

Prevalence and associated risk factors of bovine clinical mastitis in Patiya upazila under Chittagong district of Bangladesh

Bari MS^{1*}, Alam M², Uddin M³ and Rahman MK¹

¹Department of Dairy and Poultry Science, ²Department of Animal Science and Nutrition, ³Department of Anatomy and Histology, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh

[Received: April 21, Accepted: May 05, 2014]

ABSTRACT

A cross sectional study was conducted to measure the prevalence; and identification of risk factors associated with clinical mastitis in dairy cows at Patiya upazila under Chittagong district of Bangladesh from 20th July to 31st December, 2013. A total of 160 farms and households were selected and 634 cows were clinically examined for determining the prevalence of mastitis and identification of risk factors. The overall prevalence of clinical mastitis was found 8.36%. Mastitis prevalence in crossbred cows was significantly ($P<0.05$) higher (10.09%) than indigenous cows (4.26%). The prevalence of mastitis was also significantly higher ($P<0.05$) with advancing age (12.5%) and in 3rd lactation period (13.62%). The cows were more prone to mastitis during 1st month of lactation (17.53%). There was a significant relationship ($P<0.05$) between prevalence of clinical mastitis and associated risk factors like general physical condition, herd size, frequency of dung removal, floor drainage quality and condition of floor. There was higher ($P<0.01$) prevalence (33.67%) of mastitis in cows having history of peri-parturient disease compared to those not having such history. Therefore, it can be concluded that minimization of risk factors of mastitis is very much necessary to control mastitis as well as to increase profitability of dairy farms.

Key words: Clinical mastitis, crossbred cows, indigenous cows, prevalence, risk factors.

INTRODUCTION

Bangladesh is a densely populated agro-based developing country where livestock plays a crucial role in the national economy. About 6.5% of the total Gross Domestic Product (GDP) is contributed by livestock ^[1]. Now a day's it has become an efficient tool for poverty reduction, income generation, creation of employment of youths and women; and food security of vast majority people.

Bangladesh has 24 million cattle, out of which 6 million are dairy cattle of local and crossbreds ^[2]. The majority of the dairy cattle belong to smallholder dairy producers. The estimated numbers of dairy farms in Bangladesh is 1.4 million ^[3]. Milk is the major source of income from dairying. Annual milk production in Bangladesh is 1.62 million metric tons and about 64% milk comes from cattle ^[4]. However, Bangladesh has an acute shortage of milk. The produced milk can fulfill only 13.6% of the total requirement in Bangladesh. Dairying in Bangladesh is growing faster, but it also faces lots of problem including high input cost and low output prices. Disease, along with non-availability of feed resources and nutrition are the most important constraints to milk production.

Mastitis is a disease of the mammary gland caused by bacterial infection and the most common and costly health disorder of dairy cows ^[5]. It has a negative economic impact on dairy farms in terms of abnormal milk, reduced production, deterioration of milk quality and treatment costs ^[6]. It is responsible

for huge loss to the dairy industry and the annual economic losses due to mastitis have estimated to be Tk. 122.6 (US \$2.11) million ^[7].

Epidemiological study revealed that infectious agents of mastitis may be transmitted from infected animals to another animals by milker's hand ^[8, 9]. It is the outcome of the interaction of various factors associated with the host, pathogens and the environment, accounting for 38% of all morbidity ^[10]. All breeds of dairy cows are susceptible to mastitis. Exotic and crossbred cows are more prone to mastitis than the zebu cows ^[11]. Prevalence of infection increases in multiparous cows, within 2-3 months of lactation, abnormally large udder, unhygienic environment, means of milking, unclean milker's hand, udder wound and mismanagement of milking machine ^[12]. Prevalence of clinical mastitis in Bangladesh is about 13.3% ^[13]. Mastitis remains the most costly infectious disease in the dairy industry and is the most frequent cause of antibiotic use in dairy farms ^[14]. As far we are aware, a few literatures are available regarding the prevalence of bovine mastitis in Chittagong region. And the study regarding associated risk factors of bovine clinical mastitis in Chittagong district of Bangladesh is still untouched.

