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Prevalence of Mastitis in dairy cows in some regions of Bangladesh

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Abstract

Background: *Mastitis is a common inflammation of the udder and teats in dairy cows that exists in two forms: clinical and subclinical. Subclinical mastitis is more prevalent and difficult to diagnose, resulting in longer persistence in the herd and higher economic losses compared to clinical mastitis, making it a significant concern for dairy farmers.*

Objective: *The investigation used CMT score, udder scoring protocols, and physical parameters to determine the prevalence and factors affecting the incidence of mastitis in milking cows in select regions of Bangladesh.*

Methods: *The study investigated the prevalence of mastitis in 360 lactating dairy cows of different breeds, ages, and lactation stages in various dairy farms of the Matlab Dakshin, Matlab Uttar, Faridganj, and Chandpur Sadar Upazila of Chandpur district, Bangladesh. The data were collected through a farm survey, examination of the udder and milk, and California Mastitis Test (CMT), and analyzed using SPSS software.*

Results: *Utilizing a formal questionnaire, data were taken of 360 cows lactating to gather information related to Mastitis. The California Mastitis Test (CMT) confirmed that Mastitis was identified. The incidence of Mastitis in the region of the study was 36.94%. Of the 133 positive cases, there was mild 23.33%, moderate 11.67%, and severe 1.94%. The frequency of Mastitis was 32.50%, 50.00%, and 28.33% of Sahiwal cross breed, Friesian cross breed, and Local Zebu. There was a substantial distinction between different cattle breeds afflicted by Mastitis. According to, the incidence of Mastitis was 33.33%, 35.83%, and 41.67% in 2-4, 4-6, and aged cows. The rate of Mastitis occurrence varied with different milk yields. The prevalence rates rise with lower production of milk. Mastitis's prevalence in lactating cows who had 16-20L or more milk had a significantly lower percentage than that of 1-5 and 6-10L productions of milk. While the rear left quarter had a higher percentage, there was a significant variation among the different quarters afflicted by Mastitis. For one, two, three, and four quarter affected cows, the percentage of affected cows with one quarter was significantly greater than that of other cows.*

Conclusion: *Mastitis can significantly decrease the milk yield of affected cattle, resulting in economic losses. The most effective and cost-effective way to diagnose mastitis is through a physical examination, including an organoleptic test of the milk, and a chemical test such as the CMT.*

Keywords*: Mastitis, Prevalence, Dairy cows, Subclinical form, Bangladesh*

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I. Introduction

Mastitis is the most frequent condition that affects dairy Cows around the world. Mastitis, which is the inflammation of the udder and teats, exists in two primary forms: clinical and subclinical mastitis [1,2]. Clinical mastitis, which is less prevalent, is characterized by systemic signs in the cow and visible abnormalities in the udder and milk [3,4]. In contrast, subclinical mastitis is more common and results to reduced milk production without observable clinical signs or abnormalities in the udder or milk [5,6]. For this reason, subclinical mastitis is challenging to diagnose, persists longer in the herd, and is associated with higher losses compared to clinical mastitis [[7] Any time as high as 50% of cows could be infected within one or more quarters [8]. Because of this, the number of people who are affected is decreasing. The production of fat, lactose, solids from nonfat milk, and casein. Whey proteins, sodium pH, chloride, and free fatty acids in the body are elevated [9] in mastitis milk. This is why it has become an issue of concern to the dairy farmers trying to create economically viable dairy Industries. Mastitis-related losses make industries less viable. this could be due to subclinical and clinical diseases. Mastitis-related losses in clinical Mastitis are usually evident and are made up of milk thrown away and result from the transient reduction of milk yield and culling prematurely [10]. Subclinical Mastitis is among the most significant illnesses that have resulted in a substantial economic loss for the farmers and the dairy industry due to the long-term effect of chronic illnesses [11].

