



Meat processing and handling facilities in slaughterhouses of selected areas of Bangladesh

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ABSTRACT

The study was conducted to investigate the present status of meat processing facilities in different slaughterhouse of Bangladesh through field survey. The data was collected through interview schedule selecting 30 respondents (Butcher, Seller and Consumer) in Khulna, Rajshahi and Rangpur Division in Bangladesh. They were asked about knowledge of hygienic meat production, slaughterhouse environment, existing facilities, sanitation and waste management, opinion of the butcher, seller and consumers. It was obtained from the study indicating that approximately 75.63% of the animals were slaughtered at the abattoir. Only 5.8% of butchers (n=30) knew about the production of hygienic meat. Almost 100% of the abattoirs lacked hygiene and sanitation. Only 26.66% slaughtered carcasses were checked by veterinary surgeon where another 16.7% were checked by unskilled meat inspectors from the municipality. Only 23.33% of slaughterhouses were situated in environmentally friendly locations. Consumer perception revealed that only 3.33% of consumers have knowledge of meat hygiene. Meat is a great source of animal protein in our country but hygienic condition and facilities available in slaughterhouse were not satisfactory. Slaughterhouses both in rural or municipal areas were contaminated frequently and therefore meat and meat byproducts coming from such conditions often deteriorated through bacterial infection or contamination might be the cause of food poisoning or diseases in consumers.

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Introduction

Meat is an important source of dietary protein for all community which is easily contaminated by various ways. In many countries have inadequate slaughter facilities and slaughter techniques cause unnecessary loss of meat and valuable byproducts from animal carcasses. Slaughterhouse premises are often contaminated and cannot be protected from dogs, rodents and insects. Meat and meat by-products from these conditions are often deteriorated due to a

bacterial or contaminated infection, which can cause foodborne illness in consumers. Foodborne illnesses have caused significant global morbidity and mortality (Daniels et al., 2002). According to the World Health Organization (WHO), 18 per cent of children under the age of 5 in developing countries die of diarrhea worldwide. On the other hand, food contamination from raw meat is the main cause of food borne illness or food poisoning due to improper food handling. Food safety has become very important in recent years, and ensuring

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product safety is a public health concern internationally and nationally. Food processors are one of the leading sources of food contamination (Campos et al., 2009). Most meat is handled with poor hygiene, both in rural and urban areas. Law enforcement on slaughter and meat inspection is weak. A Hazard Analysis and Critical Control Point (HACCP) system that prevents and mitigates food safety hazards through critical control points and good hygiene practices are both part of an effective food safety management system. Despite the importance of optimal levels of food safety in slaughterhouses, it has been reported that some slaughterhouses in African countries are performing poorly and require intervention in food safety planning (Akinnibosun and Imade, 2015). Abattoir workers engaging in unsanitary practices create an environment conducive to zoonotic diseases among the workers and contamination of the meat for sale. Unfortunately, microbiological profiles of slaughterhouse and butcher shop meat in the least developed countries is higher than standards set by World Health Organization (Haileselassie et al., 2013) and there have been occurrences of zoonosis among abattoir workers and in cattle in abattoirs (Iroha et al., 2011; Allwin et al., 2015). In view of the above, much research has already been done on meat quality assessment under different slaughter conditions but very little research has been done on the sanitary conditions of slaughterhouses and available meat processing facilities in Bangladesh. Therefore, this study was conducted at various slaughterhouses in Bangladesh to observe the current sanitary conditions of slaughterhouses, determine the facilities available at the slaughterhouses, and identify the problems that exist in this field.

Methodology

The survey was conducted in Khulna, Rajshahi and Rangpur Division in Bangladesh. The different districts under these divisions namely Khulna Sadar, Bagerhat, Rajshahi, Gaibandha and Rangpur Sadar were selected for data collection. The data were collected through an interview schedule selecting 30 respondents (butcher, seller and consumer) in each division. A structured interview schedule was carefully prepared and data were collected by face to face interview from the respondents. The interview schedule contained the following information: number of slaughtered animals; age, sex and sources of the slaughtered animals, pre-slaughter care of animals, slaughterhouse environment, hygienic condition of slaughterhouse, chilling facilities, methods of slaughtering, bleeding and

flaying, transportation system, slaughterhouse by-products, consumer types, consumer's perception scale, opinion of the butcher, seller and consumers. The collected data were recorded, organized and analyzed using SPSS 17.0 package. Mean comparison was done by one way ANOVA with CRD.

