease from meat but the name of a disease which transmitted from meat could not be mentioned. Details are given in Table 5.

Table 5. Knowledge of risk of working at slaughter houses

Sl No.	Parameter	Number (%)
1	Named of zoonosis	6 (2.83)
2	Transmission of disease	24 (11.32)
3	Named a disease from meat	0 (0)

Discussion

This study reports the conditions of slaughter houses in Mymensingh district with respect to infrastructure, hygiene practices, floor space, drainage systems, knowledge of zoonotic diseases, and the health status of workers. The most notable findings of the present work were the lack of facilities to ensure adequate meat and personnel hygiene as well. Ideally, the floor of the slaughter house should be hard concrete and impervious to reduce dirt in the house and allow drainage and ease of cleaning (Bengtssom *et al.*, 1998). Similarly, a roof is important to protect the carcass from the weather and to reduce the temperature in the slaughter house (Ponni *et al. 2015*). In our study, we noticed that 79.48% of slaughterhouses did not have a wall, but the majority had a cement floor. In western Kenya, 10 percent of slaughterhouses did not have a cement floor, and over 30% of slaughterhouses did not have a roof (Mann, 1984).

Ideally, on the basis of the surrounding condition, drainage system, water supply, electric supply, and the presence of dogs and cats, there should be two divisions in the slaughterhouse between dirty and clean operations to prevent carcass contamination (Codex-Alimentarius-Commission, 2005). All the slaughterhouses selected in the present study performed “batch slaughtering." This is where an animal is killed, bled, skinned, eviscerated, and split in the same spot. Disposal pits were present only in 12.82% of cases, which is very essential for every slaughterhouse. The establishment of disposal pits at Mymensingh Sadar (Machua bazar) and Bhaluka was better than the other upazilas. The presence of pests and roaming animals in the slaughter house may contribute to infectious disease transmission, either through contamination of meat or eating of meat scraps by dogs or rats, which can lead to the persistence and spread of diseases such as echinococcosis and leptospirosis (Brown *et al.*, 2011). In this study, 11.53% of slaughterhouses had some dogs and cats also present around the slaughterhouses, which is a risk factor for the transmission of disease from animals to humans.

In all slaughterhouses, carcass preparation was performed on the ground. A slaughtering point at Kachijuli in Mymensingh Sadar, workers performed slaughtering activities on the road. These processes can lead to carcass contamination from the skin, the intestines, and the ground. International guidelines specify that hot and cold water should be readily accessible for cleaning and that equipment and workers' hands should be washed with soap and hot water (FAO, 2004). This process requires piped-water facilities. In our study, we observed that water supply is present in 94.87% of slaughterhouses, but piped water facilities are only available in a few slaughterhouses. There was a lack of handwashing facilities and soap at an adequate level in all slaughterhouses. Hand wash is predominantly used to protect meat from contamination but also protects workers against directly transmitted bacterial pathogens such as *Salmonella sp*. (Brown *et al.,* 2011). The purpose of protective clothing within the slaughterhouse is primarily to protect the meat product from contamination, but it has also been shown to protect meat handlers against directly transmitted zoonoses, including leptospirosis and brucellosis (Gomes-Neves *et al.,* 2012). There was no evidence that workers wore protective equipment at the time of working, but only in 8 slaughterhouse, gum boots had seen. In different slaughterhouses in Nigeria, less than 50% of workers wore protective equipment at all times (Nabukenya *et al.,* 2013).

In the present survey, during the time of the interview with the workers, they mentioned that meat inspections were performed twice per week, but when we talked to the Upazila Livestock Officer (ULO) of Haluaghat, he denied this oral statement. All the slaughterhouses in this study sell meat to consumers and hence require inspection of carcasses before selling them for human consumption. In developed countries such as the USA and the UK, a licensed inspector must perform antemortem and postmortem inspections and must be present when slaughtering is being conducted for meat intended for commercial purposes. The USA allows 'custom' slaughter and the UK 'home' slaughter for personal consumption, and this meat is not required to be inspected. A lack of knowledge regarding the process of meat contamination is the biggest hindrance to improving the conditions of meat in the slaughterhouse. This study has shown that only 11.32% of workers were informed about the transmission of disease from meat, but the name of the disease that was transmitted from meat could not be mentioned. Training personnel in meat hygiene is essential to improving conditions in slaughterhouses and to reducing bacterial contamination of meat and disease exposure in workers (Wamalwa *et al.,* 2012). Several potential risk factors that have been associated with zoonotic disease exposure in slaughterhouse workers in previous studies (Swai *et al.,* 2009) were observed in the study population. These included cutting animal's throats, which have been associated with brucellosis exposure, and cleaning animal parts, which are associated with brucellosis exposure. Workers did not wear special protective clothing or gloves to reduce their exposure for self-protection. Smoking at slaughterhouses has been associated with an increased risk of zoonotic diseases such as leptospirosis. In this study, we found that 100% of workers were male, muslim, smokers, with an age range of 22–35 years, and their educational qualification was primary. The findings of this study are similar to reports from other countries in Mymensingh district regarding lack of facilities, hygiene, and inadequate meat inspections. These findings are likely to be indicative of slaughterhouses in rural areas across the region. Training should focus on clean evisceration, hand washing, instrument washing, carcass trimming, protective equipment, and inspection. Slaughterhouse workers may act as sentinels for disease outbreaks in animals and people. This study did not measure specific disease risks, but a number of risk factors were identified, highlighting the potential for slaughterhouse workers to be exposed to disease (Rabinowitz *et al.,* 2009). Slaughterhouse workers should be educated about the decreased risks of illness and injury.

Conclusion

This study contributes to understanding the current situation in the slaughterhouse in Mymensingh district. It can be concluded that the selected slaughter houses lacked a drainage system, floor space, and disposal pits, and workers did not have protective clothing or gumboots except one. The majority of slaughterhouse infrastructure did not match the guidelines of an ideal slaughterhouse, including structural requirements, sanitation facilities, and running tap water. The reason is that there was no ideally established slaughterhouse supported by the Department of Livestock Services (DLS) or local governments or NGO's. In addition, there was no restricted fence or boundary for the roaming animals, like dogs and cats, around slaughterhouses. On the other hand, lack of training on the slaughtering of animals, personal hygiene, and knowledge of zoonotic diseases and their transmission are major risks to the infection and health hazards of slaughterhouse workers. Training of slaughterhouse workers should be ensured by the upazilla Livestock Office or from other projects that can improve the workers knowledge about the harmful effects of the zoonotic disease as well as public health. The government can take the initiative to establish a modern slaughterhouse at every upazilla level and at least one district level, following international standard guidelines with proper veterinary inspection in Bangladesh.

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Author's contribution

MAI and SAS designed and implemented the study. Data collection was done by SM, KCR and MTA. MAI and SAS led data analysis with support from all authors. Manuscript writing was done by MAI, SAS and SM with revisions from the other authors. Finally, all authors read and approved the manuscript.

Competing interest

Authors have declared that no competing interest exists.

Ethical approval

The study was planned and approved by the Department of Medicine, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. The names of the participants of the slaughterhouses were not stated at data collection, analysis, and presentation; so as to ensure confidentiality. Participants in the study were given all the information regarding the study and given verbal consent form before they were recruited into the study.

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