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Research Article

The Prevalence of Bovine Mastitis in and around Abomsa Town In Oromiya Regional tate of Ethiopia

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Abstract

The study was piloted as of November 2019 towards May 2020 to examine or evaluate the occurrence of bovine mastitis in and around Abomasa town; Oromia, Ethiopia. Californian Mastitis Test (CMT) did the ways of examination of the sample. Based on our current investigation, the overall mastitis positive cases were 41.92%, of which 16.66% (64/384) clinical and 25.26% (97/384) sub-clinical cases. Additionally, based on the examination of teat quarters, around 1524 quarters evaluated and 288 quarters (18.9%) paraded as affected by the pathogens and 148 teat quarters were infected by clinical mastitis and 0.78% (12/1536) quarters were blind. Out of 140 CMT positive subclinical quarters cultured, 129 (92.14%) bacterial growths were observed and 11(7.86%) showed no growth up on culture. Out of 129 bacterial growth observed, 55 (42.64%) *Streptococcus agalactiae*, 30 (23.26%) *Staphylococcus aureus*, 29 (22.48%) *Streptococcus dysagalactiae* and 8 (6.2%) *Staphylococcus* epidermidis were confirmed as the major cause of the bovine mastitis in study area and Other bacterial isolates were *E.coli* and *Corynebacterium bovis* contributed 5 (3.87%) and 2 (1.55%) respectively using 50% predictable occurrence of the disease, 95% sureness intermission, and 5% total accuracy.

Keywords: Abomsa; Bovine Mastitis; California Mastitis Test (CMT); Ethiopia: Oromiya; Prevalence

Introduction

Ethiopia was one of the African continents that were registered as a country with highly populated with livestock production. Furthermore, from livestock population dairy animal was the most prominent, which estimates around 9.9 million are heifers. According to the Ethiopian Central Statistical Agency, the dairy outcomes like Milk and milk yields are used as a main nutritional basis for both urban and rural people [1]. Mastitis is one of the microbial pathogens that can be occurred due to the soreness of the mammary gland and it had around 130 serotypes were originated from milk sample however other bacterial species like *Enterobacteriaceae, Streptococci* and *Staphylococcus* can also cause mastitis infection to the dairy animals [2]. Based on their severity, the typical clinical symptoms of this infection can be divided to two major classes (subclinical and clinical) [3]. For the development of this infection, different circumstances can take places, like – the availability of the disease, occurrence of the susceptible host cells and the situation of the air condition [4]. Mostly, because the infection can affects dairy cows and it affects the teat canal of the animals later up to leads to blind the teat canal, due to this reason it will reduce animal production like milk and which have adverse side effects on the economy of the countries and reduces the herd numbers.

The overdue removing of dairy cows due to the of chronic development of the infection , costs for treatment, reduction in the milk quality or pureness, this infection can causes major economic problems. Milk with high bacterial load causes interference with manufacturing process [5]. In Ethiopia, this infection can be well knower; however still know there is no investigation can be done analytically, based on the occurrence and its side effects on livestock productions. Generally, this pathogen can be occurred due to the techniques that we kept our dairy animals, especially at the early time. Although this disease can developed by different pathogens including infectious and non-infectious once, bacterial pathogens the primary causes that can affects most dairy animals. Therefore, this Study was conducted based on the physical and clinical examinations of clinical cases, screening tests using the Californian Mastitis Test (CMT) and microbiological investigation, beginning from November 2015 to May 2016, with the following objectives:

- To determine the prevalence of bovine mastitis in and around Abomsa town in Oromiya Regional State of Ethiopia.
- To identify the major pathogens responsible for the disease in the study area.

Materials and Methods

Study Areas

The current study was carried out in and around Abomsa town in Arsi Zone of the Oromiya Regional state of Ethiopia from November 2015 to May 2016 and it is the administrative center of Merti woreda, which is found about 232km away from (Finfinne) Addis Ababa (www.wikidistance.org/Abomsa). It is located at latitude of 8°35′N and longitude of 39°51′E and the average Altitude of 1438 meters above sea level (m.a.s.l). The area experiences a mean annual temperature of about 28°C and Wind S at 14 km/h with 47% of humidity. The prevailing agricultural system in the area is mixed farming with crop and livestock production [6].