Mastitis in the clinical stage can be detected through visual inspection of milk or udders and the physical examination of the cow. Subclinical mastitis is usually detected by taking a test, e.g., California Mastitis Test (CMT) [10]. Subclinical mastitis doesn't just cause financial loss to the dairy farmers and acts as a source and carrier of infection to other cows on the farm. Many patients suffering from clinical mastitis are treated every day; however, only a small percentage are healed due to the absence of medical diagnostic equipment within the fields. In the United States of America, subclinical mastitis is responsible for between 60 and 70% of the total economic losses resulting from any mastitic disease [11,12]. These losses could even be greater in Bangladesh because mastitis diagnostic services and treatments specific to the condition are not utilized in the field. Non-registered health professionals treat mastitis in many cows for animals. In this investigation, CMT score, udder scoring protocols, and physical parameters were employed to establish the prevalence of mastitis among milking cows in select regions in Bangladesh and to determine the effects of breed age, the duration of lactation, and the yield of milk on the incidence of mastitis.

II. Materials and Method

Research area and duration

The present study was conducted in Upazila Livestock Office, Matlab Dakshin, District Livestock office and Hospital, Chandpur, and the Department of Pathology, Sher-e-Bangla Agricultural University, Dhaka during the period February 2020 to June 2020. The field investigation was done at various dairy farms of the Matlab Dakshin, Matlab Uttar, Faridganj, and Chandpur Sadar Upazila of Chandpur district, Bangladesh.

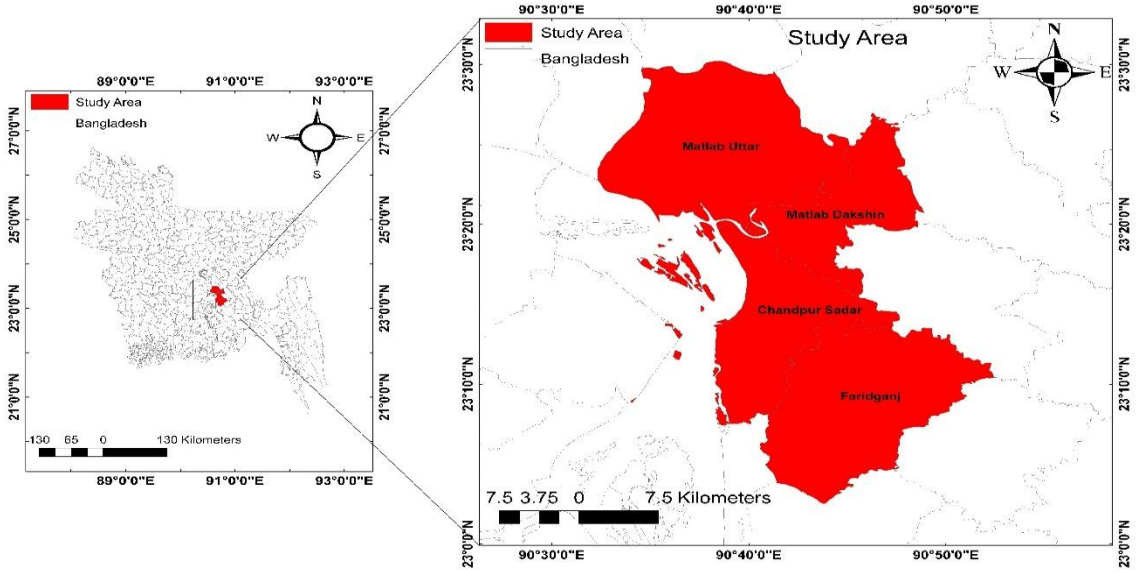

Figure 1: Study area of this research

Selection of dairy farms and animals

360 lactating dairy cows of different breeds, ages, and lactation stages were investigated to study the prevalence of mastitis that was came from different locations of Chandpur district.

Farm survey and data collection

The selected farms were surveyed one time to determine the incidence of Mastitis. The survey's data comprised the form to enter when visiting the farms. Farmers were interviewed to get information on the dairy production process and farms. The farms' cows were inspected for specific variables, and data were recorded on the form designed for the management of farms of Mastitis. Information that could not be observed during the visits to the farm was gathered by asking farmers (ages, the lactation stage, and the production of milk.). The examination of the Udder and milk was done to determine the clinical manifestation of Mastitis among cows. Subclinical Mastitis was identified by the California Mastitis Test (CMT). The Udder and the CMT score were determined under the procedures of the National Mastitis Council (1999).

