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Study on the prevalence of mastitis in cows reared in free range and intensive systems in Dinajpur district of Bangladesh

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Abstract

In this study, a total of 100 cows were sampled during the period from March, 2012 to December, 2012 from different farms to determine the prevalence of mastitis at Dinajpur Sadar, Dinajpur. The overall prevalence of mastitis was 60%, 83.33% and 15% quarters affected in summer, rainy and winter season, respectively. The prevalence of mild mastitis 54%, 70% and 15%, where as Gangrenous mastitis affected 6%, 13.33% and 0% in summer, rainy and winter season, respectively. The incidence of mastitis in intensively rearing cows was higher (60%) than free ranged cows (40%). Diagnosis of mastitis is a multiple step procedures and the pathological observation was done in the laboratory of the department of pathology and parasitology, HSTU. The prevalence of mastitis is regarded as quite high. Dry and clean floor to keep cow's udder and teat clean would help control mastitis in the dairy farms of Bangladesh. In general, management practices and hygiene of dairy environment in all studied pastoral associations were very poor. Adequate sanitation of dairy environment, proper attention to health of mammary gland, regular screening tests and awareness of the people of the area about the disease should get emphases as control strategies were recommended for further study.

Keywords: prevalence, mastitis, cows, pathology and management

Introduction

Livestock is one of the important sources of our national economy. Cattle population in Bangladesh is about 24.50 million (FAO, 2003). Nearly, 85 percent of the populations are engaged in Agriculture and Livestock sector. The number of milking cows in

Bangladesh is 3.75 million, which is 35 percent of the total cattle population in Bangladesh. The annual milk production in Bangladesh is nearly 1.62 million metric ton which is very low in respect of our demand which is nearly 9.0 million metric tons.

The domestic house holders, small farmers however are facing a great problem with the diseases of udder of their animals and this has become a threat to their economy. Inflammation of udder or mastitis needs to be thoroughly studied with respect to the etiologic agents and holistic approaches. It continues to be a major economic issue for dairy producers all over the world. Mastitis, a major disease affect in dairy cattle worldwide. In the case of high yielding animals as their udders are particularly prone to infection and inflammatory process because of physiological stress and strain of heavy milk production (Giannechini *et al.*, 2002).

The term 'mastitis' is derived from Greek word 'mastos' which means 'breast' (mammary gland) and 'itis' means inflammation. Mastitis is defined as an inflammation of the parenchyma of mammary gland, which can reduce milk yield and alter milk composition. The causative organisms of mastitis are ubiquitous in nature and persist long time in the cow yard or barns and there is a chance of constant udder infection under poor hygienic and management systems (Roy *et al.*, 1988 and Radostits *et al.*, 2000). Epidemiological studies on mastitis revealed that mastitogenic organisms are widespread on different body sites of the cows, milker's hands, milking cans and in the milk samples. Teat apices have been reported to be the most common site (Itagaki *et al.*, 1999), from where these organisms have been isolated (Malhotra and Kapur, 1982; Prabhakar *et al.*, 1990). The main etiological agents responsible for mastitis include *Staphylococcus aureus*, *Streptococcus agalactiae*, *Streptococcus dysagalactiae*, *Streptococcus uberis*, *Streptococcus bovis*, *Corynebacterium bovis*, *Corynebacterium pyogenes*, *Escherichia coli*, *Enterobacter faecalis*, *Klebsiella pneumonia*, *Mycoplasma bovis* etc. There are two main classes of mastitis. The first is clinical mastitis, which manifests signs observed from the animal or the milk. Clinical mastitis is characterized by sudden onset, swelling, and redness of the udder, pain and reduced and altered milk secretion from the affected quarters. The other is subclinical mastitis, which produces no visible signs from the udder except when using diagnostic tools (Radostits, 2001).

Materials and Methods

01. Research area

The samples were collected from the different slaughter houses of Sadar at Dinajpur. The collected samples were submitted to the laboratory of the Department of Pathology and Parasitology under

Hajee Mohammad Danesh Science and Technology University (HSTU), Dinajpur, for the diagnosis. The research was done in different dairy farms in sadar upazilla of Dinajpur. Udders were collected from butcher house at Dinajpur district and examined in the laboratory of the Department of Pathology and Parasitology under HSTU, Dinajpur. The experiment was conducted from 6 July, 2012 to December, 2012.

02. Cleaning and sterilization of required glassware

Test tubes, glass tubes, glass slides, cover slips, beakers, pipettes, reagent bottles, glass bottle, spirit lamp, measuring cylinders etc. were used in this study. The conical flask, measuring cylinder, beakers, glass slides, cover slip, for slide preparation for histopathological study and staining of organisms after smear and pipettes, reagent bottle, glass tubes for different biochemical tests. New and previously used glassware were collected and dipped in 2% sodium hypochlorite solution and left there until cleaned. After overnight soaking in a household dishwashing detergent solution, the glassware were cleaned by brushing and washed thoroughly in running tap water and rinsed three times in distilled water. The cleaned glasswares were then dried on a bench at room temperature or in an oven at 50-70°C.