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Sample Size Determination

The desired sample size for the study was calculated using the formula given by [7] with an expected prevalence rate of 50%, 95% confidence interval, and 5% absolute precision.

$$n = \frac{1.962 \times Pexp\ (1 - Pexp)}{d^2}$$

Where:

n = sample size

Pexp = expected prevalence

d = desired level of precision

The precision level was decided to be 5% at a confidence interval of 95%. Thus, a total of 384 lactating cows with about 1536 teat quarters were considered for the study.

Study Methodology

a. Clinical Examination

Obviously, based on actual examination the whole udders and teats were investigated by necked eye. Later on based on palpation ways of examination, we assess either it has fibrosis, damages, tick infestation, degeneration of tissue, and totally solidness or death of the teat canals. In order, to collect the samples aseptically we used diluted alcohol, cotton, and cleaning the teat canals by soaps [8].

b. California Mastitis Test (CMT)

Subclinical mastitis were assessed by CMT techniques and by taking sample and placed on clean slides we evaluated the presence of jelling and tackiness, that can gives the hint for the existence and gravity of the disease [9]. The California Mastitis Tests (CMT) were done, as it was labeled on the reagents leaflets [2]. Udder and teat was first washed with water and disinfected by commercial detergents then, about 2 ml of milk sample was taken from all quarter teat canal and put in to the sterile. Then based on the general direction of the reagents we added similar amount of the reagent on each cup and mixes very well for 15 seconds. Finally, based on the direction we found the occurrence of the disease (gel formation) and absence of the disease (no change). Based on this finds we were discuss about the types of the mastitis classes.

c. Bacteriological Isolation and Identification

Based on our interpretation we observed that, *Staphylococcus* species and we recognizes this pathogens based on morphigical characteristics of it like Gram staining, colony, oxidase test, hemolysis, ferment maltose, catalase test, slide coagulase test, growth on Edward's medium and CAMP test. Coli form species were recognized and distinguished by morphological appearance of the colonies under microscope. When we examine on other Medias like MacConkey agar, Gram stain, motility test, indole test, and Triple sugar iron agar test to detect sugar fermentation. Corynebacterium species were identified and differentiated by colony morphology, Gram stain, hemolysis production, catalase test, Indole test and fermentation on glucose and mannitol. Salmonella are identified and differentiated by growth on ordinary culture media, indole test, and fermentation on lactose, glucose and maltose [10]. The plates were examined for growth of micro-organisms and those negatives were re-incubated further up to 4 days, after which the conclusion of no growth of micro-organisms was arrived at [3].

Data Analysis

All the data collected on the sample collection format and from the microbiology, culture and biochemical tests were recorded and coded on excel spreadsheet. Arithmetical investigation was by STATA® sort 1. Descriptive investigation procedures were used to outline the occurrence of subclinical mastitis. The overall occurrence of mastitis was designed as percentage values, using chi-squared ($\chi 2$) test. P value less than 5% ($P < 0.05$) was included as if statistically significant.

Results

Currently, 384 lactating dairy cows was taken as a presentative samples for the occurrence of both clinical and sub clinical mastitis diseases. The prevalence was analyzed at heifer and teat canal stage. The general observance of the current studies were revealed that 41.92% (161/384), out of which 16.66% (64/384) and 25.26% (97/384) were clinical and sub clinical infections, one –to-one (Table 1). Based on the quarter stages of the teat canals, 18.9% (288/1524) was recorded. In this study, Of 1524 quarters examined, 288 quarters (18.9%) indicated the presence of mastitis and 148 quarters was affected by clinical type of mastitis cases and variation were recorded on the milk (Table 1) and 0.78% (12/1536) had blind teats.

Observation level	Clinical Cases			Subclinical Cases		
	No examined	Positive	Percent	No examined	Positive	Percent
Cows level	384	64	16.66	384	97	25.26
Quarter level	1524	148	9.7	1524	140	9.2

Table 1: Prevalence of clinical and subclinical mastitis at cow and quarter level.