Results and Discussions

Butcher's knowledge on slaughterhouse

Table 1 shows the scenario of knowledge of the butchers about different pre and post slaughter activities in Rajshahi, Rangpur and Khulna division.

Table 1. Knowledge on slaughterhouse in Rajshahi (R), Rangpur (RP) and Khulna (K) division

Knowledge on	Division			p- value
	R (%)	RP (%)	K (%)	
Hygienic meat				
Partially know	60	70	70	0.062
Know	10	10	0	0.078
Do not know	30	20	30	0.037
Pre slaughter care				
Quarantine				
Partially know	10	40	50	0.0056
Know	0	0	0	0.059
Do not know	90	60	50	0.043
Lairage				
Know	50	40	50	0.066
Do not know	50	60	50	0.075
Post slaughter care				
Flaying defect				
Know	80	80	60	0.032
Do not know	20	20	40	0.0046
Chilling of carcass				
Know	0	0	0	0.071
Do not know	100	100	100	0.057

Only 10, 10 and 0% butchers of Rjshahi, Rangpur and Khulna division know about healthy meat production. Significant difference was found (P<0.05) among the butchers who don't know about healthy meat production. Knowledge on pre slaughter care was similar in these divisions. Knowledge on post slaughter chilling of carcasses was same and none of the butchers found to know about this. Ahsan *et al.*, (2020) found that only at one slaughterhouse out of 35 has partial lairage facilities and butcher has very little knowledge on wholesome meat production, pre and post slaughter care of slaughtered animal.

Meat inspection in slaughtering places

Only 30%, 10% and 40% of the abattoir in Rajshahi, Rangpur and Khulna division were inspected by the veterinarian (Table 2). Untrained municipality worker check 10%, 20% and 20% slaughterhouses of the respective area.

A huge percentage of meat was not checked by any veterinarian or other law enforcement agencies.

Table 2. Meat inspection practices by professional in slaughtering places of Rajshahi (R), Rangpur (RP) and Khulna (K) (n=30)

Meat inspector	R (%)	RP (%)	K (%)
Veterinarian	30	10	40
Municipality sanitarian	10	20	20
Health ministry staff	0	0	0
None	60	70	40
Total respondent	10	10	10

Table 3. Environmental condition of slaughterhouses in Rajshahi (R), Rangpur (RP) and Khulna (K)

Place	Division			p-value
	R (%)	RP (%)	K (%)	
Place				
Right place	0	70	0	0.039
Trading area	70	10	100	0.0037
Residential area	20	20	0	
Others	10	0	0	0.045
Utilities				
Water and electricity	60	90	70	0.031
Water	40	10	20	0.0054
Drainage system				
Proper	0	0	0	0.065
Not proper	70	70	80	0.078
Not available	30	30	20	0.040
Sanitation				
Disinfectant				
Used	0	0	0	0.052
Not used	100	100	100	0.059
Footbath				
Used	0	0	0	0.083
Not used	100	100	100	0.076
Hand washing facilities				
Used	30	30	20	0.033
Not used	70	70	80	0.038

However, meat inspection is very important for early identification and exclusion of apparently sick animals and tissues (Thornton *et al.*, 1997). Alam *et al.*, (2020) surveyed 20 abattoirs and meat sales centers, of which 30% animals were slaughtered without inspection by a veterinarian or meat inspector. Slaughter of infected animals is a risk factor for contracting certain zoonotic diseases, such as anthrax (Ray *et al.*, 2009).

Environmental condition in Slaughterhouse

In Rajshahi district, 70% of the slaughterhouses were located in trade areas and there were no slaughterhouses in suitable location. About 70% of the slaughterhouses were located in suitable

place, 20% in residential areas and 10% in industrial areas in Rangpur division. 100% slaughterhouse was at trade zone in Khulna (Table 3). Significant difference was found (P<.05) among location of slaughterhouse. Ahsan *et al.*, (2020) found that 33 out of 35 slaughterhouses located in an inappropriate area. Moreover, 30 of 35 were adjacent to the residential area, which may lead the citizen exposure to the different types of pathogens causing zoonotic diseases, food poisoning, diarrhea, and other health outcomes (Hassan *et al.*, 2015).