Reagent preparation, conducting CMT and screening of the udder quarter for mastitis

According to the instructions, the entire CMT Concentrate bottle (Original Schalm CMT, California Mastitis Test, Techni Vet, USA.) contents were added to ten bottles of water to make the working solution of one gallon of the manufacturer. The quarters of all udders from 360 cows were examined for Mastitis using CMT, and the interpretation was made following the procedure described elsewhere [13]. To perform CMT, 2 ml of milk was collected into individual cups using hand milking while the paddle was horizontal. A similar amount of CMT Reagents was then added to milk. After that, the paddle turned in a circular motion to blend the ingredients. It was then scored in less than 10 seconds of turning the paddle. It was then rinsed using water before being used in the next test. Its CMT result was classified as positive or negative, based on the degree of the reaction. The test result of CMT was recorded and scored by the formation of gels. Samples with CMT scores of 1 were considered negative, with a CMT score of one being considered negative, whereas those with CMT scores of 2, 3 or 4 were considered positive (Table 1) [14]

Table 1: Description and interpretation of CMT scores

Description of visible change	Interpretation	Scores
Mixture remains liquid, no slime or gel formation	Negative	1
Mixture becomes slimy or gel-like. It seems to best advantage by tipping the paddle back and forth, while observing mixture as it flows over the bottom of the cup	Suspicious (mild)	2
Mixture distinctly forms a gel	Positive (moderate)	3
Mixture thickens immediately tends to form a jelly. Swirling the cup moves the mixture in towards the center exposing the outer edges of the cup	Positive (severe)	4

Clinical diagnosis of mastitis

An examination of the cattle confirmed Mastitis and visual inspection of the Udder and milk, palpation, and an examination of milk with CMT to confirm. The results of udder palpation were divided into 1, 2, 3, and 4 for the absence of pain or swelling in the udder or ventral area, swollen ventral quadrant generalized swollen quadrant, as well as a painfully swollen and painful udder, respectively. Milk scores where one is normal, 2 is flacks or clots, otherwise regular milk. 3, no milk, moderately abnormal color, and 4 = abnormal milk. The scores were not based on watery blood or serum. CMT score was 1, 3, and 4 (Table 1.). Positive mastitis cases were classified as mild, moderate, and severe based on the results of an examination (Table 2) [14].

Table 2: Classification of mastitis based on milk, udder, and cow examination

Mastitis Category	CMT Score	Udder Score	Comment (Cow)
Mild	2-4	1-3	Normal
Moderate	2-4	2-4	Normal
Severe	2-4	2-4	2 or more abnormal physical examination parameters

Statistical analysis

All the results were entered into the Statistical Package for the Social Sciences (SPSS) software version 26.0 and analyzed accordingly. The data were then inserted in an MS Excel spreadsheet (Microsoft Excel 2018, Microsoft Corp, Redmond, WA, USA) for cleaning, processing and analysis. The data indicated about the prevalence of mastitis expressed in percentage (%). The data were examined using IBM SPSS Statistics (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp) [15].