The absolute occurrence of various bacterial species sequestered from the CMT positive subclinical cases are shown in (Table 2). Out of 140 cultures, growths were observed on 129 (92.14%) and 11(7.86%) of them showed no growth up on culture. The results of bacteriological culture from CMT positive subclinical mastitis showed the involvement of 129 bacteria belonging to 4 genera and 6 species. All transmissible and conservational pathogen were sequestered from milk samples. In this study the predominant bacterial species isolated was *Streptococcus* species (65.12%) followed by *Staphylococcus* species (29.46%), and *Escherichia coli* (3.87%). The *Streptococcus* species were the major pathogens out of which Streptococcus agalactiae and Streptococcus dysagalactiae contributed the major share accounting 65.12% and *Staphylococcus* species accounting 29.46%, of which 23.26% *Staphylococcus* aureus and 6.2% *Staphylococcus epidermidis* was isolated from subclinical mastitis and the third predominant bacterial genera isolated were the coliform with 3.87% of *E.coli* and 1.55% of *Corynebacterium bovis* (Table 2).

Discussion

In Ethiopia, subclinical mastitis was one of the most common infections of the udder and teats that leads to dairy mastitis infection and it was found as major problem in the areas. In this study, the occurrence of mastitis was designed at heifer and quarter stages. The general occurrence of mastitis at heifer stage was 41.92% (161/384), out of which 16.66% (64/384) and 25.26% (97/384) were clinical and

Bacteria isolated	No. of isolates	Rate of isolation
Staphylococcus epidermidis	8	6.2
Streptococcus dysagalactiae	29	22.48
Staphylococcus aureus	30	23.48
Streptococcus agalactiae	55	42.64
E.coli	5	3.87
Corynebacterium bovis	2	1.55
Total	129	100

Table 2: The rate of bacterial isolation of CMT positive subclinical mastitis.

sub clinical infections, respectively (Table 1). This outcome is in similar to that investigation by [11] which reveals 40.40% and 46.7% [12] in Adama town. But [13] reported lower quarter prevalence (17.9%) than the current study. However, the finding of this study was found lower than the previous reports by [14], who outlined that the occurrence of mastitis were 71% in heifer farms of Holeta town, Oromia regional state, Ethiopia. Additionally, based on our current outcomes, the clinical mastitis positive cases were 16.66%, while the sub-clinical mastitis was 25.26% of the stake. The reports of [15] (15.1%) on clinical bovine mastitis was lower than the present study. In case of the mastitis that were subclinical type, the current outcome were somewhat higher than clinical types [16]. The outcome of mastitis, that was subclinical type at cow level founded on CMT test was (25.26%), which is similar to 25% reports of [17] in Holeta town, central Ethiopia.

The results of bacteriological culture on the CMT positive Subclinical mastitis cows showed the involvement of 129 bacterial growths belonging to 4 genera and 6 species. All transmissible and conventional pathogen were outline from CMT positive subclinical mastitis cows. Based on our current outcomes a high occurrence of mastitis that was subclinical type and *Streptococcus* and *Staphylococcus* species being the most common infections that causes disease in the areas, causing subclinical mastitis (Table 2). In the current investigations, most of the bacterial infection that designed on CMT positive subclinical mastitis was *Streptococcus* groups (65.12%) being the predominant followed by 29.46% of *Staphylococcus* species. This finding were higher than the finding of [15] (51.14%) of *Streptococcus* species. The most outcomes of this pathogen was related with its recurrent establishment of teats, its capacity to happen intracellular and inhabit inside carbuncles in the udder and later resistant to antibiotic treatment [18]. Another most common prevalent pathogen was coliforms. This outcome similar to that of [19], in which the coliform accounts for 14.10%. Furthermore, 3.87% outcomes were recorded as a pathogen that had been caused by E. coli which is in similar with the outcomes of [15,20,21] whom outlined that 4.60, 3.64 and 3.14%, respectively in various location of our countries. The cumulative incidence of *streptococcal* mastitis during this survey (65.90%) was higher than the amount reported by the [22] (53.55%), and [23] (27%) in dairy cows.

Conclusion

A study conducted from November 2019 to May 2020 in and around Abomsa town in Oromiya Regional state of Ethiopia revealed a high prevalence of clinical and sub-clinical mastitis implying significant economic loss. The current outcomes revealed that the occurrence of disease at heifer and quarter teat canal rank was elevated and *Streptococcus* and *staphylococcus* species was the common infection that observed as sub-clinically infected heifer. The most common factors that activate this pathogen were associated with humble hygienic exercise and low management condition/system. Similarly, the actors that plays a major role as a basis of infection for other heifer in the flock. Farmers and health managers only concerned with clinical mastitis and often are unaware of the prevalence of infection in their herds and resulting in major economic loss. Thus, improvement of management system, regular screening of early infection and effective treatment should be practiced to reduce the impact of bovine mastitis.

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