Original Research Article

Prevalence of Bovine Subclinical Mastitis and Associated Risk Factors at Sylhet District in Bangladesh

ABSTRACT

Mastitis is a globally recognized disease that has a significant impact on the dairy industry's economy. The study was conducted in order to ascertain the prevalence and related risk factors of subclinical mastitis (SCM) in dairy cattle owned by farmers at Sylhet district in Bangladesh. A total of 114 dairy cows from 22 dairy farms were sampled for this study, and the milk of the cows was screened for SCM using the California Mastitis Test (CMT). Results reveal that the prevalence of SCM at the individual cow and farm level was 25.43% and 31.81%, respectively. Highest prevalence of SCM was recorded in semi intensive farm (36.36%) with a concrete floor (41.67%) where proper drainage system is present (33.33%). However, on farms where the farmers are illiterate (44.44%) and work as dairy farmers (35.71%) without any professional experience (44.44%), the frequency is higher. Also, SCM is common at dairy farms that utilize the manual milking method (38.46%) and wash the udder prior to milking (35.29%). Cross-breed cows had the highest reported prevalence of subclinical mastitis (26.14%). The majority of cows (28.57%) older than seven are impacted by SCM. Additionally, a higher percentage of subclinical mastitis was seen in cows producing 4 to 10 liters of milk (36.84%) and in early lactation (33.96%). In conclusion, the results of this study demonstrate the high prevalence of SCM, which poses a serious risk to the productivity performance of the dairy business. To combat the disease, CMT screenings on a regular basis, good hygiene, improved management practices, and farmer awareness are recommended in the studied areas.

Keywords: Subclinical mastitis; California mastitis test; Prevalence; Risk factors; Bangladesh.

1. INTRODUCTION

The dairy sector of Bangladesh is becoming more and more well-known every day.Currently, 6 million crossbred, high-yielding cows are raised on both commercial and household farms nationwide, producing 9.4 million metric tons of milk annually [1, 2]. Dairy cows frequently get mastitis, which causes numerous physical, chemical, pathological, and bacterial changes in the glandular tissue and milk [3]. This has had an impact on the dairy industry worldwide, with direct and indirect financial ramifications for farms in the form of decreased milk output and quality, a high rate of culling, subpar productivity, volatile milk prices, costs associated with replacement and treatment, and other factors [4, 5]. Due to difficulties in diagnosing mastitis, dairy farmers can underestimate these expenditures [6]. Among bovine diseases, mastitis has a significant negative influence on both the economy and animal welfare [7].

The clinical mastitis can be detected by the patient's history and clinical signs; laboratory tests are required to diagnose the subclinical mastitis. Studies show that there is a notably

greater incidence of subclinical mastitis (SCM) than clinical mastitis. With a frequency that is 15–40 times higher than that of clinical mastitis, subclinical mastitis is much more prevalent [8]. Most of the dairy farms suffer large financial losses as a result, and the dairy business in Bangladesh is particularly hard hit [9]. According to the California Mastitis Test (CMT), the prevalence of SCM in cows in Bangladesh varies between 20 to 44% [10, 11]

Recently, CMT was used in a study to determine whether a patient has subclinical mastitis [12]. According to various researches, the prevalence of SCM in crossbred dairy cows in Bangladesh has been reported to range from 28.5% to 61.3% [13, 14, 15, 16]. Unfortunately, little research has been done on SCM in eastern side of Bangladesh, especially in the district of Sylhet. Aside from Sylhet, a Bangladeshi district where cattle farming is more prevalent and impacted by several production diseases such mastitis [17]. Thus, the current study aims to determine the prevalence and risk factors related to sub-clinical mastitis in the Sylhet district of Bangladesh.

2. MATERIALS AND METHODS

2.1 Study Area and Animals

The study was carried out in the registered medium to large sized commercial household dairy farms of Sylhet district in Bangladesh. In order to investigate the prevalence of SCM at the farm and animal level, 114 dairy cows were selected at random as sample populations from a total of 22 dairy farms. Thus, a detailed list of household dairy farms was created using the data obtained from the Sylhet district livestock office.

2.2 Data Collection Procedure

A structured questionnaire was given to the livestock farmers to gather information on the cattle breed (cross/indigenous), age of cow (<5 years/5 to 7 years/>7 years), production system (intensive, semi intensive and extensive), floor type (concrete/semi concrete/muddy), washing of udder before milking (yes/no), lactation stage (early/mid/late), professional experience of farmers (yes/no), milking techniques (hand milking/machine milking), and milk yield (<4 liters /4 to 10 liters/>10 liters). Farmers' approval was obtained prior to data collection and every questionnaire question lasted for about 15 minutes. Interviews with the farm owners and, in certain situations, an abstraction of the farm records were used to collect data.

