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# Survey on Major Risk Factors Associated with Bovine Mastitis in Coffela and Shashemenie District, West Arsi Zone of Oromia Region, Ethiopia

[1]Mesgana Berta, [1]Nigus Abebe, [1]Getachew Gugsa and [2]Berhanu Shelima
[1]*Mekelle University, College of Veterinary Medicine, P.O. Box 2084, Ethiopia*
[2]*Adami Tulu Research Center, Ethiopia*

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**Corresponding Author:**
Nigus Abebe
*Mekelle University, College of Veterinary Medicine, P.O. Box 2084, Ethiopia*

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**Abstract:** Mastitis, inflammation of the parenchyma of the mammary gland has an effect on animal production, public health and economical importance. A cross sectional study was conducted with the objective of determining the possible risk factors in urban area of Coffela and Shashemenie Town from November 2013 to April 2014. A total of 44 farm owners and/or attendants of dairy cattle herds were interviewed using structured questionnaire. In this study, the numbers of indoor housed farms were 36(81.82%) and barn ones were 8(18.18%). The nature of floor of animal house whose bedding made of concrete was 13(29.55%), stony 5(11.36%), soil 25(56.82%) and others 1(2.27%). The inclined flooring system of the farms accounts 17(38.64%) and leveled one was 27(61.36%). The entire respondent (100.00%) cleaned the houses daily. Among the different farms, 27(61.36%) farm owners were washed and cleaned their cows, 37(84.09%) washed udder and teats and 43(97.73%) respondents washed their hands before milking. From the total farms, 25(56.82%) were used towels for drying the teat and 2(4.55%) were used disinfectant before and after milking. Of the total farms, 4(9.09%) were milked mastitis positive cow at first, 19(43.18%) farms were milked mastitis positive cows at last and 21(47.73%) were milked without order. From these 44 farms, 397 cows were screened for mastitis and of these 246(61.96%) were positive for bovine mastitis and the higher prevalence was documented from Kofel (73.87%) compared to Shashemenie (28.12%). In conclusion, the prevalence of the bovine mastitis was associated with the dairy farm management practices. Further, investigation should be conducted on risk factors associated to prevalence of mastitis to undertake measurable control options of mastitis in the farms and isolation and characterization of the possible

bovine mastitis causing agents should be done. In order to reduce the higher prevalence of the diseases, improved milking hygiene, prevention of skin lesion, culling of clinically infected cows should be practiced.

## INTRODUCTION

Dairy production is a biologically efficient system that converts feed and roughages to milk (Yohannes, 2003). Ethiopia has the largest livestock population in Africa. The total cattle population of Ethiopia is estimated to be 53.5 million. The majority (97.9%) of the cattle population is found in rural areas while very small proportion is accounted for urban areas (2.1%) (CSA., 2011).

However, milk production often does not satisfy the country's requirements due to a multitude of factors. Mastitis, inflammation of the parenchyma of the mammary gland and its associated structure is among the various factors contributing to reduced milk production (Biffa *et al*., 2005). Mastitis is usually considered the most costly disease of dairy cattle. Subclinical mastitis is considered the most economically important type of mastitis because of long term effects on total milk yields. Improperly management also causes mastitis. Mastitis may be attributed to deficient management, improper milking procedures, faulty milking equipment, inadequate housing and breeding for ever-increasing milk yield. Management and environmental factors also interact, increasing the exposure of cows to mastitis organisms, reducing the cow's natural resistance to the disease or aiding micro-organism's entry through the teat canal. Climate, season, herd size, type of housing, nutrition and stress all influence the incidence of mastitis. The most common causative organisms of udder disease include: staphylococci (*S. aureus* and *S. epidermidis*), streptococci (*Str. agalactiae*, *Str. Dysgalactiae*, *Str. umberis* and *Str. Bovis*) and coli forms (mainly *E. coli* and *Klebsiella pneumonia*). Other less frequent agent include: Pseudomonasdes, nocardiac, mycoplasema and yeast (McDonald, 1979).

Udder disease, including udder disorders and high Somatic Cell Count (SCC), constitutes the most common reason for culling. In 2007, 26% of culling was attributed to udder disease and 10% of the total cow population was consequently, culled because of udder disorders and high SCC.