III. Results

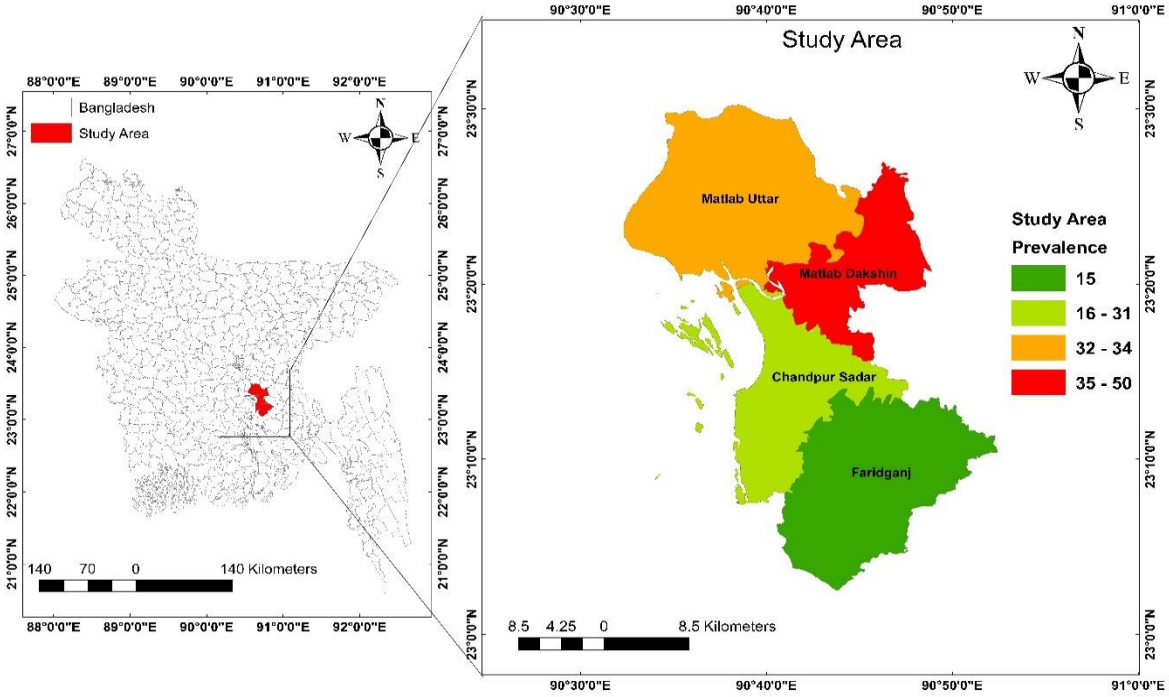

Figure 2 Prevalence of Mastitis on different upazila in Chandpur District

Table 3 Prevalence of Mastitis in different study areas of Chandpur

Total Cases	Number of affected cases	Percentage (%)	Healthy Cases	Percentage (%)
360	133	36.94	227	63.06

The table presents the prevalence of mastitis in different study areas of Chandpur. Out of 360 cases, 133 (36.94%) were affected by mastitis while 227 (63.06%) were healthy.

Table 4 Number, percentages, and stages of mastitis in the selected areas

Total number of examined cases	Number of affected cases	Percentage of Mastitis (%)	Stages of mastitis
360	84	23.33	Mild
	42	11.67	Moderate
	7	1.94	Severe

The table shows the number, percentages, and stages of mastitis in the selected areas. Out of 360 examined cases, 84 (23.33%) were affected by mastitis, with 42 (11.67%) in the moderate stage, 84 (23.33%) in the mild stage, and 7 (1.94%) in the severe stage.

Table 5 Prevalence of Mastitis on the basis of different types of Breeds

Types of Breeds	Number of Cow Examined	Number of Affected	Percentage (%)
Sahiwal Cross	120	39	32.50
Friesian Cross	120	60	50.00
Local Zebu	120	34	28.33

The table presents the prevalence of mastitis on the basis of different types of breeds. Out of 120 cows examined for each breed, Sahiwal Cross had a prevalence of 32.50%, Friesian Cross had a prevalence of 50.00%, and Local Zebu had a prevalence of 28.33%.

Table 6 Prevalence of Mastitis on the basis of age of cows

Age (Years)	Number of Cow Examined	Number of Affected	Percentage (%)
2-4	120	40	33.33
4-6	120	43	35.83
6-8	120	50	41.67

The table shows the prevalence of mastitis on the basis of the age of cows. Out of 120 cows examined in each age group, those aged 2-4 had a prevalence of 33.33%, those aged 4-6 had a prevalence of 35.83%, and those aged 6-8 had a prevalence of 41.67%.