2.3 Detection of Subclinical Mastitis by California Mastitis Test (CMT)

Firstly, 2 ml of milk were manually collected in each cup while the paddle was held almost horizontally. Next, a polyethylene wash bottle was used to dispense an approximate equivalent volume of CMT reagent, which is made up of 3% sodium hydroxide, 1.5% bromocresol purple, and 1.5% alkyl acryl sulfonate. The paddle was used to mix the ingredients gently for a short period of time in a horizontal plane. The high somatic cell concentration in the milk caused the response to occur relatively instantly. Within ten seconds, the reaction peaked and was scored. Before being utilized for the following test, the paddle was thoroughly cleaned with water. Depending on the strength of the response, the CMT test findings were categorized as either positive or negative. Gel formation was used to score and record the CMT outcome [18]. Based on the udder's physical examination, the type and appearance of milk output, and the animal's response to CMT, SCM was identified [19].

2.4 Data Analysis

With the aid of Microsoft Office Excel Worksheet 2010, all the data collected throughout the study were loaded into a spreadsheet program for data summary and analysis to determine the prevalence of the diseases.

3. RESULTS

3.1 Overall Prevalence of Subclinical Mastitis at Sylhet District in Bangladesh

In this study, a total of 114 dairy cattle were examined using California mastitis test, out of which 25.43% (n = 29/114) were recorded as positive for mastitis. Out of 22 farms, 7 farms were affected with mastitis which was 31.81% (n=7/22) of the total farm (Table 1).

Table 1. The overall prevalence of subclinical mastitis at Sylhet district in Bangladesh

Level	Number of tested (N)	Number of affected (n)	Prevalence (%)
Farm	22	07	31.81
Individual	114	29	25.43

(N) = Number of tested farm / animal, (n) = Number of affected farm / animal, (%) = Percentage of prevalence

3.2 Household Dairy Farm Level Prevalence of SCM at Sylhet District in Bangladesh

According to this study, the prevalence in extended, semi-intensive, and intensive housing systems was determined to be 36.36%, 28.57%, and 25%, respectively. In house with a proper drainage system, SCM was recorded at 33.33%, whereas in house with a defective drainage system, it was recorded at 28.57%. Concrete has the highest occurrence (41.67%), followed by semi-concrete and muddy floor with 25% and 16.67%, respectively. It was observed that on farms where the udder was cleaned prior to milking, the prevalence was 35.29%, while on farms where this practice was not followed, the prevalence was 20%. The farms with the highest incidence (35.71%) had farmers as their primary occupation, whereas farms with farmers who also operated a small business had the lowest prevalence (25%) of SCM. Compared to farmers without experience (44.44%), those with professional experience had a lower frequency of SCM (23.08%). The percentage of SCM in illiterate, SSC, HSC, and graduate farmers were 44.44%, 25%, 33.33%, and 0%, respectively. The farms with hand milking had the highest frequency (38.46%), whereas farms with machine milking had the lowest prevalence (22.22%) of SCM (Table 2).

Table 2. Household dairy farm level prevalence of SCM at Sylhet district in Bangladesh

Risk factor	Categories	Farms tested		SCM positive	
		N	%	n	%
Type of housing	Intensive	11	50.00	04	36.36
	Semi intensive	07	31.82	02	28.57

	Extensive	04	18.18	01	25.00
Proper drainage facilities	Present	15	68.18	05	33.33
	Absent	07	31.82	02	28.57
Type of floor	Muddy	04	18.18	01	25.00
	Concrete	12	54.55	05	41.67
	Semi concrete	06	27.27	01	16.67
Udder washing before milking	Yes	17	77.27	06	35.29
	No	05	22.73	01	20.00
Farmer's occupation	Dairy farming	14	63.64	05	35.71
	Farming and business	08	36.36	02	25.00
Professional experience	Yes	13	59.09	03	23.08
	No	09	40.91	04	44.44
Educational status	Illiterate	04	18.18	04	44.44
	SSC	09	40.91	01	25.00
	HSC	06	27.27	02	33.33
	Gradute	03	13.64	00	0.00
Milking method	Hand milking	13	59.09	05	38.46
	Machine milking	09	40.91	02	22.22

(N) = Number of tested farm / animal, (n) = Number of affected farm / animal, (%) = Percentage of prevalence, (SSC) = Secondary school certificate, (HSC) = Higher secondary certificate

3.3 Individual Cow Level Prevalence of SCM at Sylhet District in Bangladesh

The prevalence of SCM varies according to breed, age, lactation stage, and milk yield, as Table 3 illustrates. Crossbred cows had a relatively higher frequency of SCM (26.14%) in the area compared to native cows (23.08%). There were three observed prevalence rates of SCM: 22.92% (5 to 7 years), 28.57% (>7 years), and 25.81% (<5 years). Mastitis is more common in cases of early lactation (33.96%) than it is in cases of mid- and late-lactation (19.15%) and 14.29%, respectively. In order to investigate the frequency of SCM based on milk supply, mastitis in cows producing less than four liters, four to ten liters, and more than ten liters was found in 16.39%, 36.84%, and 33.33% of cases, respectively.

