



Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

<https://doi.org/10.34104/ejmhs.024.050056>

European Journal of Medical and Health Sciences

Journal homepage: www.universepg.com/journal/ejmhs

European Journal of
**Medical and
Health Sciences**



Determination of the Risk Factors of Slaughterhouses and Butcher Shops in Public Health

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ABSTRACT

The current study was designed to understand the present status of beef markets as well as the quality of beef in selected five upazilas (Dinajpur Sadar, Parbotipur, Nawabgonj, Fulbari, and Birampur) of Dinajpur district, Bangladesh. These included cleaning hands completely before handling beef (100%), cleaning the butchery on a daily and weekly basis (12%), cleaning meat-cutting knives before use (100%), wearing hand gloves (8%), wearing a protective coat (12%), wearing a head cover (2%) while handling and selling meat, and growing long fingernails (55%). Muslims make up the majority of the population in the chosen areas, and 100% of the animals are slaughtered according to the halal method. The r_s , specific slaughter house, washing of animals before slaughter, ante-mortem inspection by the government authority, regular post-mortem inspection, and preservation of unsold beef were positively correlated with the biosecurity maintenance of meat practiced and had a significant ($p < 0.01$) positive relationship with biosecurity practice. The r_s value of preservation of unsold beef had a positive correlation but was weakly ($r_s < 0.3$) correlated. Butchers addressed the following issues: middlemen (23%), disorganized markets (21%), capital (17%), extraction (15%), importation of animals from foreign nations (14%), irregular investigations (8%), and other issues (2%). Various customer perspectives were used to gather some problem findings for the beef market survey, including excessive cost (37%), inadequate market oversight (28%), unclean surroundings (14%), adulteration (11%), and others (10%). The relevant authorities in the livestock business and the government could step in to address the existing problems.

Keywords: Beef market, Slaughter, Butcher, Inspection, Livestock, Middlemen, Public health, and Correlation.

INTRODUCTION:

In the meat industry, killing an animal - which involves stunning, bleeding, eviscerating, and skinning - is the first stage in the meat preparation process. The

Mohammedan or Halal technique of slaughtering is frequently employed in Bangladesh because Muslims make up the majority of the population (Small *et al.*, 2013). According to Murphy *et al.* (2011), meat is

ingested because it offers beneficial nutritional advantages and promotes human health. Halal slaughter requires bleeding from carcasses to cause the most blood loss. According to Nakyinsige *et al.* (2014) this method sacramentally purifies the animal, making it fit and wholesome for ingestion. Since only live animals are permitted to be completely conscious of being slaughtered, thorough bleeding can be ensured under Islamic law (Khalid *et al.*, 2015). The usual methods of preserving meat from bacteria and decay are refrigerating, freezing, curing, freeze-drying, and canning (FAO, 2005). Meat producers are required to abide by a few laws set forth by governmental organizations due to financial and religious considerations (Murphy *et al.*, 2014). In light of this, it is crucial for food control laboratories to be able to carry out the species differentiation of raw materials used in industrial food preparation and the detection of animal species in food products (Luo *et al.*, 2008). The exact process of disease transmission, both from animals to animals and from animals to humans, became an issue of contention in the late 19th and early 20th centuries (Rosenkrantz, 1985). Additionally, the initial microbiological load on the carcass in slaughterhouses and meat stores, as well as age, sex, feed, body weight, growth, physiological condition, and physical activity of the animal, have a significant impact on the overall composition of the carcass (Owen *et al.*, 1978). Electrophoresis, liquid chromatography, dot blot hybridization, randomly amplified polymorphic DNA PCR, RFLP analysis, and the species-specific PCR are currently utilized methods to identify various species (Aida *et al.*, 2005).

In order to maintain fair trade and conformity with the law, it is crucial to find unacceptably high levels of chemicals in meat products, in addition to doing so for economic, health, religious, and the ethical reasons (Spink, 2011). Because of worries over food quality, safety, and animal welfare, consumers are becoming more and more interested in the source of their food. Producers must abide by a set of laws established by the government in order to guarantee high-quality beef (Murphy *et al.*, 2014). Both theories have traditionally been applied to federal meat inspection legislation, such as the Meat Inspection Acts of 1891 and 1906 (Kolko, 1963). For the safety of customers and the management of hazards to the public's health, food

facilities such as slaughterhouses and meat sales centers must follow strict cleanliness regulations. This is due to the fact that food workers' cleanliness practices have a substantial impact on the occurrence and spread of foodborne illness (Assefa *et al.*, 2015). Insufficient private sector investment and inadequate trade regulation account for the disparity between contemporary meat processing plants and small slaughterhouses in the meat business (Mann *et al.*, 1983). The following goals guided the undertaking of the current study:

- 1) To analyze the current state of the slaughterhouses and butcher shops in the districts of Dinajpur.
- 2) To determine the risk factors for slaughterhouses and butcher shops.
- 3) To evaluate the hygienic management of beef slaughterhouses and butcher shops.