Considering all the above facts, the present study was undertaken to determine the prevalence of mastitis and identify the association of different risk factors with bovine clinical mastitis in a selected upazila; Patiya in Chittagong district.

* Corresponding author: drmsb09@gmail.com

MATERIALS AND METHODS

Study Area

The field investigations were carried out at different dairy farms in the Patiya Upazila under Chittagong district. The study area is found at 22°18' N longitude and 91°98' E latitude with temperature

sample size, thus determined was 634 cows from the study population.

Study Design

Prevalence of clinical mastitis was determined cross sectionally in Patiya Upazila based on clinical examination, palpation, observation of milk secretion etc. Prevalence was calculated according to the

Table 1: Distribution and association of clinical mastitis with different variables

Variables	Categories	Number of Cows Examined	Number of Affected Cows	Mastitis Prevalence %	χ^2 Value	P Value
Breed	Indigenous	188	8	4.26	5.88	0.01
	Crossbred	446	45	10.09		
	Total	634	53	8.36		
Age Groups (Years)	3.5 to 5	190	9	4.74	5.17	0.04
	5 to 6.5	242	24	9.92		
	6.5 to 8	162	15	9.26		
	8 or above	40	5	12.50		
	1st Lactation	85	4	4.71		
Lactation Number	2nd Lactation	183	9	4.92	14.17	0.01
	3rd Lactation	235	32	13.62		
	4th Lactation	98	5	5.10		
	5th Lactation	33	3	9.09		
	1st Month	97	17	17.53		
Stage of Lactation	2nd Month	103	9	8.74	13.73	0.02
	3rd Month	127	7	5.51		
	4th Month	119	9	7.56		
	5th Month	112	6	5.36		
	≥ 6th Month	76	5	6.58		
Affected quarters	1	33	33	62.26	58.44	0.00
	2	13	13	24.53		
	3	4	4	7.55		
	4	3	3	5.66		

N = 634

ranges 13.5°C to 32.5°C.

Duration of Study

The study on prevalence and associated risk factors of bovine clinical mastitis was conducted from 20th July 2013 to 31st December 2013 in the study area.

Study Population

Farms and households in the aforementioned upazila of Chittagong district were the sources of population for conducting the study. The study area comprised about 296 registered dairy farms and 55 non-registered dairy farms under Upazila Livestock office in Patiya. The estimated cows in the study area were 14750 crossbreds and 20575 zebu cows. Total 160 dairy farms and households were selected randomly. The total experimental population was 634.

Sampling Methods

All 20 Union Councils of Patiya Upazila comprising 128 villages constituted the universe of the study population. 4 villages from each union council (Total 20) were selected randomly for collection of epidemiological data. Finally 2 dairy farms or households or one dairy farm and one household were selected from each village as study unit. Total 160 farms and households were selected. The

formula given by ^[15]. Prevalence = (No. of animals with the disease/ No. of animals at risk) × 100

Data collection

A structured questionnaire was developed, selected farm owners or farmers were asked and the pre-set questionnaire was filled. Each questionnaire asking time was about 10-15 minutes. The questionnaire contained information regarding age, breed, health, stage of lactation and management status. Answer to open ended questions were collected and recorded.

Diagnostic Procedure

Diagnosis of clinical mastitis was performed on the basis of clinical signs showed by the animals. The signs include abnormality in milk such as flakes and clots in the milk, slight to moderate swelling of infected quarter, hot and painful udder, fever, rapid pulse, loss of appetite, dehydration and depression ^[16].

Data Analysis

All collected data were entered into Microsoft Excel spreadsheet 2007. The prevalence of clinical mastitis was the dependent variable while a total number of animal examined, herd size, age, breed, general physical condition, lactation number, lactation stage

and quarter involvement were independent variables considered at cow level. The independent variables at herd level include barn floor status and hygienic strategy. The association between dependent and independent variables were tested by χ^2 test using

In the subsequent months the prevalence showed considerable variation. In the 5th month of lactation the prevalence was lower (5.36%) than the other months (Table 1).

