SCENARIO OF SLAUGHTERHOUSES AND MEAT SELLING CENTERS IN DHAKA CITY

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June, 2019

SCENARIO OF SLAUGHTERHOUSES AND MEAT SELLING CENTERS IN DHAKA CITY

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REGISTRATION NO. : 12-04737

A Thesis

*Submitted to the Faculty of Animal Science & Veterinary Medicine,
Sher-e-Bangla Agricultural University, Dhaka-1207,
in partial fulfillment of the requirements
for the degree of*

MASTER OF SCIENCE (MS)

IN

ANIMAL SCIENCE

SEMESTER: JANUARY- JUNE, 2019

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CERTIFICATE

This is to certify that thesis entitled, "SCENARIO OF SLAUGHTERHOUSES AND MEAT SELLING CENTERS IN DHAKA CITY" submitted to the Faculty of Animal Science & Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE (MS) in ANIMAL SCIENCE, embodies theresult of a piece of bona fide research work carried out by MD. ABU JAFOR PK. Registration No. 12-04737 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that such help or source of information, as has been availed of during the course of this investigation, has duly been acknowledged.

_____

Dated:

Place: Dhaka, Bangladesh

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DEDICATED TO

My Beloved Parents

ACKNOWLEDGEMENTS

The author

SCENARIO OF SLAUGHTERHOUSES AND MEAT SELLING CENTERS IN DHAKA CITY

ABSTRACT

A field survey was conducted to investigate the scenario of slaughterhouses and meat selling centers of Dhaka city. About ten meat selling centers were included in this study. Data were collected from 130 meat shops in 10 meat selling centers. Data collection period was from June 2018 to February 2019. A total of 582 cattle and goat were slaughtered per day in 10 meat selling centers. The butchers slaughtered their animals at slaughter house, market place and nearby road side. The butchers purchased these slaughtering animals from Gabtoli, Amin bazar and Jatrabary markets. In all slaughterhouses, animals were found slaughtered in Mohammedam method. Bleeding of animals occurred in the drainage pit and on the ground during slaughtering. Time elapsed for flaying was about 30-40 minutes. Time required to transport the carcass from slaughterhouses to selling center was about 5-10 minutes. Time required selling all the meat after receiving to the selling centers was about 5 hrs. Average live weight of slaughtering cattle was 137.5 kg and goat 17.1 kg. The carcass weight of cattle was 78.6 kg and goat 8.9 kg. The proportion of carcass weight was 57% in case of cattle and 52% in case of goat. Price of cattle meat and goat meat was Tk. 492 and Tk. 757 per kg, respectively. All meat selling centers had proper ventilation and sunlight facilities but inadequate drainage system, water supply and provision of sewerage. By-products include blood, skin, hide, head, tail, lower fore and hind limb and stomach were thrown here and there in the meat selling centers. Preservation method of surplus meat was freezing in the refrigerator or supplied to the hotel. From this study it can be suggested that small scale slaughterhouses and meat selling centers need to be established in Dhaka city for hygienic meat supply for human consumption.

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LIST OF SYMBOLS AND ABBREVIATIONS

%=Percentage

SAU=Sher -e- Bangla Agricultural University

BBS=Bangladesh Bureau of Statistic

BC= Before Christ

CFU=Colony Forming Unit

e.g. =For example

et al. = And others

FAO=Food and Agriculture Organization

FMD=Foot and Mouth Disease

Ft=Feet

g=Gram

Hrs. =Hours

i,e,=That is

IU=International Unit

K.cal=Kilo calorie

Kg=Kilogram

Km=Kilometer

Mg=Milligram

Min=Minute

N=Total number of animals

Wt. = Weight

J. = Journal

etc. = Etcetra

CHAPTER I

INTRODUCTION

A slaughterhouse or abattoir is a facility where farm animals are processed for ingestion as food products. Slaughterhouses are the key element in the meat production and supply chain. Meat was the first important food that met up the hunger of ancient people living in cave.

Meat is an important livestock product which includes all those parts of the animals that are used as a food by man. Meat is the first important food that met up the hunger of people. The Summary of about 3000 BC are said to have been the first livestock breeders and dairymen and were among the first to make butter, salted meats and fish. Since similarities in disease possesses in man and animals were noted in early centuries, the inspection of slaughtering animals and marketing of meats were therefore introduced both in ancient Athens and in Rome. Meat declared condemned by inspectors was thrown into the river Timber (Schwabe *et al*., 1969).

General public slaughterhouses existed in ancient Rome. Slaughtering in public Slaughter houses was made compulsory in Germany in 1276 and meat inspectors were appointed to supervise quality meat.

To build up a fit nation sound and wholesome meat is essential and it plays an important role in keeping the human body in order by providing energy, health and vigor. It is the most concentrated and easily assailable nitrogenous food and is a good source of first class protein, as it contains essential amino acids for human life. Polyunsaturated fatty acids of meat are imperative for brain development; especially in the foetus. Meat can be regarded as an imported source of dietary vitamins and minerals. A vegetable diet in comparison with a meat diet is usually incomplete in essential amino acids, the vegetable proteins are less easily digested and remain in the stomach for a shorter period than meat protein with the result that a feeling of hunger recurs more readily (Gracy, 1986). Awareness about nutritive quality has dictated influencing consumption of more meat among the conscious people.

In developed countries, per capita daily intake of meat is more than 100 g, whereas in Bangladesh it is very low. Butcher meat is a valuable part of the human diet because (a) it is the most concentrated and easily assailable nitrogenous foods and is a good source of first class protein (b) it is stimulating to metabolism due to its high protein content (c) it is

satisfactory for the existence of fat in the diet and delays emptying of the stomach. (d) After suitable treatment which includes a palatable flavor, acts as a stimulant to gastric secretion and is easily digested. In spite of these facts the hygienic control of meat in Bangladesh is a primitive one. Since meat provides an excellent source of protein in human nutrition, the present scarcity of this protein in developing countries makes it necessary to produce, conserve and utilize meat supplies to the fullest possible extent. Keeping this in view, it is an accepted principle in meat hygiene practices that all meats for human consumption originating from food animals should be subjected to ante mortem and postmortem examinations. Meat inspection should be made compulsory. Experiences in developed countries have clearly shown that properly executed inspection services afforded a high degree of protection to consumers. Ante mortem and Postmortem inspection are therefore recognized as defenses to obtain a wholesome meat supply for human consumption and prevent danger to human health in all developed countries. Meat inspection Act and Regulations are enforced strictly to meet the purpose of getting sound and wholesome meat foods. It is unfortunate that the meat inspection service in this country is quite different from developed countries. Almost all public slaughterhouses are run and governed by municipal authorities. In a very few slaughterhouses either a veterinarian or sanitary inspector is deputed to supervise and examine dressed carcasses.

There is no practice of humane Slaughtering Act in Bangladesh. Animals which are transported to slaughterhouses do not have any limitations. Aged sickly animals and on the contrary very immature as well as some vigorous animals are also slaughtered. Here, only one Act is enforced which states that killing is not allowed on certain days of a week although there is relaxation which necessities prior permission from the concerned authorities. In Bangladesh the largest proportion of cattle and goats destined for the meat stalls are slaughtered by butchers at location of their convenience. The animals are walked from the live animals market to the slaughtering location. An accepted religious person is employed to perform the Halal ritual slaughter and the butcher's employees perform the tasks of flaying, dressing the carcass and offal preparation. Here the situation of meat production, supply and distribution in terms of handling, slaughtering and dressing of meat animal in Bangladesh takes place in a much disorganized way. Animals are slaughtered randomly and indiscriminately, in cities and towns although there are few slaughterhouses, but these are very poorly developed. Food animals such as cattle, buffalo, sheep and goats are brought to these slaughterhouses from long distances remote areas usually by driving on the hoof and by different roads and river transports. Since there exists no lairage

facility, animals waiting for slaughter do not receive any ante mortem care. The hygienic practice of ante mortem examination is not conducted. There is neither any enforcement of slaughtering and Meat inspection Act or regulation relating to hygienic production of meat as a result this highly nutritious food is handled, produced and distributed in a very insanitary condition.

There is no hygienic management of slaughter houses in Bangladesh. In Bangladesh slaughter animal gets very little priority from hygienic point of view and is done in an unhygienic way here and there and meat is prepared in dirty places allowing degradation of its quality. The main causes behind it are lack of well facilitated definite place for animal slaughter. In some cities and towns few slaughter houses are present, but in many cities it is totally absent. In view of proper management of slaughterhouses and meat selling centers in Dhaka city the present study was undertaken with the following objectives:

i) To investigate the scenario of slaughterhouses.

ii) To investigate of meat selling centers.

iii) To determine the facilities available in the slaughterhouses.