Table 3. Individual cow level prevalence of SCM at Sylhet district in Bangladesh

Risk factor	Categories	No. of sample tested	SCM positive

		N	%	N	%
Breed	Indigenous	26	22.81	06	23.08
	Cross	88	77.19	23	26.14
Age	<5 years	31	27.19	08	25.81
	5 to 7 years	48	42.11	11	22.92
	>7 years	35	30.70	10	28.57
Stage of lactation	Early	53	46.49	18	33.96
	Mid	47	41.23	09	19.15
	Late	14	12.28	02	14.29
Milk yield	<4 liters	61	53.51	10	16.39
	4 to 10 liters	38	33.33	14	36.84
	>10 liters	15	13.16	05	33.33

(N) = Number of sample tested, (n) = Number of SCM positive sample, (%) = Percentage

4. DISCUSSION

The mastitis prevalence of 25.43% obtained in this study is lower than the 51.3% reported by Rahman et al. [20] in cows on a farm in the same district using modified white slide test. Sayeed et al. [17] stated that around 71.9% farm of Jhenaidah district was affected with subclinical mastitis which was a matter of anxiety for the dairy farmers of this region. The overall prevalence of SCM at Bijoynagar upazila under Brahmanbaria district of Bangladesh was 28.75% which was almost similar with our findings [21]. On a global scale, the current study found that the prevalence of SCM is lower compared to studies conducted in Nigeria (85.3%) [22], Uganda (86.2) [23], and Vietnam (88.6%) [24]. On the other hand, the estimated prevalence of SCM is more than that found in the studies conducted in Ethiopia

[25] and Rwanda [26]. The disparity in the prevalence of subclinical mastitis in cows across various studies conducted within the country and worldwide can be attributed to differences in geographical location, meteorological conditions, farm makeup, and overall husbandry practices [27].

According to Islam et al. [28], the prevalence of SCM in local breed cows was 22.22%, 27.94%, 21.21%, and 18.18%, respectively, for the age groups of 3 to 5 years, >5 to 8 years, >8 to 12 years, and >12 years. Simultaneously, the age groups of 3 years to 5 years, >5 years to 8 years, >8 years to 12 years, and >12 years in cross-breed cows showed 33.33%, 40.90%, 28.57%, and 0.00% frequency of SCM, respectively. Our study is more or less supported by these results.The high incidence of SCM in the initial phase of lactation can be attributed to the susceptibility of high-yielding cows with larger udders to infection and inflammation. This observation confirms the findings of Pal and Verma [29], who reported that there is a higher occurrence of mastitis in cows producing up to 9 kg of milk, and a lower occurrence of the disease in later stages of lactation (after five months).

From the results of this investigation, prevalence of the condition based on lactation stage, there was a tendency for the prevalence of SCM to decline from early (45.83%) to mid (31.58%), with a greater incidence in the late stage than the mid (33.33%) stage [28]. However, Rahman et al. [30] found that the highest occurrence of subclinical mastitis is during the third month of lactation (34%), while the lowest occurrence is during lactation periods of five months or longer (2%). Islam et al. [12] and Sinha et al. [31] found a greater occurrence of subclinical mastitis during the later stages of lactation in Bangladesh.

Sohidullah et al. [32]and Almaw et al. [33] showed a higher prevalence of SCM in cross-breed dairy cows, in an investigation of the prevalence of the condition based on breed type. Our results were nearly identical to those of these investigations.

Moreover,the prevalence of SCM in milk production per day was found to be 13.04%, 20.75%, and 30.95%, 37.5%, and 50% in local breed cows whereas in cross breed cows, it was recorded 28.57%, 35.48%, 40.00%, and 42.85% in >1-2 liters, >2-5 liters, >5-10 liters, and >10 liters milk producing cowsrespectively [28]. This finding is in similar to the results of our study.

The type and cleanliness of the floor are crucial risk factors for the occurrence of SCM. Previous research has shown that cemented floors and their cleanliness play a significant role in increasing the risk of SCM elsewhere [34, 32]. Nearly same results were also seen in our investigation.

5. CONCLUSION

It can be concluded that subclinical mastitis poses a significant obstacle to the advancement of dairy farming in Bangladesh. At the farm and individual animal levels, the prevalence of SCM is determined to be 31.81%, and 25.43%, respectively. It is necessary to control subclinical mastitis in its early stages in order to prevent its advancement to clinical mastitis. Thus, using CMT is an affordable and practical method for routinely checking subclinical mastitis in field level. Farmers should be aware of the disease's economic impact and take steps to improve care and management practices.

ETHICAL APPROVAL

This study does not require ethical approval. For the sake of scientific research, no animals were killed in this investigation.

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