Table 7 Prevalence of Mastitis on the basis of milk yield

Milk yield (Litre)	Number of Cow Examined	Number of Affected	Percentage (%)
1-5	130	60	46.15
6-10	80	35	43.75
11-15	72	23	31.94
16-20	48	11	22.92
21+	30	4	13.33

The table presents the prevalence of mastitis on the basis of milk yield. Out of the cows examined, those with a milk yield of 1-5 liters had the highest prevalence of mastitis at 46.15%, followed by those with a milk yield of 6-10 liters at 43.75%. The prevalence decreased as milk yield increased, with cows producing 21 or more liters having the lowest prevalence at 13.33%.

Table 8 Prevalence of Mastitis on the basis of lactation periods

Period of Lactation (Months)	Number of Cow Examined	Number of Affected	Percentage (%)
0-2	160	53	33.13
2-4	120	46	38.33
4-6	80	34	42.5

The table shows the prevalence of mastitis on the basis of lactation periods. Out of the cows examined, those in the lactation period of 4-6 months had the highest prevalence of mastitis at 42.5%, followed by those in the period of 2-4 months at 38.33%. Cows in the period of 0-2 months had the lowest prevalence at 33.13%.

Table 9 Prevalence of Mastitis on the basis of the position of quarters affected

Quarters	Number of Quarters examined	Number of Affected cases	Percentage (%)
Right Front	360	30	8.33
Left Front	360	36	10.00
Right Rear	360	53	14.72
Left Rear	360	60	16.67

The table presents the prevalence of mastitis on the basis of the position of quarters affected. Out of the quarters examined, those in the left rear position had the highest prevalence of mastitis at 16.67%, followed by those in the right rear position at 14.72%. Quarters in the right front position had the lowest prevalence at 8.33%, while the left front position had a prevalence of 10.00%.

Table 10 Prevalence of Mastitis in relation to the number of Quarters affected

Total Cows	Number of Quarters affected	Number of Affected	Percentage (%)
360	One	85	23.61
	Two	20	5.56

	Three	18	5.00
	Four	10	2.78

The table shows the prevalence of mastitis in relation to the number of quarters affected. Out of the 360 cows examined, 85 (23.61%) had mastitis in one quarter, while only a small percentage of cows had mastitis in more than one quarter, with 20 (5.56%) having it in two quarters, 18 (5.00%) in three quarters, and 10 (2.78%) in all four quarters.

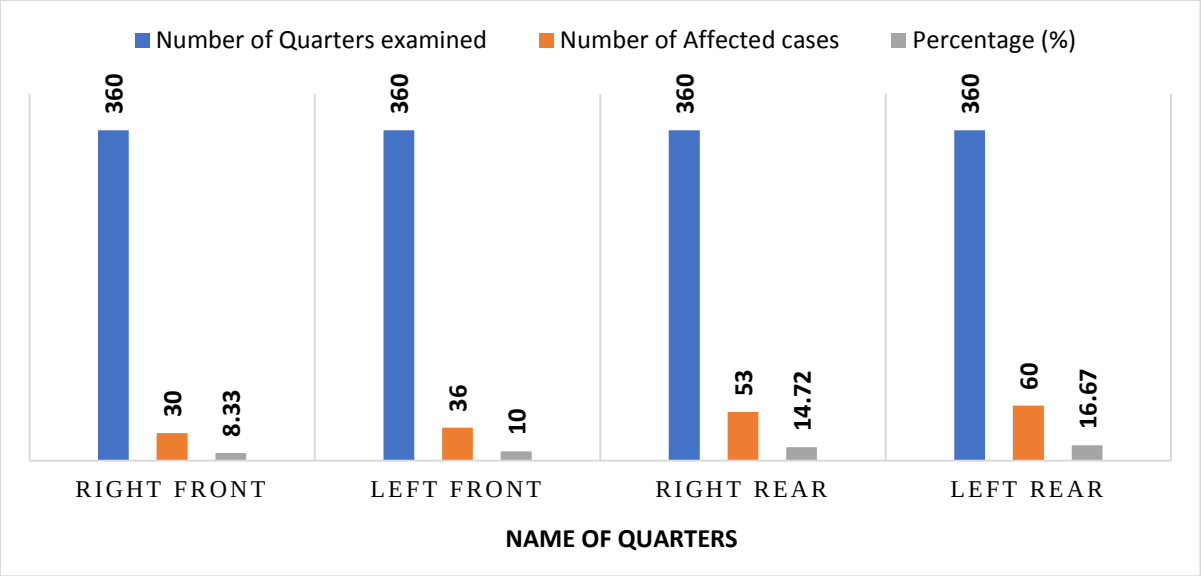

Figure 3 Prevalence of Mastitis on the basis of the position of quarters affected