CHAPTER II
REVIEW OF LITERATURE

The contribution of livestock as a source of meat is recognized. The role of slaughterhouse and meat selling center are important for hygienic meat for human consumption. The management of slaughterhouses and meat selling centers are described below

2.1 Butcher's Bibliography

Age does not have any role in livestock rearing or transportation. However, young and middle aged person are more active and productive in keeping livestock than the aged groups. Male always dominates in livestock keeping and their marketing programs. It has been reported earlier that most of the innovators and/or investors in animal agriculture are young or middle aged (Ani, 2007). It has recently been reported that most of the livestock keepers are within lack of formal education (28%) or just finished primary education (28%). Secondary and higher secondary school completed, and graduate and/ or above are 22%, 15%, and 7%, respectively. Thus, majority (73%) of the respondents have at least primary education. The fact that most of them are literate is advantageous to the adoption of any innovation meant to improve livestock keeping in the study area (Agwu and Anyanwu, 1996) have reported that increased farmer education is positively influenced adoption of improved practices. The transport of animals can have three types of influence on their lives. First, the handling, loading, and novelty of the transport environment and experience can induce a psychological stress response in animals. Second, the withdrawal of feed and water and the need to stand and maintain balance for transport periods can cause a physiological and fatigue challenge to the animals. Finally, the thermal and physical conditions of the vehicle and journey can present a risk to the physical integrity of the transported animals. Moreover, a group of personnel such as farmer, transporter, and butcher are directly involved in livestock rearing program.

2.2 Knowledge on slaughterhouse

(Otter, 2008) described the term "slaughterhouse" originally did not refer to a specific structure used for slaughtering animals. It referred to any building where animal slaughter took place (such as a butcher's shed)

Slaughterhouses are included into the food industry by the Spanish CNAE 2009(National Classification of Economical Activities). Food industry corresponds to division 10, and slaughterhouses fit class 10.11, "Processing and preservation of meat" (Spanish Government, 2007)

The EU defines slaughterhouses as any premises, including facilities for moving or lairaging animals, used for the commercial slaughter of animals, ruminants, pigs, rabbits and poultry (European Commission, 1993)

The slaughterhouse emerged as a unique institution in the early nineteenth century as part of a larger transition from an agrarian to industrial system, accompanied by increased urbanization, technological developments, and concern about public hygiene. Prior to that point, animals were slaughtered for consumption in diverse places, such as backyards. Beginning in the eighteenth century, reformers argued that "public slaughterhouses" would be preferable to "private slaughterhouses" (the term referred to any structure in which animals were slaughtered for human consumption, e.g., a butcher's shed) because they would remove the sight of animal slaughter from public places and indiscreet private slaughterhouses, they could more easily be monitored, they were generally considered more spacious and clean (Otter 2008), and reformers argued that the state should be regulating morally dangerous" work (MacLachlan, 2008).

The abattoir, invisible but not secret, may have been built in response to concerns about activility, or feelings of deep repulsion, but it in turn created the conditions under which true disgust can be felt (Otter, 2008).

(Remy, 2003) point out that modem humane slaughter requirements in the slaughterhouse have resulted in contradiction or tension whereby it is acknowledged that the sentient creatures being killed are worthy of protection.

2.3 Present status of slaughterhouse

There is no practice of humane, slaughtering method. Most animals are slaughtered according to Halal method. Slaughtering animals transported to slaughtering premises do not have any restrictions. One can see on the one hand very aged and sickly or emaciated animals and on the other hand very immature and healthy animals. This depicts the fact that due to lack of enforcement of Slaughtering Act, food animals of different ages are killed indiscriminately without giving due to consideration to the microbiology hygienic quality status of meat supply to consumers which may lead to the potential health hazard.

In this country only one act is enforced which states that killing of animals is not permitted for two days in a week with relaxation which necessitated prior permission from the municipal authorities. In Bangladesh, there are many self-mode field abattoirs. In rural and urban areas, towns and even in cities slaughtering of animals in still done by unauthorized and authorized butchers in fields, bushes, and backyards or in some open street corners, where killed animals are eviscerated and dressed. The dressed carcass is made into various cuts and sold to consumers. Ante Morten & postmortem examinations are not at all practiced and they do not form integral parts and many a times people purchase meat which cannot ensure protection to consumers from the effect of potential health hazard of interior quality meat.

2.4 Environment protection of slaughterhouses

There are several important environmental issue associated with slaughterhouse. Hygiene standards should be addressed in treating, handling and storage of animals and meat in all stages of the production process. Maintenance of high standards of cleanliness throughout the slaughterhouse should be followed. Regular hygiene and animal health checks should be carried out at all stages of the process, including for example:

- Inspection of live animals by a veterinarian prior to slaughter.
- Inspection of carcass following slaughter.

The operations area in slaughterhouse pose various risk to employees as a result of slippery floors and surface caused by oil and fat deposits as well as through the use of sharp utensils and equipment. The wastewater may contain organic materials and nitrogen as well as such pathogens as salmonella and shigella bacteria, parasite eggs, and amoebic cysts. Pesticide residues may also be present from treatment of animals and their feed while smoking operations can release toxic organics in the air. These factors all poise a treat to the health of the employees as well as the residents nearby. Slaughterhouses usually use large quantities of water for washing meat and cleaning processing areas. Effluent produced during the slaughtering process may generate pollution problems due to the high content of animal fat, waste, blood and any cleaning detergents. The effluents from slaughterhouse need to be treated and usually requires hot water spraying to dislodge fats that have accumulated in the on-site drainage system Slaughterhouses also release large amounts of substances into the atmosphere. These include odor as well as chlorofluorocarbons (CFCs). It may be used in refrigeration or freezer plant. CFCs are ozone depleting substance and their production and use is now subject to national and

international regulations. Atmospheric odor is also a major problem associated with slaughterhouses. The main sources of atmospheric odor are:

- Animal waste (rumen injesta, digested feed materials in intestine, blood) unprocessed materials and any other solid waste.
- In the animal by-product rendering process, odor may be generated.
- From cooking activities via leaking ducts on the processing equipment.
- Untreated effluent.

Odor control may be a significant issue, particularly when the slaughterhouse is located near residential areas or in hot environment. Ammonia based refrigeration systems may be required for cooling. The disposal of solid waste, which includes animal waste as well as other waste, is also an environmental issue associated with slaughterhouses. These unwanted remains must be disposed of a hygienic manner approved by the health authorities.

2.5 Impact of meat preservation and processing

With regard to providing consumers with adequate quantities of quality meat and meat products, one aspect is becoming increasingly important, namely, the processing of products based on meat as a row material. Appropriate processing techniques offer the opportunity of overcoming the two main constraints to a better supply of livestock products availability and price.

2.6 Meat hygiene and inspection

Meat hygiene may therefore, be defined as that part of the regimen of food hygiene which concerns with the procurement of whole some meat foods for man, their value to public health, quality control and quality assurance programs, hazard analysis, critical control point determination as well as arising out damages which threaten consumers of diseased or unsound meats and meat products. With regard to further processing of meat, one important aspect that is widely neglected in developing countries must be stressed. Both modern and traditional meat processing methods require that raw meat of good hygienic quality is supplied to the meat processors through abattoirs. Unfortunately, the abattoir sector does not keep space with new developments in the processing sector. Meat processing methods is usually a private enterprise while abattoirs are often publicly run or public facilities leased to private entrepreneurs. The recent change to market economies in

many countries has only exacerbated the problem, since a great number of small hygienically unsatisfactory slaughtering facilities, mostly, run by private business, have opened up. It has also been observed that reasonably good central abattoirs have been abandoned slaughterhouses because of lower costs resulting from the absence of expensive hygienic facilities and proper meat inspection. This development is clearly detrimental to any progress in meat processing. It is often the case that meat processors.

Another issue often neglected in developing countries is that of adequate meat inspection. The principal reason for meat inspection is to protect consumers from zoonotic diseases. It has also been introduced in order to condemn those carcass parts that are heavily contaminated or have undergone unfavorable biochemical changes and are therefore not suitable for further processing (FAO, 1994).

The hygienic control of meat in market and food serving establishments is an indispensable part of general food control measures, the object of which is to ensure that the consumer obtains foods as far as possible are fresh and unadulterated at the time of sale (WHO, 1997). In spite of this fact the hygienic control of meat in Bangladesh is primitive one. The meat inspection service in this country is quite different from developed countries. Lack of enforcement of slaughter Act, food animals of different ages are killed indiscriminately without giving due consideration to the microbiological implication in handling, slaughtering and dressing of animals and to the hygienic quality status of meat supply to consumers which may lead to the potential health hazard.

(Sankaran *et al*., 1975) observed that total bacterial count, thermopiles coliforms and staphylococci, streptococci and molds in dressed carcass of the local slaughterhouse. They founded that initial bacterial load per gram of meat sold in the local market varies from 1.5 x 10 to 1.6 x 106. The minced meat had a higher no. in total count that ranged from 7.7 x 10' to 7 x 106 no. significant correlation ship was established between log total plate count and log streptococci indicating that the later could be taken as an index of bacteriological quality of meat. Pseudomonas, microscopes and bacillus were the common contaminating bacteria present in the carcasses.

(El-Bassiouny and Samaha, 1991) examined body swabs and sewers swats to determine role of abattoir effluents in contaminating carcass with some food poisoning bacteria.

Salmonella typhimurium, salmonella enteritidis and salmonella Newport were isolated from meat at a rate of 2%, 2% and 4% respectively. The same bacteria were also isolated from sewer swabs at a rate of 10%, 5% and 5% respectively. Staphylococcus was detected in 75% sewer swabs and 10% of carcass swabs and escherichia coli was isolated at a rate of 80% and 100% from caresses and swabs respectively.