03. Clinical findings

The general health condition and age of the cattle were recorded. The cattle were observed to detect clinical signs. The clinical signs were observed from the visual examination. The clinical signs were recorded during the physical visit of the affected flocks and the farmer's complaints about the affected cattle were also considered.

Surgical correction and collection of gangrenous tissue

For the surgical collection of gangrenous udder tissues, restrained the animal by lateral recumbency. Epidural anaesthesia with blocking 3rd lumber spinal nerve was done. Incision was made above the affected area margin and dissection was continued and the major arteries and veins were ligated with catgut and sectioned between ligatures. The gland was removed completely with the affected part. After controlling the bleeding the cavity was closed by suturing the skin with simple interrupted mattress suture.

04. Necropsy findings of suspected cattle

The necropsy was done on the selected sample taken from butcher house, Dinajpur. At necropsy, gross changes were observed and recorded carefully by systemic dissection. The samples were also preserved in 10% neutral buffered formalin for the histopathological study.

05. Histopathological study

During necropsy, udder was collected, preserved in 10% buffered neutral formalin for histopathological studies. Formalin fixed tissue samples were processed for paraffin embedding, sectioned and stained with hematoxylin and eosin according to standard method (Luna, 1968).

06. Processing of tissues and sectioning

The tissues were properly trimmed into a thin section to obtain a good cross section of the tissue. The tissues were washed under running tap water for overnight to remove the fixative. The tissues were dehydrated in ascending grades of alcohol to prevent shrinkage of cells using 50%, 70%, 80%, 90% alcohol, and three changes in absolute alcohol, for 1hr in each. The tissues were cleaned in two changes in chloroform to remove alcohol, 1.5hr in each. The tissues were embedded in molted paraffin wax at 56-60°C for two changes, 1.5hr in each. Paraffin blocks containing tissue pieces were made using templates and molted paraffin. Then the tissues were sectioned with a microtome at 5-6µm thickness. The sections were allowed to spread on luke warm water bath (40-45 °C) and taken on a glass slide. A small amount of gelatin was added to the water bath for better adhesion of the section to the slide. The slides containing sections were air dried and stored in cool place until staining.

Results

Percentage of quarters affected with mastitis in different season

A total of 50, 30 and 20 dairy cows were studied in summer, rainy and winter season, respectively to detect the prevalence of mastitis and found about 60% (30/50), 83.33% (25/30) and 15% (3/20) quarters were affected in summer, rainy and winter season, respectively with mastitis (Table 1). Mild to moderate mastitis was in 54% quarters during the summer season, 70% quarters during the rainy season and 15% during the winter season. Gangrenous mastitis affected

6%, 13.33% and 0% in summer, rainy and winter season, respectively.

Relationship of mastitis with different rearing system

The relationship of mastitis with types of rearing of cows has been shown in (Table 2). Cows reared in intensive farming system showed 60% udder infection which were higher compared to cows reared free range system 40% infected udder.

Clinical finding

100 dairy cows were examined to detect the clinical findings of mastitis, where one or more pathological disorders were recorded in 13 quarters (Table 1). Gangrenous mastitis characterized by swollen mammary gland, cold and very pain to touch and bluish-black in colour. The affected skin area peels off with oozing of serious fluid.

Histopathology

Mastitis, an inflammatory reaction of the mammary gland that is usually caused by a microbial infection, is recognized as the most costly disease in dairy cattle. Mammary tissue damage reduces the number and activity of epithelial cells and consequently contributes to decreased milk production. Mammary tissue damage has been shown to be induced by either apoptosis or necrosis contributes to epithelial tissue damage. During infection of the mammary glands, the tissue damage can initially be caused by bacteria and their products. Certain bacteria produce toxins that destroy cell membranes and damage milk-producing tissue, whereas other bacteria are able to invade and multiply within the bovine mammary epithelial cells before causing cell death. In addition, mastitis is characterized by an influx of somatic cells, primarily polymorphonuclear neutrophils into the mammary gland. With more immune cells migrating into the mammary gland and the breakdown of the blood-milk barrier, damage to the mammary epithelium worsens. The form of Gangrenous mastitis is generally designated by the clinician as acute mastitis. The lesions were massive and occupied large areas. Usually there was necrosis with subsequent loss of architecture and highly congested blood vessels, mild to moderate infiltration of reactive cells and wide spread fibroplasia. In the involved parenchyma the details of the architecture were lost, and the area was infiltrated by heterophils and macrophages. Affected alveoli were filled up with exudates and normal

alveoli containing protein precipitation. Ducts were filled with abnormal cellular debris and exudates. Fibrous connective tissue was proliferation surrounding the duct. Often the tissue adjacent to an involved area manifested changes of cloudy swelling suggesting that the nearby lesion was influencing the area next to be attacked. Thrombi undoubt aided in

forming the large destructive lesions. The whole process was pathologically an abscess formation. The large necrotic areas were replaced by granulation tissue which eventually matured to form scars. The pathologic process at times became completely arrested, resulting in replacement fibrosis.