Quarter of udder

Table 2: Distribution and association of clinical mastitis with various risk factors

Variables	Categories	No. of Cows Examined	No. of Affected Cows	Mastitis Prevalence %	χ^2 Value	P Value
Physical condition	Poor	230	35	15.22	22.16	0.00
	Good	404	18	4.46		
Herd size	1-5 cows	404	42	10.40	6.32	0.04
	6-10 cows	167	9	5.39		
	≥ 11 cows	63	2	3.17		
Frequency of dung removal (Times/day)	1	385	35	9.09	0.76	0.69
	2	226	16	7.08		
	3	23	2	8.70		
Floor drainage quality	Poor	290	35	12.07	10.75	0.00
	Acceptable	238	15	6.30		
	Proper	106	3	2.83		
Floor Type	Concrete	238	13	5.46	4.18	0.04
	Bare floor	396	40	10.10		
Peri-parturient diseases	Without history	536	20	3.73	96.96	0.00
	With history	98	33	33.67		

N = 634

[†]Floor drainage quality

Poor = Water/urine keeps standing on the floors for more than 2 hours after washing floor or after urination.

Acceptable = Water/urine keeps standing on the floors for less than 2 hours after washing floor or after urination.

Proper = Floor dries up quickly within 1 hour after washing or after urination.

EPI-INFO version 3.5.4 software. P-value < 0.05 and P - value < 0.01 were considered as significant and highly significant, respectively.

RESULTS

Prevalence of mastitis

Breed

The overall (Indigenous plus crossbred) prevalence of mastitis was 8.36%. The prevalence of mastitis was found significantly higher ($P < 0.01$) in crossbred cows (10.09%) than in indigenous cows (4.26%). These findings are documented in table 1.

Age

In case of cows the prevalence of mastitis increased with the advancing age as shown in (Table1). The rate of increasing prevalence was significant ($P < 0.05$).

Lactation number

The investigation (table1) shows different prevalence of mastitis in different lactation of cows. The prevalence was significantly higher ($P < 0.01$) in 3rd lactation than others (Table 1).

Stage of lactation

The prevalence was higher during first month of lactation (17.53%) and gradually decreased onward at 2nd and 3rd months of lactation (8.74% and 5.51%).

There was highly significant ($P < 0.01$) variation in number of quarter affected. Among the affected animals most of the cases (62.26%) one quarter and least of the cases (5.66%) four quarters were affected with mastitis (Table 1).

Risk factors associated with mastitis in cows

General physical condition

The findings of the study revealed a highly significant association ($P < 0.01$) between the general physical condition and mastitis prevalence in cows. The prevalence of clinical mastitis was 15.22% and 4.46% in poor and good physical condition, respectively (Table 2).

Herd size

The majority of the dairy farms had 1-5 lactating cows. The higher the herd sizes the prevalence of clinical mastitis was lower (Table 2).

Frequency of dung removal

The present study revealed that there was no significant association with cows between the frequency of dung removal and the prevalence of mastitis. The prevalence rate was 9.09% in cows when the dung removal was done once/day. When cleaning of sheds was practiced twice a day, 7.08% mastitis was observed (Table 2).

Floor drainage

The present findings documented a significant ($P < 0.05$) association between the drainage quality and mastitis status in cows. There was a higher prevalence of mastitis in cows (12.07%) that were managed under poor floor drainage quality than those managed with proper drainage (2.83%) as shown in table 2.

Condition of Floor

The current study focused that the prevalence of mastitis in the farms that have bare floor made of clay (10.10%) is significantly higher ($P < 0.05$) than that of concrete or brick-block floor (5.46%) as shown in Table 2.

Reproductive diseases

Table 2 stated that the prevalence of mastitis in cows with peri-parturient disease (33.67%) was highly significant ($P < 0.01$) than the cows without peri-parturient disease (3.73%).