(Perieto *et al*., 1991) studied the bacterial counts from these sites neck, brisket and leg of lamb carcass. After slaughter mean count of mesophiles (30°C) was 4.96 logo CFU/cm2. The mean values of mesophiles and psychrotrophs associated with spoilage were loglo 7.4 CFU/cm2 and log,o 7.95 CFU/cm2 respectively. The brisket and legs were the most contaminated areas. Percentages of bacteria recovered by crapping were higher than those obtained by swabbing (about 20%) CFU (Colony Forming Unit).

(Rao *et al*., 1992) revealed that careful handling at the different stages of sheep processing reduced the level of microbial contamination of carcass. Processing steps stich as evisceration and washing did not increase the microbial counts on the carcass surface. Sources of microbial contamination in the abattoir were skin, floor washing, intestinal contents and gambrels. Seasons of the year did not have any effect on the microbial contamination of carcasses.

Since meat provides excellent sources in human nutrition, the present scarcity of this protein in developing countries makes it necessary to produce, conserve and utilize meat supplies to the fullest possible extent. Keeping this in view it is an accepted principle meat hygiene practices that all meats for human consumption originating from food animals should be subjected to ante mortem and postmortem examinations.

Meat inspection should be compulsory and experience in developed countries has clearly shown that properly executed inspection service affords a high degree of protection to consumers. Veterinarians are recognized for their expertise in maintaining the health of animals and provide leadership worldwide in protecting people from disease acquired as a result of eating foods of animal origin (Hubbert *et al*., 1996).

Antemotem and post mortem inspection are therefore, recognized as defenses to obtain a whole some meat supply for human consumption and prevent danger to human health. In

all developed countries meat inspection act and regulations are enforced strictly to meat the purpose of getting sound and wholesome meat foods

2.7 Marketing system of livestock and their products

A marketing system includes all activities involved in the flow of goods from the point of initial production to the ultimate consumer. It includes the exchange activities associated with transferring properly rights to communities, physically purchasing and allocating resources, handling products, disseminating information to participants and making institutional arrangement for facilitating these activities (Amir and Knischeer, 1989).

Meat marketing starts from the producers who sell the animals at their own homesteads or in the livestock markets and ends with the consumers purchasing meat from butchers.

2.7.1 Marketing channel

The chain of intermediaries or middlemen through which the transaction of goods takes place between the producer and to the ultimate consumer is known as a marketing channel. It is the pipeline through which a products flows on its way to the consumers. In other words marketing channel refers to the sequential arrangement of various marketing intermediaries involved in the movement of products from production to consumer (Rashid, 1969).

In the process of beef cattle marketing no. of important operations were performed at different stages by a series of intermediaries or middlemen who linked the producers of beef cattle with the butcher.

(Hasan *et al*., 2004) has done the work on management system of slaughterhouses and meat selling centers in Mymensingh, reported that the animals were slaughtered adjacent to dwelling house, road side, market place, open field etc. The live weight of slaughtering cattle and goat was 138 kg and 15 kg respectively. He observed the dressing percentage of slaughtered cattle and goat were 50% and 40% respectively

(Hossain, 2004) reported that most of the places in Bangladesh animals were slaughtered in unhygienic way. He found the live weight of slaughtering cattle was 137 kg.

(Rahman, 2001) mentioned the dressing percentage for bull 58 to 65, cows 55 to 60, sheep and goat 45 to 55 percent respectively.

(Moniruzzaman, 2002) and (Das, 2001) reported that the dressing percentage of Black Bengal goat was 41.48 % to 43.73%.

(Faruque, 2004) reported dressing percent of Black Bengal goat between 181 and 365 days of age was 46.4%.

(Amin, 2009) reported 42.44% for crossbred goat (Black Bengal X Jamnapari),
M. N. Amin reported that the total quantity of waste produced from slaughter houses were 2888.45 tonnes/year in Khulna city corporation area of Bangladesh. The management of that volume of waste was found unsatisfactory by most of the stakeholder groups due to fail the conservation of public health and ecosystem of the local community. He recommended three separate designs of the conventional bio machination plant and a potential biogas production model for slaughterhouse.

(Adzitey, 2011) described that poor animal handling has adverse effects on the animal, carcass and meat quality. Poor quality animal and meat will have poor processing properties, functional quality, eating quality, and more likely to be unaccepted by consumers. Developing countries also take interest in proper pre-slaughter handling of animals due to their beneficial effect on meat and carcass qualities.

(Perez *et al*., 2002), (Santos *et al*., 1997), (Warriss *et al*., 1995) observed that "A lairage period of two to three hours is necessary to recover from transport stress, because of reduced meat quality with shorter lairage times Various pre slaughter handling routines for reindeer, such as gathering and herding, selection, feeding, road transport and lairage, imply stressful events which can affect glycogen stores in muscle and hence meat quality. During a 3 day helicopter drive (20 km/day), they found no negative effects on glycogen stores or ultimate pH values. Lorry transport of reindeer over various distances (from 0 to 1000 km) did not cause any increase in ultimate pH values in bulls and calves, though cows did show a slight increase in PH. A 2-day pre-slaughter waiting period at a slaughterhouse, where the reindeer were fed hay and water, caused no deleterious effects on muscle glycogen content or PH. (Malmfors and Wiklund, 2012).

Meat is an important source of protein and a valuable commodity in resource-poor communities. In many developing countries, lack of appropriate slaughtering facilities and unsatisfactory slaughtering techniques are causing unnecessary losses of meat as well as invaluable by-products from animal carcasses. Slaughtering places are frequently contaminated and may not be protected against dogs, rodents and insects. Meat products coming from such conditions are often deteriorated due to bacterial infection or contaminated, which may cause food poisoning or diseases in consumers. In many developing countries, regulations concerning meat inspection and/or control are inadequate or non-existent allowing consumers to be exposed to pathogens including zoonotic parasites (Adzitey and Hud, 2012).

(Adzitey and Hud , 2012) described "Due to the lack of implementation of the Meat Inspection Act and resultant absence of meat inspection, meat from sick or parasite-infected animals is serving as a source of infection to humans as well as other animals". A number of factors including the genetics of the animal, production practices, age of the animal at slaughter and how live animals are handle prior to and during slaughter contribute significantly to meat quality. Apart from these, post-slaughter practices also influence meat quality to an appreciable extent.

(Stephen Wiedemann and Mingjia Yan, 2014) investigated four different approaches for handling co-production between meat and non-meat co-products; allocation based on either i) biophysical / protein utilization (BIO); ii) economic value (ECON); system expansion (SE), and a hybrid approach utilizing both biophysical allocation and system expansion (BIO-SE). The impact from processing varied depending on species and impact category, but for all species, the choice of method used to handle co-products had a substantial impact on results. Carcass and human edible yield is also discussed as an important consideration when comparing meat products at intermediate stages in the production supply chain.

(Cederberg *et al*., 2009) has reported results using a carcase weight (CW) or even a boneless meat functional unit, creating a mismatch between the functional unit and system boundary. This approach induces two errors; firstly it fails to include impacts associated with the meat processing stage of the supply chain and associated transport.

It is well documented that consumers cannot be categorized based on one type of behavior. Both their behavior and their context interact, i.e. consumer behavior is shaped by their needs and what is available to meet their needs. However behavior is strongly influenced by the psychological factor perception. (Korzen and Lassen, 2010) described how perceptions of meat qualities vary between contexts. In relation to meat, the authors described two contexts such as the "everyday context" (relating to buying, preparing and eating) and the "production context" (relating to primary production, slaughtering and meat processing).

Perception not only relates to basic senses such as visual, flavor and taste attributes, but also to formed learning or experiences. Some of our non-cognitive learning mechanisms such as conditioning and imitation are predominant in the early formation of food habits. Therefore, perception incorporates complex aspects of consumer behavior such as learning, motivational and contextual factors. Various models and theories have been developed and are discussed by (Koster and Mojet, 2007).

Consumer perceptions are not fixed and may change. How and in what direction consumer perceptions change is difficult to predict because of the complex dynamic which drives the change. (Grunert, 1997) reported that the extrinsic and intrinsic quality cues infer specific quality attributes and that these are quite similar across a number of countries. The consumer therefore forms the decision to purchase meat on the basis of a large number of cues (price, label, brand, appearance, and type of cut) which in turn signposts the quality of the meat in forms of attributes (tenderness, flavour, freshness, and nutrition). Despite our knowledge on the type and importance of meat quality attributes, consumers still have difficulty in accurately predicting experienced quality by perception at the point of purchase (Grunert *et al*., 2004)

(Grunert *et al*., 2004) detail the Total Food Quality Model with respect to meat and describe the various intrinsic and extrinsic quality cues perceived by the consumer. Intrinsic quality cues are those which are physically part of the product itself (e.g. marbling, colour) while extrinsic cues are not physically part of the product (price, origin).

(Verbeke and Vackier, 2004) found several segments of Belgian consumers to be worried about antibiotics in fresh meat, and those concerns were ranked first when compared to other meat safety risks (namely dioxins, BSE and harmful bacteria). (Miles *et al*., 2004)

found more than 50% of the surveyed UK consumers to be extremely worried about the use of antibiotics in animal production. (Krystallis and Arvanitoyannis, 2006) describe a cluster of Greek consumers particularly concerned about meat chemical safety (i.e. its content in antibiotics and hormones). Concerns about this specific chemical hazard are also mentioned in reports about consumer's perceptions about poultry meat and pork meat (Glitsch, 2000). Estimated a positive willingness to pay among Danish consumers for pork produced under tighter rules regarding the use of antibiotics (Morkbak and Ledward, 2010).