Table 1. Percentage of quarters affected with mastitis

Season	Number of quarters examined	Number of quarters affected	% of quarters affected	Quarters affected by mild to moderate mastitis		Quarters affected by gangrenous mastitis	
				Number	%	Number	%
Summer(March – June)	50	30	60	27	54	3	6
Rainy(July – October)	30	25	83.33	21	70	4	13.33
Winter(November – February)	20	3	15	3	15	0	0

Table 2. Relation of rearing system with mastitis

Types of rearing	Herd size	No of cases positive to mastitis	% of mastitis
Intensive system	80	54	60
Free range system	20	4	40
Total	100	58	100

Discussion

Mastitis is one of the major problems challenging the dairy industry countrywide and worldwide. 100 cows from different farms were collected for the determination of prevalence of mastitis. Different experimental work including determination of affected quarter percentage in different season, relationship of mastitis in different rearing systems, clinical findings and histological study were done to determine the prevalence of mastitis in this present investigation. In this study showed that 60%, 83.33% and 15% quarters were affected in summer, rainy and winter season, respectively with mastitis and mild to moderate mastitis was observed 54%, 70% and 15% in summer, rainy and winter season, respectively. Gangrenous mastitis affected 6%, 13.33% and 0% in summer, rainy and winter season, respectively. These results have dissimilarities with Rahman *et al.*, (2009) who found that 6.8% and 18.7% affected quarter during dry and wet season, respectively. Mild mastitis was in 5.8% quarters during the dry season and in 16.6% during the wet season (Table 2). Moderate mastitis affected 1.0% and 2.1% in dry and wet seasons, respectively.

These differences occur due to temperature variation, humidity, farm condition, management system,

geographical condition, variation in sample collection etc. In the present study, the prevalence of mastitis was 60% in housed and 40% in free ranged cows. Kabir (2006) stated that prevalence of mastitis was 43.33% and 40% in housed and free ranged cows, respectively. Elahi *et al.*, (1996) stated that 18.53% in large herds and 13.80% in backward individually reared cows. There might be greater exposure to mastitis pathogens because of less cleanliness and possibility of lateral spread etc. in intensive system of cow rearing in the present study. The prevalence of mastitis at housed level in this study is in disagreement with the report of Kabir (2006) and Elahi *et al.*, (1996) because it is lower than the findings. These differences occur due climatic condition, temperature, humidity and overall housed condition etc. But in the free land cows it is almost similar with Kabir (2006) and dissimilar with Elahi *et al.*, (1996) because in Bangladesh the climate and environment almost similar in everywhere. In this investigation cows were examined to detect the clinical findings of mastitis affected udder. Those cows which were affected with mastitis showed various abnormal change in there udder i.e. swollen mammary gland, cold and very pain to touch and bluish-black in colour. The affected skin area peels off, with oozing of serious fluid.

Gangrene usually affects first the teat and adjacent portions of the udder and may not be more extensive, or it may extend even to whole quarter. The tissues become blue and eventually black and are softer, insensitive and cold. There is pitting edema of the inguinal area, flank and venter, and in a day or so the necrotic skin begins to exude serum and to slough, and crepitating gas bubbles develop beneath it (James, 2002). In the histological study revealed numerous changes in a mastitis affected tissue. The lesions were massive and occupied large areas. Usually there was necrosis with subsequent loss of architecture and highly congested blood vessels, mild to moderate infiltration of reactive cells and wide spread fibroplasia. Affected alveoli filled up with exudates and normal alveoli containing protein precipitation. Ducts became filled with abnormal cellular debris and exudates Houe *et al.*, (2002) found these changes in their experiment and told as acute mastitis. These findings are fully agreed with Houe *et al.*, (2002). Mastitis diagnosis is not possible with a single test. Although time consuming and labour - intensive approach, it should be studied with various pathological, microbiological and chemical test. These facilities for diagnosis of mastitis in dairy farms should be strengthened. As a result, the production of quality milk will be increased in Bangladesh.

Conclusions

In this study, the prevalence of gangrenous mastitis of cattle was determined using clinical findings, histological study, survey to determine the percentage of affected animal in different seasons and different rearing system. Both clinical and subclinical mastitis harm the dairies and prevalence is higher, so diagnostic facilities should be strengthened in dairy farms to improve the hygienic milk production for the nation. Understanding the biochemical and cellular changes that occur in the gland during mastitis will ultimately lead to a means of manipulating mammary functions to minimize the damage from mastitis. In addition to the use of antibiotics to treat mastitis, other measures for reducing tissue damage may be a cost-effective way to reduce the losses caused by mastitis.

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