Table 4. Checklist for slaughterhouse (√=Present, x= Absent) in Rajshahi (R), Rangpur (RP) and Khulna (K)

	Division		
	R	RP	K
Quarantine facilities	x	x	x
Adequate lairage	x	x	x
Post mortem inspection of carcass	x	x	x
Sufficient number of rooms	x	x	x
Facilities for disinfection of equipment	x	x	x
Proper washing facilities	x	x	x
Proper drainage system	x	x	x
Waste management system	x	x	x
Chilling facilities	x	x	x

Sanitation facilities in slaughterhouses among three divisions were not satisfactory. Almost 100% slaughterhouses don't use any disinfectants. Abdulla *et al.* (2020) found that 55% of the slaughterhouses had moderate drainage condition followed by poor (43.33%) and good (1.67%) drainage condition. Alam *et al.* (2009) reported that 50% of abattoir and/or meat sales centers in Gazipur district had adequate drainage and water supply systems.

Facilities available in Slaughterhouse

The slaughterhouse was checked according to the HACCP checklist. All facilities according to HACCP

Table 5. Butcher knowledge on meat processing (n=30) in Rajshahi (R), Rangpur (RP) and Khulna (K)

Knowledge on	Division			p- value
	R (%)	RP (%)	K (%)	
Standard Wholesale and retail cuts				
Know	30	0	0	0.004
Do not know	70	100	100	0.059
How much time meat should remain open				
Know	60	80	60	0.042
Do not know	40	20	40	0.007
Spoilage of meat				
Know	80	90	100	0.035
Do not know	20	10	0	0.008
Chilling of carcass				
Know	0	0	0	0.058
Do not know	100	100	100	0.067

Table 6. Checklist for meat processing and selling center (√=Present, ×=Not Present) in Rajshahi (R), Rangpur (RP) and Khulna (K)

Facilities	Rajshahi	Rangpur	Khulna
Facilities for disinfection of equipment	×	×	×
Proper washing facilities	√	×	×
Chilling facilities	×	×	×
Preservation facilities	√	×	√

Table 7. Time needed to sale meat in the market (n=30)

Time	Rajshahi (%)	Rangpur (%)	Khulna (%)
1-3 hrs	20	0	0
3-6 hrs	20	20	10
6-9 hrs	50	50	30
9-12 hrs	10	10	50
More	0	10	20

checklist was absent in all slaughterhouses (Table 4). According to HACCP principles, all abattoirs were in very poor condition. Water and electricity facilities were adequate and the main water

Butcher knowledge on meat processing

Visiting the slaughterhouse of three divisional cities found that only 30% of butcher in the Rajshahi division knew about standard wholesale and retail cuts but none of the butcher of other two divisions know about this. Data were also collected on meat spoilage, carcass cooling, and carcass cooling requirements (Table 5). No significant difference was found in chilling knowledge (P > 0.05).

Table 8. Consumer's perception scale (% n =30) in Rajshahi (R), Rangpur (RP) and Khulna (K) division.

Knowledge on	Types	R	RP	K
Hygienic meat	Yes	0	10	0
	No	0	10	0
	Partially know	100	80	100
Symptoms of spoilage of meat	Yes	10	20	50
	No	10	0	10
	Partially know	80	80	40
The necessity of chilling	Yes	10	0	10
	No	60	70	10
	Partially know	30	30	80
Freezing and thawing of meat	Yes	0	0	10
	No	30	80	50
	Partially know	70	20	40
Requirement of immediate chilling	Yes	20	0	10
	No	20	80	50
	Partially know	60	20	40
Proper cooking temperature of meat	Yes	0	30	0
	No	70	20	70
	Partially know	30	50	30
Bad effects of spoiled meat	Yes	20	40	50
	No	20	0	0
	Partially know	60	60	50
Zoonotic disease	Yes	0	10	10
	No	40	40	80
	Partially know	60	50	10
Meat sellers spray water on meat for better look	Yes	90	100	80
	No	0	0	0
	Partially know	10	0	20
Quality of meat changes with age	Yes	100	10	50
	No	0	10	0
	Partially know	0	90	50
Organic meat production	Yes	30	20	0
	No	50	50	30
	Partially know	20	30	70

source was tube well water. Alam *et al.*, (2009) also found the similar result.

The lack of adequate water source was observed, and similar situation were found by Cook *et al.*, (2017) in abattoirs of western Kenya. Alam *et al.*, (2020) reported that only 35% of abattoirs and meat retail centers had hand washing facilities, and tube wells were the main water source.

A big difference was found in meat spoilage and standard cuts of meat. ($P < 0.01$). Murshed (2014) found the similar results where 70% butcher of Dhaka division don't know about the standard meat cut.