There is growing need for finding of the solution for safe disposal of animal by-products by their utilization and processing into animal feeds and bio fuels because of the intensive livestock production and increase of capacities of industrial slaughterhouses, building of new small slaughterhouses, of meat processing plants and increase of the volume of international trade of commercial animal products (Okanovie *et al*., 2006).

With respect to realization of this, arises the necessity of organized collection, storage and disposal of animal by-products from slaughtering, by their technical processing in specialized plants, which produce from this raw material (depending on category foreseen in the Directive EU 1774/2002) high-quality animal feed or raw materials for bio-fuel production (biogas, biodiesel) with the complete protection of the environment (Ristie and Okanovie ,2007) and (Okanovie *et al*., 2006). With respect to the facilities for animal wastes processing, they should fulfil two basic functions such as to protect the environment from pollution cause by animal wastes and to generate sanitary safe products and, during the designing of the facility and during its regular operation, as well as during the unwanted incidents, to implement regular measures for protection of the environment. (Ristie and Okanovie, 2007).

Producers, sellers and safety authorities have more and better information about the potential hazards and the dimension of risk associated with the consumption of a given food product. The asymmetry can be associated with the (intentional or not) unavailability of information for consumers, but also with differences between scientific evidence and consumers' perception (Miles and Frewer, 2004) and (Yeung and Morris, 2001).

To ensure food safety at slaughter, additional measures to the traditional meat inspection procedures are required, in particular because healthy food-producing animals can be carriers of important bacterial pathogens causing human illness (Norrong and Buncic, 2008) and (EFSA/ECDC, 2014). They must apply compulsory self-checking Programs following the hazard analysis and critical control points (HACCP) approach. For assessment of process performance, analysis of the slaughter process is of central importance.

To enable risks involved to be estimated and appropriate measures to be taken, slaughter process analysis most also include abattoir-specific microbiological data on carcass contamination during slaughter (Spescha, *et al*., 2006) and (Milios *et al*., 2014), especially because carcasses might be contaminated despite the absence of visible contamination (Gill and Jones, 2004). For verification of slaughter hygiene conditions in the daily practice, the microbial status of carcasses is often determined by monitoring indicator organisms on carcasses at the end of slaughter (Brown *et al*., 2000) and (Zweifel, 2007).

Meat safety is a complex concept, as there are many hazards and challenges to be considered. Hazards include microbial pathogens, resistance to antibacterial, food additives, chemical residue and other possible contaminants, to name a few (Knowles *et al*., 2007). Meat safety challenges involve traceability issues, pathogen and chemical residue detection problem, regulatory issues, addressing consumer concerns etc. (Sofos, 2008).

CHAPTER III
MATERIALS AND METHODS

3.1 Selection of study site

Study areas were the slaughterhouses and meat selling centers of different markets of Dhaka city. These markets were Town Hall market, Mohammadpur kacha bazar(krishi market), Taltola kacha bazar, BNP bazar, Kawran bazar, Kaptan bazar, Gopibug bazar, Hazaribug kacha bazer, Zigatolla noton bazar (sazek garden kacha bazer),and Hazrat Shah Ali City Corporation Market, Mirpur 1.

3.2 Parameters in interview schedule

The interview schedule was arranged to fulfill the objectives of the study. The details of interview schedule are presented in Appendix 1. The interview schedule contained both closed and open form of questions. These questions were set chronologically, so that the butcher/respondent/sellers could provide data in a systematic manner. The interview schedule initially prepared was pre tested with 3 butchers before using it for final collection of data. This pre-testing facilitated the investigator to observe the suitability of different questions and statements of schedule necessary correction, additions and rearrangements were made in the interview schedule based on the pre-tested experience. The survey schedule was then copied in its final form for the collection of data.

3.3 Data collection

The data were collected from Jane 2018 to February 2019. Data were collected from the certain slaughterhouses and meat selling centers through personal interview. Desired rapport was recognized to each respondent, so any respondent failing to understand any question, care was taken by the researcher to explain the situation. The data were collected from 10 meat selling centers in Dhaka city. Duration of data collection was 8 months (240 days).

3.4 Variables and their measurements

The selection of variables and their sizes constitute an important task in research work. The researcher selected some characteristics of slaughterhouses and meat selling centers as the variables of this study. The characteristics are described below: Slaughterhouses, number of animals slaughtered/market day, Inspection and certification method, Age and

sex of the animals, Live weight of the animal, sources of collecting animals for slaughter, pre-slaughter care of animals, slaughter methods, bleeding and flaying, time elapsed between flaying and transportation to selling center, means of transport and time required, hygienic condition of selling center, displaying the carcass in the market, carcass weight and price of meat/kg, time required to sell meat, salvation methods of surplus meat, opinion of the butcher.

3.4.1 Slaughterhouses

The whole characteristics or abilities of slaughterhouse were observed and then noted. These characteristics were included: types of slaughterhouses, provision of light, drainage facility, provision of sewerage, general hygiene, size of abattoir in relation to no of animals slaughtered daily, water supply, slaughtering space, flaying space and nature of floor.

3.4.2 Number of animals slaughtered/market day

Totals number of animals slaughtered per shop day was recorded. Animals included were cattle and goats, sometimes sheep, buffalo etc.

3.4.3 Inspection and certification method

The examination and certification method of the markets were observed and then recorded with the help of the butcher/sellers.

3.4.4 Age and sex of the animals

Ages of the animals were estimated through dentition (Miller and Robertson, 1959). Teeth were inspected directly by aparting two jaws and occasionally it was respondent or butcher dependable. Sex of the slaughtered animals was recorded by direct observations and sometimes with the help of respondents.

3.4.5 Live weight of the animal

Live weight of the animals was measured by Shaeffer's formula (McNitt, 1983). Shaeffer's formula ($W = L \times G2/300$) lb is most useful for zebu cattle within 5% accuracy where, W = weight of the animal, L = length from the point of shoulder to pin bone (inch) and G= heart girth (inch).

3.4.6 Sources of collecting animals for slaughter

Different kind of sources of collecting animals for slaughter was recorded directly from the respondents.

3.4.7 Pre-slaughter care of animals

What kind of pre-slaughter care to be taken of slaughtered animals was recorded directly from the respondent.

3.4.8 Slaughter methods, bleeding and flaying

The methods of slaughtering, bleeding and flaying were recorded with direct observations.

3.4.9 Time elapsed between flaying and transportation to selling center

How long time does it require between flaying and transportation to selling centre was recorded directly from the respondent.

3.4.10 Means of transport and time required

Means of transport and how long time does it requires to bring meat from abattoir to selling center was recorded directly from the respondents.

3.4.11 Hygienic condition of selling center

Hygienic condition of the selling center was observed and then recorded.

3.4.12 Displaying the carcass in the market

How does the butcher/seller display the carcass in the market was observed and then recorded.

3.4.13 Carcass weight and price of meat/kg

Carcass weight was measured in kilogram. It excluded blood, horns, hooves, stomach, rumen content, intestine, gall bladder, genital organ, feet and hide & skin. Meat price were calculated in Taka per kg of meat in case of cattle and goat (sometimes sheep, buffalo) separately.

3.4.14 Diseases found in slaughtered animals

What kind of diseases to be found in slaughtered animals was recorded directly from the respondent.

3.4.15 Time required selling meat

How long time does it require to sell meat soon after carrying to selling center was recorded directly from the respondents.

3.4.16 Important sources of contamination of meats

The important sources of infection of meats in the slaughterhouses and meat selling center were observed and then recorded.

3.4.17 Preservation methods of surplus meat

What type of preservation methods to be used in cases of surplus meat was recorded directly from the respondents.

3.4.18 Preventive measures of contamination during slaughtering

What kind of preventive measures of contamination to be taken during slaughtering were recorded directly from the respondents.

3.4.19 Different means and materials for meat preservation

Different means and which materials to be used for meat preservation were recorded directly from the respondents.

3.4.20 Opinion of the butcher

Butcher's opinion about their problems in the process of meat selling and environment pollution was taken. Suggestions to overcome their problems and improvement relating environment was recorded.

3.4.21 Killing season

Which season increase or fewer animals slaughtered recorded directly from the respondents.

3.4.22 Presence of dog

There was presence of dog observed by visual inspection.

3.4.23 Site of slaughter

Condition of the site of slaughter by visual inspection.

3.4.24 Dragging the carcass after killing

When dragged the carcass recorded directly from the respondents.

3.4.25 Bleeding

Bleeding after slaughtered is complete or incomplete recorded directly from the respondents.

3.5 Statistical analysis

The survey on different parameters in this study were exploratory descriptive. Therefore, data were compiled, tabulated and analyzed with simple statistical method to fulfill objectives of the study. Tabular technique was applied for the analyses of data using simple statistical tools like average, percentages etc.