MATERIALS AND METHODS:

Study area

The investigation proceeded for a full year, from June 2022 to July 2023. The information was gathered through interviews with butchers and slaughterhouse workers in Bangladesh's Dinajpur districts. The respondents were picked to go through the various stages of meat production, processing, and delivery. Each upazila had an interview with a randomly selected respondent who worked in a butcher shop.

Data Collection

Depending on methods used for processing meat, facilities used for slaughter, issues butchers and consumers face, etc. The information needed to complete the survey came from discussions with respondents and the creation of a standard questionnaire based on observational research. In-person interviews were used to gather information on the respondents. When the respondents had spare time, in-depth interviews were often conducted at their residences and places of employment. Slaughterhouses and butcher shops had been closely monitored. Key informant interviews (KII) were conducted with authorities on government livestock. 200 butcher and slaughterhouse records in total were collected.

Parameters studied

The interview schedule contained meat handling practice, slaughtering techniques and related facilities,

problems faced by butchers, problems faced by consumers, etc.

Computing and statistical analysis of data

Descriptive analysis was done, like averages and percentages, as well as the Spearman correlation coefficient (r_s) and level of significance, through SPSS Statistics 25.0. Spearman correlation coefficient is measured by following formula,

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where,

$d_i = \text{rg}(X_i) - \text{rg}(Y_i)$, is the difference between the two ranks of each observation.

n is the number of observations

RESULTS AND DISCUSSION:

Meat handling practice of workers in Butcher shops

The data represented in **Table 1** indicates that the meat handling practices of workers in butcher shops were categorized into the various parameters, which are washing of hands before beef handling (100%), workers' hands should be cleaned with soap and hot water, and there should be hot and cold water available for cleansing (Food and Agriculture Organization of the United Nations [FAO], 2005). About 43% of the biosecurity maintenance in meat shops. The findings indicate that the current state of affairs bears greater resemblance to the findings of a prior study by Smigic *et al.* (2016), which discovered that poor nations such as Bangladesh and Kenya have nearly identical levels of basic hygiene knowledge. frequency of cleaning of butchery, which was categorized daily (88%) and weekly (12%), cleaning of meat cutting knives before use (100%), wearing of hand gloves (8%), protective

coat (12%) and head cover (2%) during handling and selling of meat, and keeping finger nails long (55%). Additionally, it reduces the possibility that meat handlers will contract zoonotic infections (Nabukenya *et al.*, 2013). Cook *et al.* (2017) found that 49% of workers in western Kenyan slaughterhouses wore rubber boots, and 53% wore protective coats. According to Green *et al.* (2007), wearing gloves correctly can lessen the spread of germs from hands to food, and 90% of respondents were aware that wearing gloves at work can lower the chance of contaminated meat. The findings of this study revealed that very few respondents wore gloves on a regular basis, in contrast to earlier research (Jianu & Golet, 2014). Due to the fact that the majority of the people in the selected areas are Muslims, the slaughtering method for cattle is halal (100%). As stated by Sen *et al.* (2004), the total composition of the carcass is also significantly impacted by the animal's age, sex, nutrition, body weight, growth, physiological state, physical activity, and initial microbial load on the carcass at slaughterhouses and meat markets. As a result, Islamic law only permits the killing of living animals after they have full awareness of their impending death, which can guarantee total bleeding (Khalid *et al.*, 2015). Ahsan *et al.* (2014) discovered that, aside from mentioning God's name in Bangladeshi slaughterhouses, the halal regulations were not effectively observed. At the moment of slaughter, the phrase "Bismillah Allahu Akbar" (in the name of Allah; Allah is the Greatest) must be spoken. A sharp knife must be used to butcher the animal. The weight of the knife must not kill. Should it die from impact, the flesh could not be acceptable. According to the Department of Halal Certification, Europe, (2018) animals shouldn't be killed in front of other animals.

Table 1: Meat handling practice of workers in Butcher shops.