Table 9: Problem identified in relation to slaughterhouse slab, meat processing and selling center

	Observations (n=30)	Ranking %
Slaughter slab		
Adequate slaughterhouse facilities are not available	30	100
Training programs are not arranged for the butchers	30	100
Lack of proper drainage system	28	93.33
Slaughterhouses are small in size	21	70
No slaughterhouse is available in some districts	5	16.67
Meat processing and marketing		
Utilities available are not sufficient	30	100
No specific meat market	26	86.67
No training programs are arranged	25	83.33
Area is small	24	80
Facilities are not up to the mark	23	76.67
Slaughterhouse is at distant place	2	6.67
Consumers		
Unhygienic marketplace	30	100
No grading system in the market	30	100
No quality control system	30	100

Facilities available in meat processing and selling center

In Rajshahi Division adequate washing facilities and meat storage facilities were accessible. There were no facilities on meat processing available in the Rangpur division and only meat preservation facilities were available in Khulna division (Table 6). These facilities are important to maintain quality of meat. Murshed (2014), states that some facilities were available at municipal abattoirs. Adequate washing and meat storage

facilities were available in Dhaka Division. There were no facilities available in Chittagong division.

Time needed for meat selling

About 20% respondents in Rajshahi division were sold the meat within 1-3 hours. In maximum selling areas meat remains open for 6-9 hours. In Khulna and Rangpur division it was found to remain more than 12 hours (Table 7). Time is a very important factor in the sale of meat, as it has been found that longer time after slaughter increases microbial load and reduces meat quality. Gichure *et al.*, (2014) found that meat was rarely tenderized and was usually sold within 24 hours after slaughter in pastoral region of Kenya.

Consumer's perception scale

Table 8 shows consumer perception measures ranked yes, no and partially know. Consumers present at the meat market were asked about various hygiene and safety measures of meat that affect the quality and safety of meat production. The difference between consumer perceptions was very small. Consumers should know these aspects for consumption of safe meat. Liana *et al.*, (2010) stated that consumers must have minimal knowledge on meat hygiene.

Problems Identified

There were some problems identified in relation to slaughterhouse slab, meat processing and marketing were shown in Table 9. In this study, about 83.3% of respondents had not received any training in food safety and meat hygiene, although most workers at slaughterhouses and butchers expressed willingness to attend a training program on food safety and meat hygiene. Training programs increase the knowledge of meat processor (Ansari-Lari *et al.*, 2010). The training of meat handlers is essential to prevent foodborne illness (Nel *et al.*, 2004; Shojaei *et al.*, 2006).

Conclusion

The general condition of the slaughterhouse and meat sales center did not meet the standard requirements. In some places butchers and met seller are completely ignorant of hygiene measures. Consumers are unaware of slaughterhouse condition and slaughter hygiene. All area involved in slaughtering and meat processing lack adequate facilities. Many facilities are absent in the study area including meat inspection. Quarantine, lairage, modern equipment, washing facilities, drainage and waste

management system, chilling facilities are inadequate in all most all the areas. To solve these issues some initiative should be taken and implemented by local and national governments. Among which first one is introducing efficient meat inspection procedures, then building simple and modern slaughterhouses with all the necessary facilities for waste disposal to prevent contamination of the environment and establish standard procedures to secure the health and well-being of butchers, meat processor and the public.

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Conflict of interest

The all authors declare that there is no conflict of interest with any organization regarding the aspects discussed in the manuscript.

Authors' contributions

M.M. Hossain and S.M.E. Rahman conceived and planned the experiments and guided the research team, M.A. Alam and M.T. Hasan collected data from the respondents, S. Ahemd and S.A.M. Hoque analyzed and interpret the data, M.D. Hossain drafting the manuscript. Finally all authors reviewed the results and approved the final version of the manuscript.