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Number of animals slaughtered per day and their age and sex

Number of animals slaughtered per day and their age and sex in each meat selling centers are presented in Table 1. Out of the 10-meat selling centers in Dhaka city, higher number of animals were found slaughtered per day in Kaptan bazar. The lowest numbers of animals were found in BNP bazar and Taltola kacha bazar. A total of 582 animals were slaughtered per day in 10-meat selling centers in the study area. Out of 582 animals, 182-cattle, 400-goat and a few numbers of sheep and buffalo. The average number of callte and goat slaughtered per market day was 58.2. As regards species, goat was slaughtered in the highest number. Sex of the slaughtered cattle animal was male-132, female-50 and number of goat male 180, goat female 94.

In kawran bazar numbers of slaughtered animal depend on order. Most of them are whole seller. Whole seller sells meat before the sunset. Age of the slaughtered animals were calculated in the 10 -meat selling centers, animals age of two to four years, cattle slaughter in average age 3 years. Age of the slaughter goat was 1 to 2 years and average 1.5 years. Out of 10-meat selling centers higher number of shops in used were found per market day in Kaptan bazar and the lowest number of shops in used were found in Taltola and BNP bazar. In Kawran bazar meat selling center found buffalo meat. In BNP bazar, Hazaribug kacha bazar and Zigatola notun bazar goat were not slaughtered.

(Hossain, 2002) described the Irrespective of slaughtering sites the percentage kill is highest in cattle. According to species, cattle were slaughtered in the highest number of meat selling centers (Kawran bazar, Kaptal bazar, Hazaribug kacha bazar, Mohammadpur kacha bazar (krishi market) and etc. that is 76% and goat was 17%. The present study showed the percentage slaughter is highest in goat. According to species, goat was slaughtered in the highest number of meat selling center that is 69% goat and cattle were 31%.

Table 1. Number of animal slaughtered per day and their age and sex

Name of the selling center	No. of shop	No. of animal	No of animal slaughter per day						
			Cattle			No. of animal	Goat		
			Sex		Age		Sex		Age
			Male	Female	2-4 years		Male	female	1-2 years
Town Hall market	13	20	11	9	2-4 years	35	25	10	1-2 years
Krishi market	8	11	5	6	2-4 years	25	14	11	1-2 years
Taltola kacha bazar	3	3	2	1	2-4 years	2	2	-	1-2 years
BNP bazar	3	4	2	2	2-4 years	-	-	-	-
Kawran bazar	23	Nearly 40(depend on order)	30	10	2-4 years	48	37	11	1-2 years
Kaptan bazar	42	60	50	10	2-4 years	274	180	94	1-2 years
Gopibug bazar	4	4	3	1	2-4 years	3	2	1	1-2 years
Hazaribug kacha bazer	7	11	7	4	2-4 years	-	-	-	-
Zigatolla noton bazer	5	9	7	2	2-4 years	-	-	-	-
Hazrat Shah Ali market	22	20	15	5	2-4 years	13	10	3	1-2 years
Total	130	182	132	50	30	400	270	130	15
Average	13	18.2	13.2	5	3	40	27	13	1.5
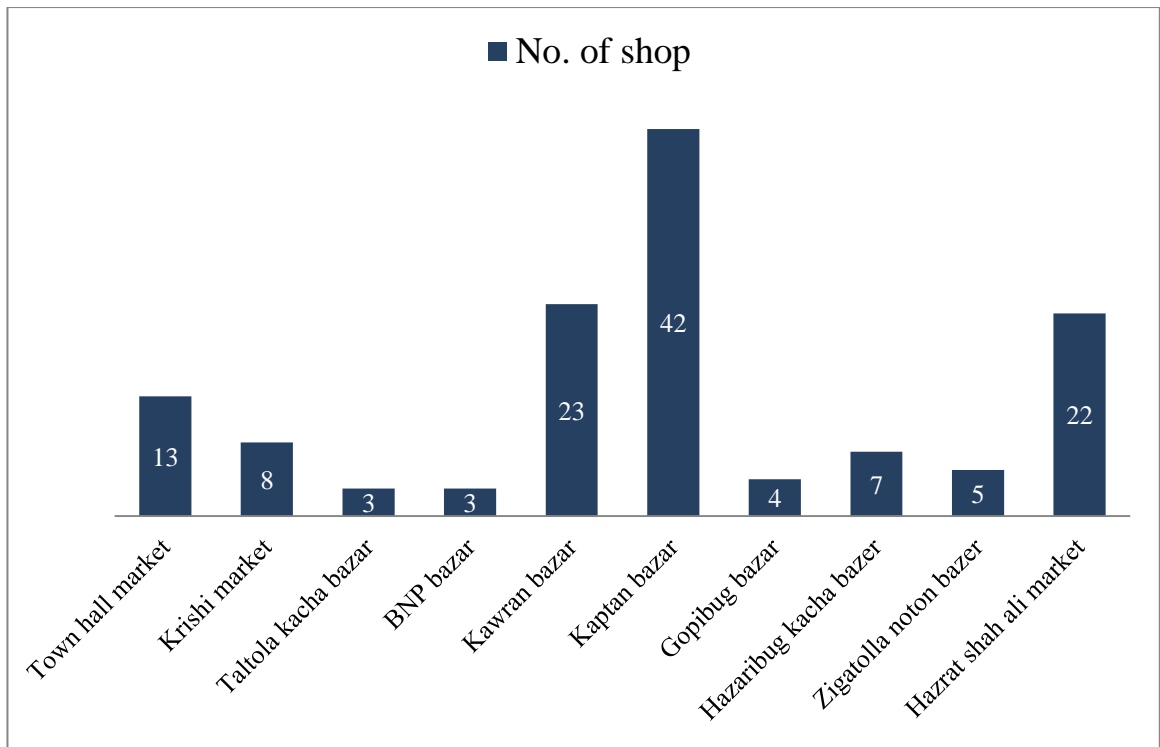
Figure 1. Number of shops in 10- meat selling centers

(Hossain, 2002) described the age of the slaughtering animal and calculated the percentage of 56% animal having 2-3 years, 19% having four to five years, 1.99% having 6 years. The present study showed the age of the slaughtering animal was calculated the percentage of cattle having 2-3 years (average 3 years) and goat 1-2 years (average1.5).
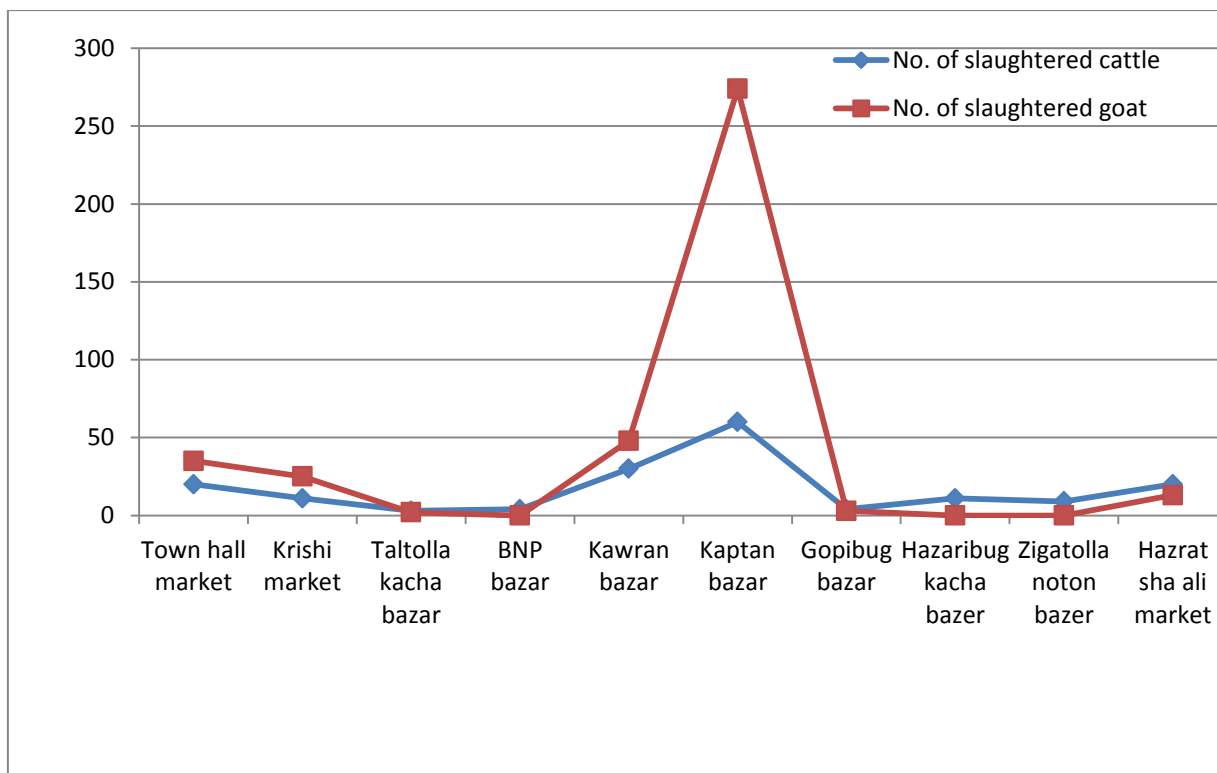
Figure 2. Number of slaughtered animal in 10- meat selling centers

4.2 Description and collection of animals for slaughter

Description and collection of animals for slaughter are presented in Table 2. In the Dhaka city 10-meat selling centers, Town Hall market, BNP bazar, Taltola kacha bazar, Hazrat Shah Ali market, Kaptan bazar, Kawran bazar,Gopibug bazar, Zigatola notun bazar and Hazaribug kacha bazar were slaughtered their animals in the market place even rode side. There were slaughterhouse in Kaptan bazar, Hazaribug kacha bazar and Hazrat Shah Ali city market. In Kaptan bazar, Hazaribug kacha bazar and Hazrat Shah Ali city market are going to renovate modernize slaughterhouse. In Mohammadpur krishi market slaughtered their animals at Mohammadpur slaughterhouse under Dhaka North City Corporation.