Parameters	Categories	Frequency	Percentage
Biosecurity Maintenance of Meat	Yes	86	43%
	No	114	57%
Washing of hands before handling meat	Yes	200	100%
	No	0	0%
Frequency of cleaning of butchery	Daily	176	88%
	Weekly	24	12%
Cleaning of meat cutting knives before use	Yes	200	100%

	No	0	0%
Wearing of hand gloves when handling meat	Yes	16	8%
	No	184	92%
Wearing of head cover while selling meat	Yes	4	2%
	No	196	98%
Keeping finger nails long	Yes	110	55%
	No	90	45%
Wearing of protective coat while selling meat	Yes	24	12%
	No	176	88%
Slaughtering Method	Halal	200	100%

Slaughtering Techniques and Related Facilities

The slaughtering techniques and related facilities of the beef markets are demonstrated in **Table 2**. The slaughterhouse facility was limited to selected areas. Specific slaughterhouses were only found in 22%. The proportion of animals washed before slaughter is much lower (19%) than without washing before slaughter (81%). The rate of regular antemortem and postmortem inspections by government authorities was only 7% and 12%, respectively. Whereas veterinary surgeons visited slaughterhouses situated in the district's major point once or twice a week to verify animal and meat quality and frequently performed antemortem examinations, meat inspectors routinely visited 70% of slaughterhouses and meat selling centers in the study

region. Anthrax and other directly transmitted zoonotic illnesses can spread through the slaughter of sick animals (Ray *et al.*, 2009). This state of affairs is unsatisfactory and could contribute to the continuation of zoonotic illnesses like cysticercosis (Mann *et al.*, 1983). A deep fridge was used to keep the unsold beef in 96% of the cases. Producers must abide by laws established by authorities in order to guarantee the quality of their meat (Murphy *et al.*, 2014). Therefore, the ability to perform species differentiation of raw materials to be utilized for industrial food preparation and the detection of animal species in food products is a critical task for food control laboratories (Luo *et al.*, 2008).

Table 2: Correlation between biosecurity maintenance and slaughtering inspection techniques and condition-related facilities.

Parameters	Categories	Frequency	Percentage	Spearman Correlation coefficient (r _s)	Level of Significant
Specific Slaughter House	Yes	44	22%	0.611	**
	No	156	78%		
Washing of Animal before Slaughter	Yes	38	19%	0.558	**
	No	162	81 %		
Regular Ante Mortem Inspection by Government Authority	Yes	14	7%	0.316	**
	No	186	93%		
Regular Post Mortem Inspection by Government Authority	Yes	24	12%	0.425	**
	No	176	88%		
Preservation of unsold Beef	Yes	192	96%	0.219	*
	No	8	4%		

r_s=Spearman correlation coefficient; NS, Non-significant (p>0.05); *= p<0.05, **= p<0.01

The r_s, specific slaughter house, washing of animals before slaughter, ante-mortem inspection by the government authority, regular post-mortem inspection, and preservation of unsold beef were positively correlated with the biosecurity maintenance of meat practiced and had a significant (p<0.01) positive relationship

with biosecurity practice. The r_s value of preservation of unsold beef had a positive correlation but was weakly (r_s<0.3) correlated (**Table 2**), which was significant (p<0.05). Here we can say that poor hygiene and biosecurity are more suspected of using illegal ways to get more profit.

Problem Faced by Butchers

During beef trading the butchers faces many problems. The problems faced by butchers were middlemen (23%), unorganized markets (21%), capital (17%), extraction (15%), import of animals from other countries (14%), irregular investigations (8%), and others (2%) (Fig.1). A Hazard Analysis Critical Control Point plan (HACCP) that identifies dangers, their

origins, and suitable preventive measures must be present in abattoirs, according to the most recent Australian Standard for meat (AS4696:2007 Anonymous, 2007; Das *et al.*, 2019). According to Haile-selassie *et al.* (2013), more or less the same condition affects butchers.

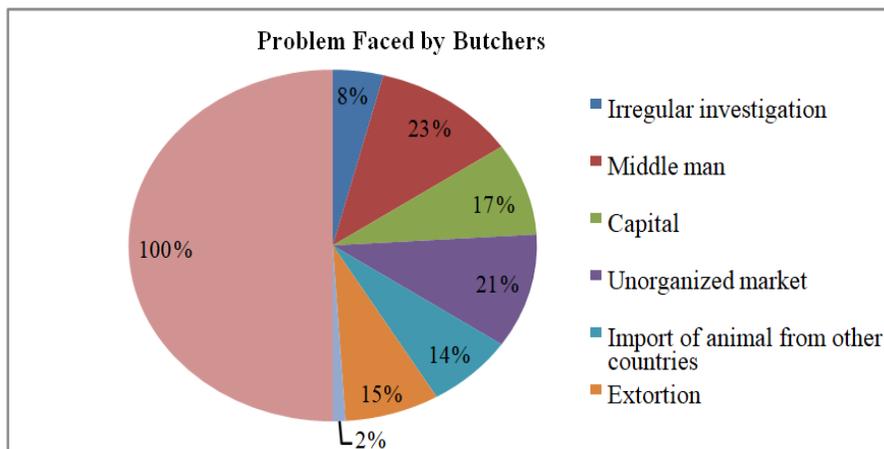


Fig. 1: Problem Faced by Butchers.