Indeed, mastitis is the most costly disease in dairy production (Seegers *et al*., 2003). Severe mastitis where the cow is depressed and off feed should be treated with supportive therapy aimed at counteracting the effects of end toxin through the use of treatments such as fluids, calcium, hypertonic saline, anti-inflammatory drugs and complete and frequent milk out of the affected quarters.

Studies have shown that antibiotics make little difference in the outcome of severe coli form mastitis. Intra mammary antibiotics are poorly distributed in a severely swollen gland. Successful treatment of these cows may require veterinary intervention and should at least follow a protocol established in consultation with the herd veterinarian. When considering the cost of any disease, it must be remembered that every disease has direct and indirect costs. Bennett *et al*. (1999) estimated that the total costs of each disease can be much higher than the direct expenditure. Most of the available estimates take into account only a part of the real cost of mastitis as estimating the true costs associated with mastitis is notoriously difficult. It is even more difficult to quantify the losses associated with sub-clinical mastitis because they are not visible to farm owners. Despite intensive research and the implementation of various mastitis control strategies over the decades, bovine mastitis has not disappeared and the reduction in the prevalence of subclinical mastitis has been minimal (Pyorala, 2002).

On the other hand, there has been a considerable decrease in the incidence of clinical cases of mastitis worldwide as a result of these control measures. Natural defense mechanisms of the udder can be used to our advantage in mastitis control. For this reason, more and exact knowledge from expanded epidemiological analysis of mastitis is needed for creating better control program. Efforts have only been concentrated on the treatment of clinical case. Therefore, the objective of this research was to determine the prevalence and major risk factors associated with bovine mastitis:

- To determine the prevalence of bovine mastitis in Cofale and shashemenie
- To assess the knowledge of the community on bovine mastitis

## MATERIALS AND METHODS

**Study area:** The study was conducted at Cofale and Shashemenie, West Arsi Zone of the Oromia Region which is situated at a distance of 163 km from Addis Ababa, the capital of Ethiopia. It is located in the Rift Valley Region. Kofale and Shashmane extend from 6012'29" to 7042'55" latitude and 38004'04" to 39046'08" longitude. It shares bounder line with East Shewa Zone to the North, SNNPRS to the West, Arsi to the Northeast, Guji to the South and Bale Zone to the East. Most parts of the zone have elevations of ranging

from 1500 to over 2300 m. Administrative center of the zone is Shashemene Town. West Arsi Zone has 11 woredas and 325 peasant association. The Zonal Agricultural and Rural Development Office has 45 clinics and 45 health posts.

**Study population and study animals:** The study was conducted on dairy cattle found at West Arsi Zone of the Oromia Region in Kofale and Shashmane from November 2013 to April 2014. Indigenous Zebu (Boran and Arsi breed) and cross breed (Holstein Friesian) lactating cows owned by small holder farmers were included in the present study.

**Study design and sampling method:** Cross sectional study was conducted in dairy farms to investigate the major risk factors associated with bovine mastitis. Simple random sampling method was employed on lactating animals using a sample frame obtained from agricultural office of the district.

**Study methodology**

**Questionnaire survey:** A structured questionnaire that could help to assess associated risk factors of bovine mastitis was developed and pretested before administered for each randomly selected study participants. The questionnaire was prepared in English and translated into local language. Respondents were interviewed to evaluate regarding the different potential risk factors such as previous history of mastitis, housing conditions, milking hygiene, general management, etc.

**Californian Mastitis Test (CMT):** California Mastitis Test (CMT) remains the only reliable screening test for sub clinical mastitis that can be easily used at the cow side based on the nature of coagulation and viscosity of the mixture (milk and CMT reagent) which show the presence and severity of the infection, respectively (Harmon, 1994). CMT was developed to test milk from individual quarters but has also been used on composite such as quarter milk samples and bulk milk samples (Schalm and Noorlander, 1957). Fresh, unrefrigerated milk can be tested using the CMT for up to 12 h, reliable reading can be obtained from refrigerated milk for up to 36 h. If stored milk is used, the milk sample must be thoroughly mixed prior to testing because somatic cells tend to segregate with the milk fat. Results should be scored within 15 sec of mixing because weak reactions will disappear after that time. The CMT reagent is simply a detergent plus bromcresol purple (used as an indicator of pH). The degree of reaction between the detergent and the DNA of cell nuclei is a measure of the number of somatic cells in milk. The use of the CMT to identify infected quarters has been extensively evaluated. In general as CMT reactions increase the likelihood of recovering pathogenic bacteria increases.