Provision of light in most of the slaughterhouses was adequate. The drainage facilities of the slaughterhouses were found in the pit, channel and slope type. Many slaughterhouses were not found drainage facilities. Sanitation and water supply in the maximum slaughterhouses found inadequate.

The collection of slaughtering animals, mode of transport for slaughtering animals is presented in Table 2. Out of 10-meat selling centers, Town Hall market, BNP bazar, Taltola kacha bazar and Hazrat Shah Ali city market collected their animals from Gabtoli. No slaughtering process occurred in Hazaribug kacha bazar. They collected slaughtered animals from Rayer bazar or Mohammadpur krishi market. Mohammadpur krishi market collected their animals from Gabtoli or Jatrabary. In Kawran bazar they collected their animals from Gabtoli, Amin bazar and Jatrabary. In Kaptan bazar collected their animals from Kaptan bazar and Gabtoli. In Zigatolla notun bazar collected animals from Rayer bazar. In Gopibug bazar collected animals from Kaptan bazar. All slaughtering cattle were transported from market by labour on foot, pick up van and the slaughtering goat were transported by on foot, pick up van and van.

Table 2. Description & collection of animals for slaughter

Name of the selling centers	Collect form		Mode of transportation	
	Village	Market	cattle	Goat
Town Hall market	-	Gabtoli	On foot	On foot
Krishi market	-	Gabtoli, jatrabary	Pick up van	Pick up van
Taltola kacha bazar	-	Gabtoli	On foot	Pick up van
BNP bazar	-	Gabtoli	On foot	-
Kawran bazar	-	Gabtoli, amin bazar & jatrabary	On foot, pick up van	Van
Kaptan bazar	-	Kaptan bazar, gabtoli	On foot	On foot
Gopibug bazar	-	Kaptan bazar	On foot	On foot
Hazaribug kacha bazar	-	Krishi market, rayer bazar	On foot	-
Zigatolla notun bazar	-	Rayer bazar	On foot	-
Hazrat Shah Ali city corporation market	-	Gabtoli	On foot	Pick up van

4.3 Certification methods in meat selling centers

Sometimes Veterinarian doctors come in the market and they observed meat quality meat price, animal's age and condition of health. Veterinarian came every day in Mohammadpur krishi market, Kaptan bazar, Gopibug bazar and Zigatola notun bazar. In Taltola kacha bazar veterinary doctor came every two months after. In BNP bazar doctor came every Friday. Sometimes inspectors visit the market. They come from Dhaka North and south city corporation. They observed meat quality and butcher license.

4.4 Pre-slaughter care of animals

Out of 10-meat selling centers, more or less all selling centers were found applying same pre-slaughter care of animals. They cleaned dust, dung etc. on the skin and hide with water. They purchased the animals before average 1- day of slaughter. They stop feeding before 12 hrs. of slaughter but plenty of clean drinking water is made available before the animals waiting for slaughter.

4.5 Slaughtering methods, bleeding, flaying, means of carcass transportation, time required to transport the carcass, time required to sell meat

Activities in slaughterhouses and meat selling centers are presented in the Table 3. In some slaughterhouses, animals were slaughtered in Mohammedan method by labor. Out of 10 slaughterhouses, most slaughterhouses were found bleeding in the drainage, floor or on the ground. Most of the slaughterhouses flaying of cattle was done on the concrete floor or on the ground with knife. In slaughterhouses flaying of goat was done by hanging condition or on the concrete floor following fishing and pulling method.

Time elapsed between flaying and transportation to meat selling center was found 30-40 minutes in case of all slaughterhouses. After flaying, carcass of animal's transportation from slaughterhouse or slaughter places to selling center were found by hand of labor, van and rickshaw etc. Out of 10-centers maximum time required to transport the carcass from slaughterhouse to selling center were found 30 minutes in case of Hazaribug kacha bazar selling center and the minimum time required one minute most of the selling centers. Time required to sell meat after receiving to the selling centers are presented in Table 3. Highest time (average 8 hrs.) is required in case of cattle in Taltola kacha bazar meat selling and lowest (average 4 hrs.) is required in Town Hall market, krishi market and Kaptan bazar meat selling centers. Highest time (average 6 hrs.) is required in case of goat in Taltola kacha bazar and lowest time (average 2 hrs.) is required in two meat selling

Table 3. Activities in the slaughterhouses and meat selling centers

Name of the selling centers	Bleeding	Flaying position		Means of carcass Transportation from slaughterhouse to selling centers		Average time required from slaughter to selling centers (min)	Average time required to sell meat after receiving in the selling centers (hrs.)	
		Cattle	Goat	Cattle	Goat		Cattle	Goat
Town Hall market	Ground	Floor	Floor	Hand	hand	2-4 minutes	4	3
Krishi market	Ground	Ground	Ground	Van	Van	7-10 minutes	4	3
Taltola kacha bazar	Floor	Floor	Floor	Hand	Hand	1 minute	8	6
BNP bazar	Ground	Ground	Ground	Hand	Hand	1 minute	7	-
Kawran bazar	Floor	Floor	Floor	Hand	Hand	1 minute	3	2
Kaptan bazar	Floor	Floor	Floor	Hand	Hand	1 minute	4	2
Gopibug bazar	Floor	Floor	Floor	Hand	Hand	1 minute	5	4
Hazaribug bazar	-	-	-	Van	Van	30 minutes	5	-
Zigztola bazar	Floor	Floor	Floor	Hand	Hand	1 minute	6	-
Hazrat Shah Ali market	Floor	Floor	Floor	Hand	Hand	1-2 minutes	5	4

centers i.e. Kaptan bazar and Kawran bazar meat selling centers out of 10-meat selling centers.
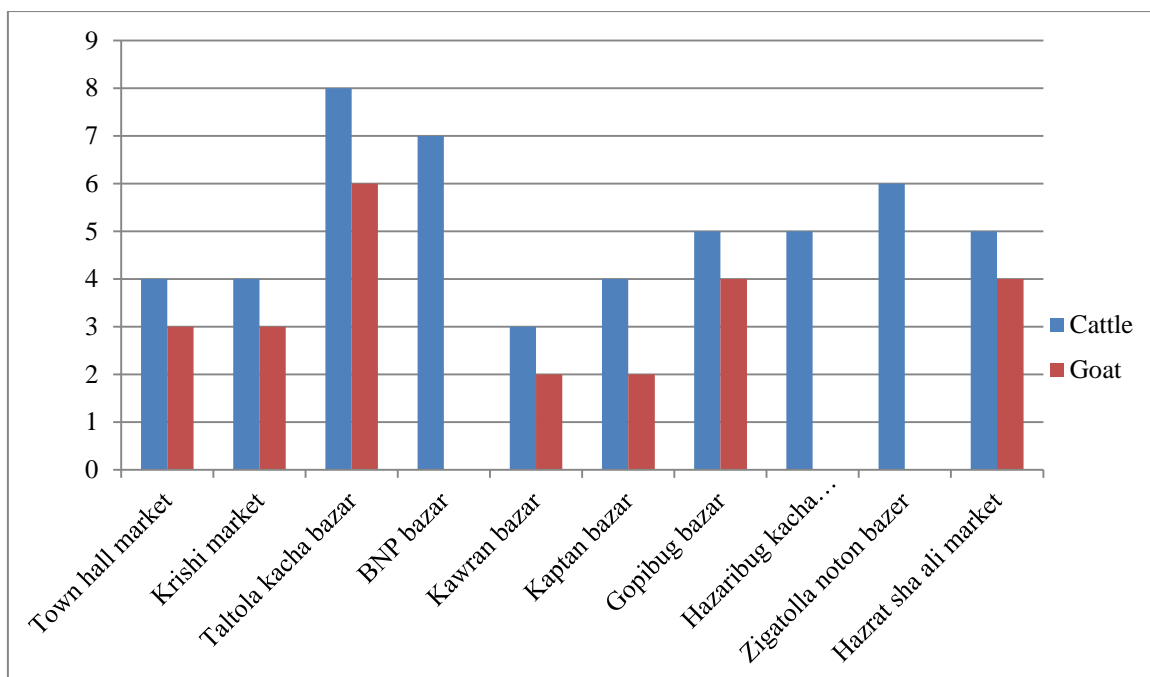
Figure 3. Average time required to sell meat after receiving in the selling centers (hrs.)