Problem Faced by Consumers

Consumer opinion is an important factor in meat marketing. Different opinions of the consumers were collected during the beef market survey, which were: high price (37%), lack of market monitoring (28%), unhygienic environment (14%), adulteration (11%),

and others (10%) (Fig. 2) respectively. [Australia's steadfast dedication to implementing the Codex Alimentarius Commission 1995. food safety risk assessment standards throughout the supply chain for red meat (Horchner *et al.*, 2005; Rahpeyma M., and Khosravy MS, 2023)].

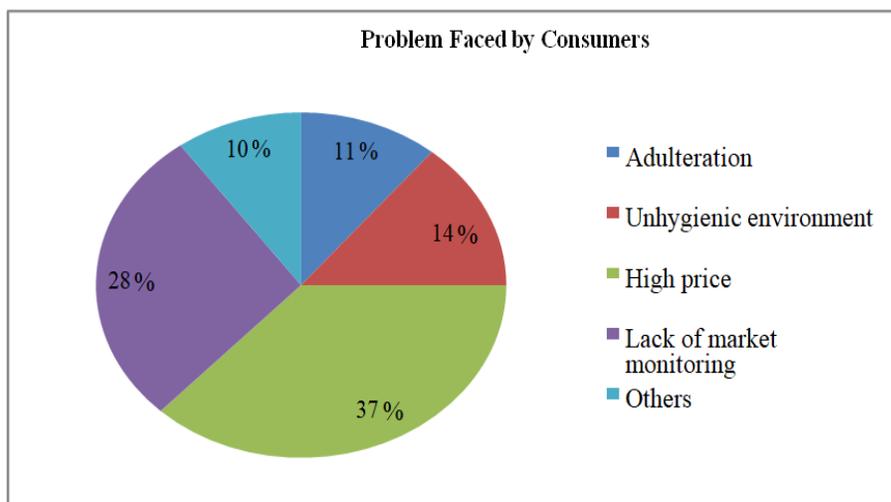


Fig. 2: Problem Faced by Consumers.

CONCLUSION AND RECOMMENDATIONS:

There are some recommendations, given our survey investigation point of view -

The government or proper authority should strictly apply the rule for adulteration of meat. Evaluation of the meat market properly. Butchers associations

should be made. An organized meat market should be established. Reduced import of animals from other countries. All over the country, one price should be applied. Butchers health insurance should be implemented. This experiment was conducted to evaluate the market condition through a survey. The survey was used by butcher shop and slaughterhouse employees who handle meat. Effective training should be required for butchers. Environmental issues should be implemented by the market monitoring committee. More organized modern slaughterhouses should be established. Public health hazard issues should be aware of butchers and people. Clinical testing should be ensured in the modern slaughterhouse. The research was based on the status of beef markets in selected areas of Dinajpur district to assess the present condition of beef markets and provide some recommendations to the butchers for the creation of awareness about health hazards and biosecurity. This research also focused on determining meat quality by evaluating various relevant parameters. Like other places of beef market in Bangladesh, the present condition of beef markets in Dinajpur district is poor due to a lack of available slaughterhouse or abattoir facilities, antemortem and post-mortem inspection, insufficient knowledge of food safety, bio-security, and food-borne zoonotic diseases, inadequate hygienic measures, and a lack of training facilities for butchers. Proper hygienic practices for the slaughtering and processing of raw beef should be accepted as strategies to control pathogenic microbes that reduce public health risks.

ACKNOWLEDGEMENT:

National Science & Technology Ministry (NST Fellowship grant).

CONFLICTS OF INTEREST:

The authors declare that there is no conflict of interest.

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Citation: Khatun Y, Salma U, Yeasmin T, Amin NJ, Sabuz SH, Habib MA, Rahman M, Jha JK, and Jaman, (2024). Determination of the risk factors of slaughterhouses and butcher shops in public health, *Eur. J. Med. Health Sci.*, **6**(2), 50-56. <https://doi.org/10.34104/ejmhs.024.050056> 