References

- Abdulla MS, Islam MS, Kabir ME, Dadok F, Zaber MA, Sarkar S (2020). Utilization of slaughterhouse by-products: a current scenario in Dhaka city. *Asian Journal of Medical and Biological Research*, 6(4): 809-816. <https://doi.org/10.3329/ajmbr.v6i4.51250>
- Ahsan MI, Khan MB, Das M, Akter S (2020). Poor hygiene, facilities, and policies at slaughterhouses: a key threat to public health and environment. *Bangladesh Journal of Veterinary and Animal Sciences*, 8(2):1-9.
- Akinnibosun F, Imade O. (2015). Hygiene assessment of the performance of food safety management system implemented by abattoirs in Edo State, Nigeria. *Journal of Applied Science and Environment Management*, 19 (3): 521. <https://doi.org/10.4314/jasem.v19i3.23>
- Alam MK, Hossain MM, Islam R, Akhter S (2009). Management of slaughterhouse and meat selling center to supply quality goat meat for human consumption. *Journal of the Bangladesh Society for Agricultural Science and Technol and Technology*, 6: 135-140.
- Alam, MK, Keiko Y, Hossain MM (2020). Present working Conditions in slaughterhouses and meat selling centres and food safety of workers in two districts of Bangladesh. *Pertanika Journal of Social Sciences & Humanities*, 28(2): 867-881.
- Allwin B, Kalaignan PA, Senthil NR (2015). Abattoir characteristics and seroprevalence of bovine brucellosis in cattle slaughtered at Bodija Municipal Abattoir, Ibadan, Nigeria. *Journal of Veterinary Medicine and Animal Health*. 7 (5): 169-172. <https://doi.org/10.5897/JVMAH2015.0370>
- Ansari-Lari M, Soodbakhsh S, Lakzadeh L (2010). Knowledge, attitudes and practices of workers on food hygienic practices in meat processing plants in Fars, Iran. *Food Control*, 21(3): 260-263. <https://doi.org/10.1016/j.foodcont.2009.06.003>
- Campos AKC, Cardonha AMS, Pinheiro LBG (2009). Assessment of personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil. *Food Control* 20: 807-810. <https://doi.org/10.1016/j.foodcont.2008.10.010>
- Cook EAJ, Glanville WAD, Thomas LF, Kariuki S, Bronsvoot BMDC, Fevre EM (2017). Working conditions and public health risks in slaughterhouses in western Kenya. *BMC Public Health*, 17: 14. <https://doi.org/10.1186/s12889-016-3923-y>
- Daniels NA, MacKinnon L, Rowe SM, Bean NH, Griffin PM, Mead (2002). Food borne disease outbreaks in United States schools. *The Pediatric Infectious Disease Journal* 21(7):623-628. <https://doi.org/10.1097/00006454-200207000-00004>; PMID: 12237592
- Gichure JN, Kunyanga CN, Mathi PM, Imungi JK (2014). The present status of meat processing and preservation in the pastoral regions of Kenya. *Food Science and Quality Management*, 34: 42-50.
- Haileselassie M, Taddele H, Adhana K, Kalayou S (2013). Food safety knowledge and practices of abattoir and butchery shops and the microbial profile of meat in Mekelle City, Ethiopia. *Asian Pacific Journal Tropical Biomedicine*. 3 (5): 407-412. [https://doi.org/10.1016/S22211691\(13\)60085-4](https://doi.org/10.1016/S22211691(13)60085-4)
- Hassan A, Kadarman N, Abdullahi A, Madobi IS (2015). Negative impact of abattoir activities and management in residential neighbourhoods in Kuala Terengganu, Malaysia. *International Journal of Public Health*.

- Health Science*, 4(2): 124-130.
<https://doi.org/10.11591/ijphs.v4i2.4722>
- Iroha IR, Ugbo EC, Ilang DC, Oji AE, Ayogu TE (2011). Bacteria contamination of raw meat sold in Abakaliki, Ebonyi State Nigeria. *Journal of Public Health and Epidemiology*. 3 (2): 49-53.
- Liana M, Radam A, Yacob MR (2010). Consumer perception towards meat safety: confirmatory factor analysis. *International Journal of Economics and Management*, 4(2): 305-318.
- Murshed HM (2014). Study on handling, processing and microbial quality of meat at Dhaka, Chittagong and Sylhet divisions in Bangladesh. MS Thesis, Department of Animal Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.
- Nel S, Lues JFR, Buys EM, Venter P (2004). The personal and general hygiene practices in the deboning room of a high throughput red meat abattoir. *Food Control*, 15(7): 571-578.
<https://doi.org/10.1016/j.foodcont.2003.09.004>
- Ray TK, Huntin YJ, Murhekar MV (2009). Cutaneous anthrax, West Bengal, India. *Emerging Infectious Disease*, 15(3): 497-499.
<https://doi.org/10.3201/eid1503.080972>
- Shojaei H, Shooshtaripoor J, Amiri M (2006). Efficacy of simple hand-washing in reduction of microbial hand contamination of Iranian food handlers. *Food Research International*, 39(5), 525-529.
<https://doi.org/10.1016/j.foodres.2005.10.007>
- Thornton ML, Scallan AJ, Wong JHF (1997). Applying statistical process control to monitor and evaluate the hazard analysis critical control point hygiene data. *Food Control* 8:173-176.
[https://doi.org/10.1016/S0956-7135\(97\)00045-5](https://doi.org/10.1016/S0956-7135(97)00045-5)