4.6 Live weight, carcass weight and price of meat

Live weight and carcass weight of animals and price of meat are given in Table 4. Live weight of slaughtered animals were calculated. Live weight calculated by Shaeffers formula (McNitt, 1983). Highest number of meat selling centers slaughtered animal live weight (cattle) were about 137.8 kg. Most of the carcass weight of 10-meat selling centers were 130 kg to 140 kg (cattle) and 16 kg to 18 kg (goat). In case of cattle carcass, highest carcass weight was found in one meat selling center and it was Hazrat Shah Ali market meat selling center and the lowest weight was in Zigatola bazar meat selling center. In case of goat carcass, highest carcass weight was found in Taltola kacha bazar meat selling center and lowest weight was found in Hazrat Shah Ali market meat selling center. The total average cattle carcass weight was found 78.6 kg and goat 9.6 kg. From live weight and carcass weight of animals, calculated the proportion of carcass weight 57% in case of cattle and 52% in case of goat.

Highest price of cattle meat was found in Hazaribug, Zigatola and Hazrat Shah Ali bazar (average 550 Tk/kg.) meat selling center out of 10-meat selling centers. Lowest price of cattle meat was found in Town Hall, Krishi market and Taltola kacha bazar (average 450

Tk/kg.) meat selling center. Goat meat price was found highest in 1-meat selling centers out of 10-meat selling centers it was 800 Tk/kg and the lowest price was found in 7-meat selling centers it was 750 Tk/kg. From the different price of meat, the total average price of cattle meat was found 492 Tk/kg and goat meat was found 757 Tk/kg.
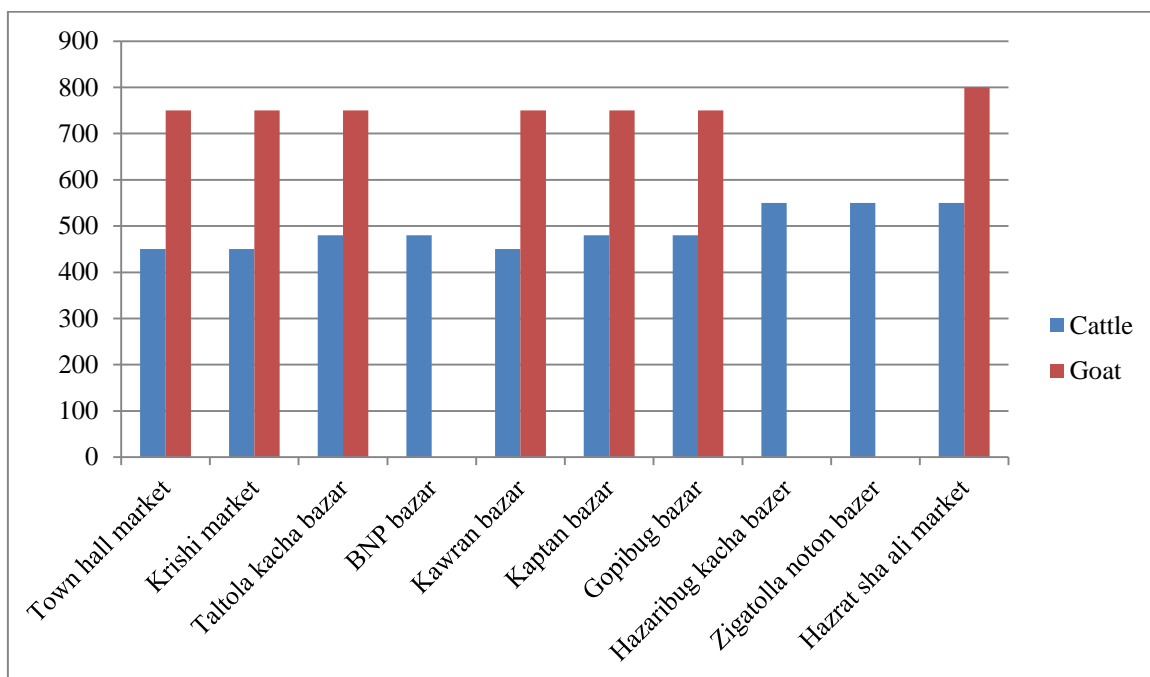
Figure 4. Meat price in 10-selling centers

Table 4. Live weight, carcass weight and price of meat per kilogram

Name of the selling Centre	Average live weight (kg)		Average carcass weight per selling center (kg)		Average price of meat/ kg		Dressing %		Proportion of carcass weight	
	Cattle	**Goat**	**Cattle**	**Goat**	**Cattle**	**Goat**	**Cattle**	**Goat**	**Cattle**	**Goat**
Town Hall market	135	17	78.3	9	450	750	58	53		
Krishi market	140	16	79.4	8.4	450	750	57	53		
Taltola kacha bazar	135	18	78.8	9.7	480	750	58	54		
BNP bazar	130	-	76.7	-	480	-	59	-		
Kawran bazar	140	18	79.8	9.3	450	750	57	52		
Kaptal bazar	145	18	81.2	9.1	480	750	56	51	57	52
Gopibug bazar	135	17	78.3	9.1	480	750	58	54		
Hazaribug bazar	138	-	77.2	-	550	-	56	-		
Zigatola bazar	135	-	74.2	-	550	-	55	-		
Hazrat Shah Ali market	145	16	82.6	8.3	550	800	57	52		
Total average	137.8	17.1	78.6	8.9	492	757.14	57.1	52.7		
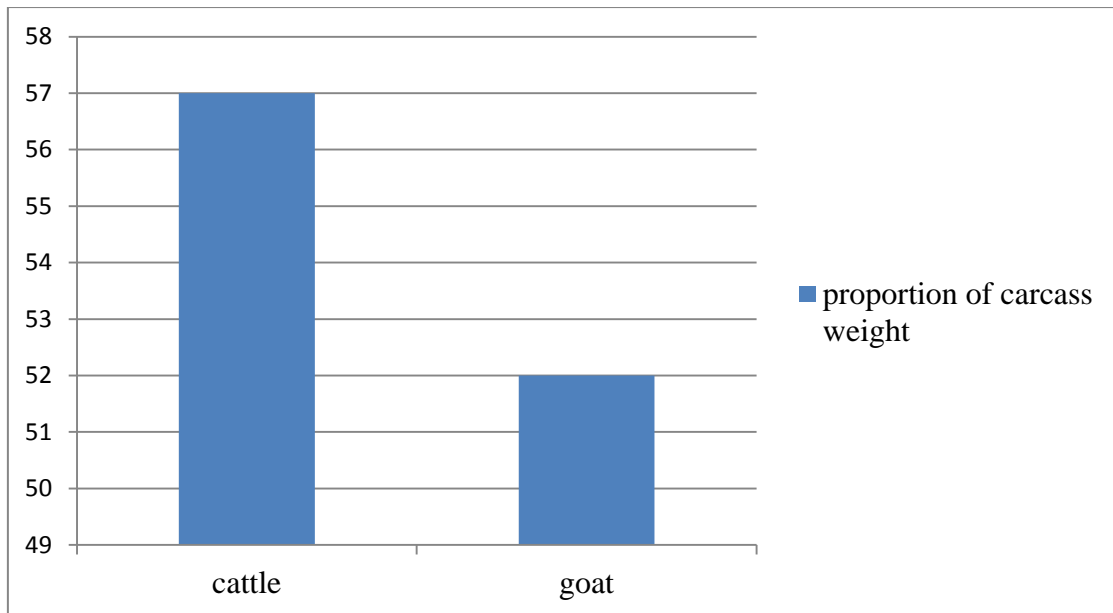
Figure 5. Proportion of carcass weight

(Rahman, 2001) described the dressing percentage of' live weight for bull 58 to 65. Cows 55 to 60, calves 60 to 65, sheep and goat 45 to 55 per cent respectively. The present study showed the dressing percentage of live weight for cattle 57.1% and goat 52.7%.

4.7 Hygienic condition of selling center

Hygienic condition of selling centers was presented in Table 5. Out of 10 selling centers, 6-selling centers had proper ventilation and sunlight facilities, 4-selling centers had improper ventilation and sunlight facilities. Out of 10-selling centers 9- selling centers had inadequate drainage system and water supply, only in Town Hall market meat selling center had good condition in drainage system and water supply. In 9-selling centers had inadequate provision of sewerage, only in one selling center had adequate provision of sewerage. 1-selling centers had no provision of sewerage. In the all selling centers condition of labor hands and cloths in the selling centers had not clean . In the all selling centers sell their by-products. These by-products include hoof; horn, tongue, caulfat, skin, hair, small intestine etc. Unhygienic condition in the slaughterhousc and meat selling center.

Table 5. Hygienic condition of selling center

Name of selling Centre	Condition of selling place	Ventilation and sun light	Drainage system	Water supply	Provision of sewerage	Condition of labor hand
Town Hall market	Enough	Proper	Good	Tap	Adequate	Dirty
Krishi market	Enough	Proper	Not proper	Pipeline	Inadequate	Dirty
Taltola kacha bazar	Not enough	Proper	Not well	Pipeline	Inadequate	Dirty
BNP bazar	Not enough	Improper	Not well	Dram	Absent	Dirty
Kawran bazar	Not enough	Improper	Poor	Tap	Inadequate	Dirty
Kaptal bazar	Not enough	Improper	Poor	Dram	Inadequate	Dirty
Gopibug bazar	Enough	Proper	Not well	Bucket	Inadequate	Dirty
Hazaribug bazar	Enough	Proper	Not well	Bucket	Improper	Dirty
Zigatola bazar	Not enough	Improper	Improper	Bucket	Improper	Dirty
Hazrat Shah Ali market	Enough	Proper	Not well	Bucket	Not well	Dirty

4.8 Displaying the carcass in the market

In Dhaka city 10-meat selling centers, found that different big cuts and small pieces of meat were hanged by the rod/rope. Three meat selling centers were found tile different cuts of cattle carcass put on the table. Meat selling centers were found the whole carcass of goat hanged with the help of rod/rope. Head of the animals, hoofs, intestine and others put on the floor.