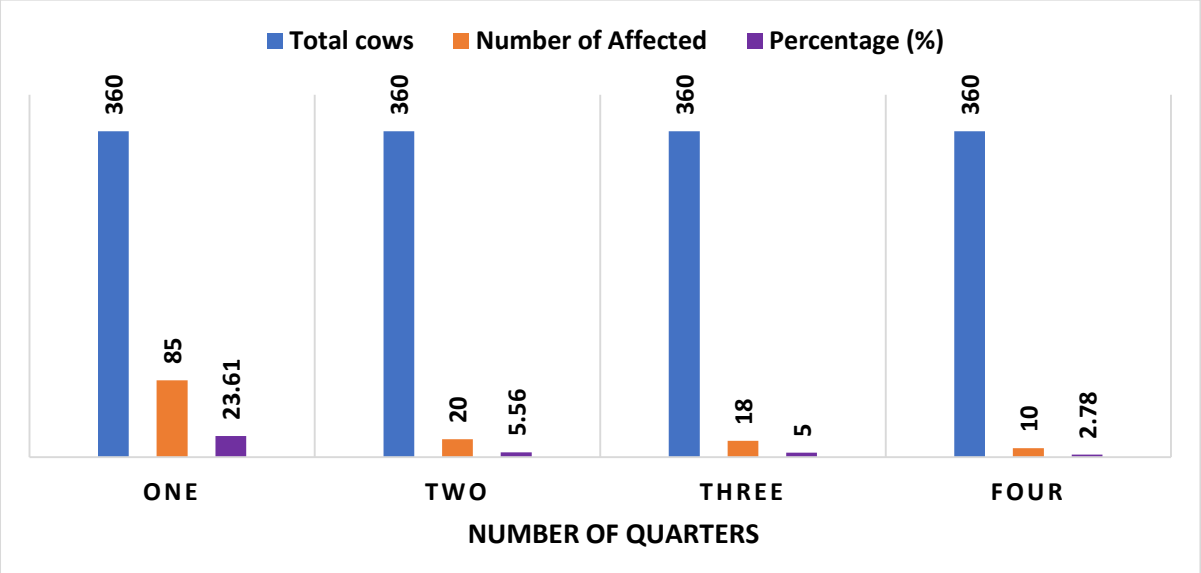

Figure 4 Prevalence of Mastitis in relation to the number of Quarters affected

IV. Discussion

The percentages, numbers as well as stages within the chosen areas are shown in Tables, mentioned above. A total of 360 dairy cows were included. The total number of cows with Mastitis was 36.94% (n=360) (Table 3). Of the 133 cases with positive results, 23.33% of cows were suffering from mild, 11.67% had moderate, and 1.94% were severely affected by Mastitis (Table 4). This study revealed the high prevalence (36.94%) of Mastitis among dairy cows from certain regions. These findings are in accordance with the earlier study [16-18].

Mastitis is a common problem in various breeds; namely, Sahiwal crosses, Friesian crossing, and locally Zebus are shown in the table 5. The higher proportions of Friesian cross 50.0% cows have Mastitis than Sahiwal

cross 32.50% and local Zebu 28.33%. Crossbred cows with high yields are more susceptible to udder infections than low-producing ones [19,20]. Production of a huge quantity of milk makes the glandular tissue more active and more prone to infections. In this study, both Sahiwal and Friesian cross had higher rates than Zebu. This finding is in line with the results in [17]. Crossbred cows have more milk production than the Zebu. A larger size, longer and pendulous udders of crossbred cows could have been more susceptible to infection with a higher risk of infection at rest [21].