DISCUSSION

The overall (Indigenous plus crossbred) prevalence of mastitis was 8.36%. As reported by [17] the overall prevalence of mastitis is 19.9% and 44.8% respectively in dry and wet season in Bangladesh. They also documented that the prevalence of mild mastitis is 17.3% and 40.7% and moderate mastitis is 2.6% and 4.1% in dry and wet seasons, respectively. Higher prevalence of mastitis in crossbred cattle that revealed in current study is also supported by other scientists [11]. It might be due to the larger udder size and genetic conformation that leads to susceptibility to various pathogens. One of the findings of the current study was that the prevalence of mastitis increased with the advancing age which has an agreement with the statements of other investigators [18, 19]. The increase in prevalence rates with the advancing age may be due to gradual suppression of the physiological condition of the body. This study revealed more prevalence of mastitis in 3rd lactation but other workers [20] reported higher prevalence in 5th lactation and onwards. The high prevalence rate during the first month of lactation is the indication of infection probably prior to freshening. The prevalence of mastitis was almost similar to that reported by Rehman et al and; Pal and Verma [21, 22] also reported lower prevalence of mastitis in stage of lactation above 5 month. The number of quarter affection was also studied in this investigation. Most of the cases one quarter was affected by mastitis. Number of quarter affection usually depends on defense mechanism of udder including lysozyme, lactoferrin, immunoglobulins and leukocytes [16]. The present study focused that the prevalence of mastitis was higher in the cows that had a poor health condition which is agree with the findings of Rehman et al [21] who concluded that poor health management may be responsible for the higher prevalence of mastitis in small herds. It was documented in current study that the higher the herd

size the prevalence of clinical mastitis is lower. The finding agreed with Rehman et al [21]. It may be due to poor hygiene practice and disease control program in small herds [23]. The current study stated that there is no effect of frequency of dung removal on mastitis occurrence in cows. Similar results have been documented by others [24]. There was a higher prevalence of mastitis in cows that were managed under poor floor drainage quality than those managed with proper drainage [25]. It might be due to the stagnant urine and water in shed act as a potential source of the pathogen for mastitis. The prevalence of mastitis was higher in the cows that are reared on bared floor. This outcome agreed with investigators [26] who reported that the prevalence of clinical mastitis is lower among cows kept in cubicles and kennels than in cows kept in straw yard. Another finding of current study is that the prevalence of mastitis in cows with the history of peri-parturient disease was higher than that do not having such history. It might be due to the lower immunity level due to peri-parturient diseases that make the cows more prone to infection in the udder. The similar result was found by others [27].

CONCLUSION

Mastitis is considered as the most costly disease of dairy industries throughout the world. It is the outcome of interaction of various factors associated with the host, pathogens and the environment. Although the overall prevalence of clinical mastitis in cows was relatively lower in the study area but it can be said that mastitis is still a disease that would threaten the growing dairy industry. The bovine clinical mastitis prevalence was found significantly higher in crossbred cows, advancing age, 3rd lactation and in 1st month of lactation period. Some factors have significant effect on prevalence of mastitis such as physical condition of cow, floor drainage quality, floor type and having history of peri-parturient disease. Proper managerial practices should be maintained to reduce the prevalence as well as to reduce economic losses of dairy farming.

REFERENCES

1. Bangladesh Bureau of Statistics (BBS) (2004). Planning Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka, Bangladesh.
2. Directorate of Livestock Services (DLS) (2008). Annual report on livestock, Division of Livestock Statistics, Ministry of Fisheries And Livestock, Farmgate, Dhaka, Bangladesh.
3. Hemme T (2008). IFCN Dairy Report. International Farm Comparison Network. IFCN Dairy Research Center. Kiel Germany.
4. Food and Agriculture Organization (FAO) of the United Nations (2004). Ministry of Fisheries and Livestock. Bangladesh. pp. 65.