4.9 Preservation methods of surplus meat

Preservation methods of surplus meat were given in Table 6. Out of 10-sellina centers, 2-selling centers were found used freezing method for their surplus meat. They used refrigerator for freezing carcass. The sources of these refrigerator were own and other sources. Out of 10-meat selling centers, 3 supply their surplus meat in hotel. Out of 10-meat selling center, 5 supply their surplus meat in hotel and used freezing.

Table 6. Preservation methods of surplus meat

Name of the selling Centre	Using method	
	Supply in hotel	**Refrigerator**
Town Hall market	Both	
Krishi market	Hotel	
Taltola kacha bazar	Hotel	
BNP bazar	Both	
Kawran bazar	Both	
Kaptal bazar	Both	
Gopibug bazar		√
Hazaribug bazar		√
Zigatola bazar	Hotel	
Hazrat Shah Ali market	Both	

4.10 Important sources of contamination of meat

During observation of different meat selling centers, the following sources of contamination of meat were found.

(1) During bleeding, flaying and cutting: hides, hooves, and hair.

(2) During handling: carts, boxes or other containers, knives, cloths, air, hand.

(3) During dressing: with feces.

(4) In the market: knives, saws, chopping blocks, sawdust and containers

The hygienic aspect of production, supply, storage and wholesomeness of meat is an important issue to the consumers. Edible tissues (meat) of meat animals are sandwiched between two regions that heavily contaminated-with microorganisms, these two regions are external layers of skin, hair, wool and feathers and the internal intestinal tract and its contents. As (Frazier, 1967) pointed out that the healthy inner flesh of meat contains few or no microorganisms. The important contamination however comes from outside during slaughtering, handling and processing. During bleeding, skinning and cutting the main sources of microorganisms are the exterior of the animals (hide, hoofs and hair) and the intestinal tract. Numerous investigators established the opinion that the principal

source of microorganisms on the eviscerating floor include contamination that is air borne, from the water used in washing and rinsing the carcass, from cloths and bushes used for wiping tools or carcasses and other tools such as knives, saws, cleaves, hoofs and from the hands of the workman.

4.11 Preventive measures of contamination during slaughtering

As per as possible butchers maintain cleanliness during slaughtering. During slaughtering they cleaned the slaughtering place, cleanliness of the knives, hand and clothing of workers. Flaying the animal with care, cleanliness of carts, boxes or other containers. Flies are prevented during slaughtering.

4.12 Butchers opinion

4.12.1 Problems faced by the butcher and their comments on environmental pollution

- There is no scientific, established slaughterhouse in each market.
- No rules of the Government Slaughter Act are executed in the slaughterhouse.
- Meat price is not always constant, sometimes fluctuates.
- Consumers do not want the bone during the time of purchase of meat.
- The butchers have no institutional training.
- Lack of butcher capital.
- Sometimes price of animal to be slaughtered is high in relation to the price of meat.
- Blood and other inedible by-products are responsible for environmental pollution. Blood clot in the slaughterhouse create bad odor.
- By-products are thrown here and there causing environmental pollution.
- Lack of proper drainage system and lack of sufficient water and electric supply in the meat selling centers.
- Government or municipal market sweeper does not perform their duties with responsibility.
- Residues drops outside the slaughterhouse pollute Surrounding environment.
- For dust and bad odor sometimes consumers avoid meat selling centers and choose alternatives. Huge amount of rumen ingesta and gut content creates environment pollution.

- The butchers have no training about slaughterhouse and environment or improvement of environment.

4.12.2 Butcher's comments and suggestions on environmental pollution and improvement

i. Necessary training on sanitation, improvement of environment, and use of inedible by-products should be carried out for the butcher.

ii. Government Slaughtering Act should be strictly implemented by the concerned authority.

iii. Modernization of Slaughter Act is necessary for the control of environmental pollution and new Act/law may be introduced.

iv. Inedible portion should not be thrown into the river or ponds.

v. Quick transportation is necessary for some of the by-products to sell.

vi. Animal should not be slaughtered around the residential area.

vii. Clean the knife and hands of butcher and blood from the slaughterhouse and meat selling center. Need a pit to store the rumen injesta and other solid waste for making organic compost.

viii. Blood should be collect for the purpose of animal feeding like swine and poultry feed.

ix. Management system of slaughterhouse by-products should be improved.

x. Importance of by-products should be realized by the concerned person.

xi. Cleanliness should be maintained in the meat selling centers and in the slaughterhouses.

xii. Scientific slaughterhouse should be established for better management and hygienic meat production.

Photographs from experimental period

Figure 6. Animal slaughtered on floor

Figure 7. Slaughtering place

Figure 8. Bleeding on floor

Figure 9. Refrigerator used in meat preservation

Figure 10. Slaughterhouse

Photographs from experimental period

Figure 11. Display of meat

Figure 12. Unhygienic condition in meat selling centers

Figure 13. By- product of slaughterhouse

CHAPTER V

SUMMARY AND CONCLUSION

The experiment was conducted in 10- different market places in Dhaka city during the period from Jane 2018 to February 2019. Data was collected from 10- meat selling centers. A total of 582 animals were slaughtered per day in 10-meat selling centers. Out of 582 animals, 182-cattle, 400-goat and sometime buffalo slaughtered in Kaptan bazar. As regards species, goat was slaughtered in the highest number. Sex of the slaughtered cattle animal was male - 132 and female 50 and goat animal was male 270 and female 130. Most of the animal collected from Gabtoli, Amin bazar, Rayer bazar, Kaptan bazar and Jatrabary. Most animals received in slaughterhouse or market on foot, sometimes pick up van. The butcher's slaughtered animals in slaughterhouse, market place even road side. The drainage facilities of the slaughterhouses were found in the pit, channel and slope type. Sanitation and water supply in the majority of the slaughterhouses were inadequate. In all slaughterhouses, animals were slaughtered in Halal method by munshi or labor. Bleeding of animals was found in pit, drain and on the ground. Flaying of cattle was done on the concrete floor and on the ground with knife. The live weight of cattle and goat were ranged from 130-145 kg and 16-18 kg, respectively. The carcass weight of cattle and goat were ranged from 77.2-86.2 kg and 8.3-9.7 kg, respectively. The price of beef and chevon were ranged from Tk. 450-550 and Tk. 750-800 per kg, respectively. Time required selling meat after receiving to the selling centers were 3-8 hours for beef and 2-6 hours for chevon.

From the present experiment, it can be concluded that there is a lack of organized small-scale slaughterhouses and meat selling centers. So, it can be suggested that small-scale slaughterhouses and organized meat selling centers need to be established in Dhaka city.

Further studies are required slaughterhouse by-products include blood, skin, hide, head, tail, lower fore and hind limb and stomach collected from slaughterhouse. Blood collected from slaughterhouse will be used poultry and swine feed.

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APPENDIX 1

Scenario of Slaughterhouses and Meat Selling Centers in Dhaka city

Questionnaire

Cattle, Goat, Sheep and Buffalo

1. Condition of the Slaughterhouse (Space, Light, Drainage, Sanitation, Water Supply)

2. No, of animals slaughtered/market day

Cattle:

Goat:

Sheep:

Buffalo:

3. Inspection and certification methods

Cattle:

Goat:

Sheep:

Buffalo:

4. Age of animals

Cattle:

Goat:

Sheep:

Buffalo:

5. Live weight of the

Cattle

Goat:

Sheep:

Buffalo:

6. Live weight in kg by Shaeffer's formula in

Cattle:

Buffalo:

7. Sources of collection animals for slaughter (owner; market, distance, transport etc.)

Cattle:

Goat:

Sheep:

Buffalo:

8. Pre slaughter care of animals

Cattle:

Goat:

Sheep:

Buffalo:

9. Slaughtering methods

Cattle:

Goat:

Sheep:

Buffalo:

10. Bleeding: Ground/drainage

11. Flaying: Ground/ hand

12. Time elapsed between flaying and transportation to selling center

Cattle:

Goat:

Sheep:

Buffalo:

13. Means of transport and time required from slaughterhouse to selling center

Cattle:

Goat:

Sheep:

Buffalo:

14. Hygienic condition of selling center

15. How do you display the carcass in the market?

Cattle:

Goat:

Sheep:

Buffalo:

16. Carcass weight and price of meat/kg

Cattle:

Goat:

Sheep:

Buffalo:

17. Diseases found in slaughtered animals

18. Time required selling meat after receiving to the selling Centre (hrs.)

Cattle:

Goat:

Sheep:

Buffalo:

19. Preservation methods of surplus meat.

20. Point out the important sources of contamination of rneats.

21. Preventive measures of contamination during slaughtering.

22. Butcher/Sellers comments on environment pollution.

23. Suggestions for environmental improvement by butcher/Sellers.

24. Problems faced by butcher/Seller.

25. Site of slaughter: Dry clean / Moist dirty.

26. Presence of dog: No/ Yes (Few/ Many)