Mastitis prevalence for 2-4 and 4-6 and 6-8-years old cows was 33.33%, 35.83%, and 41.67% (Table 6). The prevalence of Mastitis was varied according to age. Several studies agreed with the current results of an increase in Mastitis advanced age [19,20,22,23] that older cows who were 14 years of age suffered from 61.0% sub-clinical Mastitis which was in agreement with the present findings. The aging process can lead the cow to infection and decrease the effectiveness of the sphincter of the teat [24]. However, younger cows might be less prone to Mastitis due to an improved host defense mechanism [25].

The prevalence of Mastitis in the stages of lactation 0-2, 2-4, and 4-6 months was 33.13%, 38.33%, and 42.50% (Table 8). The incidence of Mastitis increased with the lactation age was significantly different among groups. A higher percentage of cows in the lactation stage of 4-6 months were suffering from Mastitis than those in the one-month lactation group. The study revealed that the frequency of Mastitis was higher during the 4-6 months after lactation. This is in line with other studies [16,17,26]. The higher rate of subclinical Mastitis over 6 months of lactation could be due to cow-to-the-cow transmission of infectious organisms in the course of milking.

Mastitis prevalence during this research was 46.15%, 43.75%, 31.94, 22.92%, and 13.33% at a milk yield of 1-5, 6-10 11-15, 16-20, and 21+ liters, respectively (Table 7). This shows that the percent of prevalence decreases as you produce more milk. This is in line with other studies [26]. The higher rate of mastitis among lower milk-producing cows is in contradiction with different published findings [27-29] investigated the link between milk production and disease and found that the high yield of milk predisposed an animal to certain diseases, especially the mastitis. Similarly, [28] stated that mastitis-afflicted cows generate more milk than healthy but generally less productive herd-mates. Sub-clinical mastitis could continue to affect milk production, particularly under circumstances of stress [30]. Losses from clinical mastitis are typically obvious and are caused by the dumping of milk, a transient decrease in milk yield, and premature culling [10]. In this study, dairy farmers in the research area provided less attention to cows with low yields. Another explanation is that chronic mastitis may have reduced milk production for the cow since there was no milk production measured at the time of examination that could have led to an increase in mastitis among high-yielding cattle.

An entire group of milking cows was randomly chosen for screening their quarters (n=360*4) for Mastitis using CMT. The percentage of different kinds of quarters that are affected by Mastitis is displayed (Figure 3, Table 9), which shows significant differences between different kinds of quarters that are affected by Mastitis ($P<0.01$). However, the left rear quarters are more affected than the other. In the 360*4 quarters examined in the study, only 16.67% (n=60) in the quarters were identified as CMT positive. The proportion in CMT positive quarters was in line with previous reports [23,31] found significant differences in the number of affected quarters compared to their anatomical locations. The tests conducted quarter-wise showed the greatest prevalence of the right rear quadrants [26,32]. The present study suggests that the greater prevalence observed in this quarter could result from exposure to urine and dung. Furthermore, pulling backward and sideways could cause unnecessary stress on the cows while milking. The number of quarters affected in mastitis cows shows that single quarter affection was significantly higher ($P<0.01$) than others.

V. Conclusions

Mastitis decreases the milk yield of affected cattle as opposed to the normal. The epithelial tissues that line the udder are severely damaged and result in the loss of a quarter. The market price of the livestock is significantly diminished and lost when all areas are damaged permanently. Thus, correct diagnosis and treatment promptly aid in reducing economic losses. However, diagnosing should be precise, cost-effective, simple, and efficient. Physical examinations include observing the udder and teat condition first, and organoleptic test of milk, such as color, odor, and consistency of the milk, then testing the animal's physiological parameters, and finally, testing the milk using different chemicals. Of all the chemically test tests, CMT will be the most effective, economical, cost-effective, and simple to carry out.

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Conflicts of Interest

The authors have no competing financial interest or personal relationships that could have appeared to influence the work reported in this paper

Informed consent
Not Applicable

Authors Contribution
All authors contributed equally to the conception, design, worked as well as the drafting and critical revision of the manuscript.

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