5. Ruegg PL (2003). Investigation of mastitis problems on farms. *Vet. Clin. North. Am. Food. Anim. Pract.* 19: 47-73.
6. Seegers H, Fourichon C, Beaudeau F (2003). Production effects related to mastitis and mastitis economics in dairy cattle herds. *Vet. Res.* 34: 475-491.
7. Kader MA, Samad MA, Saha S (2003). Influence of host level factors on prevalence and economics of sub-clinical mastitis in dairy cows in Bangladesh. *Ind. J. Dairy. Sci.* 56: 235-240.
8. Philpot WN (1975). Prevention of infection-Hygiene. In: *Proceedings on the International Dairy Federation Seminar on Mastitis Control* 7-11 April, 1975, pp: 155-164.
9. Oliver J (1975). Some problems of mastitis control in hand dairy herds. In *proceeding on the International Dairy Federation Seminar on Mastitis Control* 7-11 April, 1975. pp. 188-192.
10. Smith RE, Hagsted HV (1996). Infection of the bovine udder with coagulase negative Staphylococci. *Kiel Dairy Research Reports*, 37(4): 604-614.
11. Roy SK, Pyne AK, Maitra DN, Dattagupta R, Mazumder SC (1989). Studies on sub-clinical mastitis in cross-breeds in hot humid conditions of West Bengal, *Ind. Vet. J.* 66: 844-846.
12. Alom MG (2001). Udder inflammation: Control and Management. *Monthly Poultry and Dairy Barta*, 12 (2): 1-5.
13. Prodhan MAM, Kamal AHM Mahbub-E-Elahi ATM (1996). Prevalence of subclinical mastitis in cows of Baghabari Milkshed area. *Bangla. Vet. J.* 30:59 – 61.
14. Erskine RJ (2003). Antibacterial therapy of clinical mastitis – part I. Drug selection. Part II Administration. In: *Proceedings of the 2003 North American Veterinary Conference*. Orlando, FL, USA: NAVC, 13-16.
15. Thrusfield M (1995). *Veterinary Epidemiology*. Blackwell Science Ltd., UK.
16. Radostits OM, Gay CC, Blood DC, Hinchcliff KW, Constable PD (2006). Diseases of the mammary gland. In *Veterinary Medicine*, 10th ed., pp: 673-762. Saunders, Edinburg.
17. Rahman MA, Bhuiyan MMU, Shamsuddin M (2009). Prevalence and risk factors of mastitis in dairy cows. *The Bangla. Vet.* 26(2): 54 – 60.
18. Chakrabarti A (2007). *A textbook of Preventive Veterinary Medicine*. New Delhi: Kalyani Publishers,
19. Rasool G, Jabbar MA, Kazmi SE, Ahmad A (1985). Incidence of sub clinical mastitis in Nili Ravi buffaloes and Sahiwal cows, *Pak. Vet. J.* 5: 76-78.
20. Hillerton JE, Staker RT, Shearn MF (1995). Failure of exit-race teat spraying to control *Corynebacterium bovis* colonization, *Vet. Rec.* 137: 633-635.
21. Rehman MS, Nooruddin M, Rahman MN (1997). Prevalence and distribution of mastitis in crossbred and exotic dairy cows, *Bangla. Vet.* 14: 104-108.
22. Pal B, Verma BB (1991). A note on the incidence of subclinical mastitis in cows and buffaloes in an organized farm at Ranchi, *Ind. J. Vet. Med.* 11: 32-33.
23. Parai TP, Nandey NN, Lal SB (1992). Incidence of subclinical mastitis in cross-bred and exotic cows, *Ind. J. Vet. Med.* 12:16.
24. Carroll EJ (1977). Environmental factors in bovine mastitis. *J. Am. Vet. Med. Assoc.* 170: 1160-1163.
25. Dodd FM, Phipps RH (1984). Milking management and health in milk production in developing countries. In *the proceeding of the conference held in Edinburgh* 2-6 April, 1984.
26. O'Reilly KM, Green MJ, Peeler EJ, Fitzpatrick JL, Green LE (2006). Investigation of risk factors for clinical mastitis in British dairy herds with bulk milk somatic cell counts less than 150 000 cells/ml, *Vet. Rec.* 158: 649-653.
27. Rainard P, Riollot C (2006). Innate immunity of the bovine mammary gland, *Vet. Res.* 37: 369-400.