Before sample collection milk samples were examined for visible abnormalities and were screened by the CMT according to Quinn *et al*. (1999). From each quarter of the udder, a squirt of milk sample was placed in each of the cups on the CMT paddle and an equal amount of 3% CMT reagent was added to each cup and mixed well. Reactions were graded as 0 for negative, +1, +2 and +3 for positive (NMC., 1990; Quinn *et al*., 1999).

**Data analysis:** A data base was developed to store quantitative data from the cross sectional study using Microsoft office Excel 2007 Software. STATA version 11 was used to compute descriptive statistics of variables collected during the study. The $p<0.05$ was reported as statistically significant.

## RESULTS AND DISCUSSION

**Questionnaire survey result:** A questionnaire survey with open and closed questions was used amongst the owners whose animals were tested and who were willing to participate in the survey. The questionnaire captures information on animal husbandry, milk consumption.

A total of 44 (47.73% from Kofela and 52.27% from Shashemana) dairy farm owners' were interviewed. Based on the questionnaire study, it was found that female dairy farm owners cover majority of the dairy farm operations.

Out of the 44 farm owner respondents, 10 were males and 34 were females with mean age of 38. The educational back ground of responds were summarized as 43.18, 45.44 and 11.36% for illiterate, elementary and secondary and above, respectively.

General handling management systems of the observed dairy farms are summarized in the following graph (Fig. 1). The 81.82% of the dairy farms were managed under indoor management system. In most of the farms (56.82%), the natures of floor were soil and the floor inclination was leveled (61.36%). Surprisingly 100% of the respondents remove the manure of the animals daily.

Table 1 summarizes activities performed during milking of animals. The 43(97.73%) respondents wash their hands before and after milking and similarly 84.09% of the respondents used to wash the udder and teat of their animals. Moreover, 56.82% of the respondents use towel to make dry the teats of animals. However, 95.45% of the study participants don't use any chemical disinfectants.

Attempts were also done to get information on mastitis history and other potential risk factors. Table 2 summarizes the information obtained from the respondents regarding to history, diagnosis and clinical signs of bovine mastitis. About 38.64% of the respondents had information about bovine mastitis and 45.45% of the

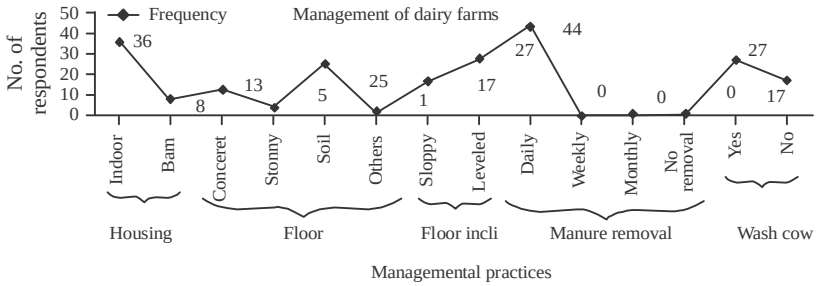


Fig. 1: Housing system of dairy farms at Kofela and Shashemane

Table 1: Summary of milking practices

| Practices during milking | Frequency | Percentage |
|---|---|---|
| **Wash hand** | | |
| Yes | 43 | 97.73 |
| No | 1 | 2.27 |
| **Wash udder teat** | | |
| Yes | 37 | 84.09 |
| No | 7 | 15.91 |
| **Use towel** | | |
| Yes | 25 | 56.82 |
| No | 19 | 43.18 |
| **Used disinfectant** | | |
| Yes | 2 | 4.55 |
| No | 42 | 95.45 |
| **Milking mastitis cow** | | |
| First | 4 | 9.09 |
| Last | 19 | 43.18 |
| Without order | 21 | 47.73 |
| **Manage mastitis milk** | | |
| Discard | 9 | 24.32 |
| Calf feeding | 21 | 56.76 |
| Human consumption | 4 | 10.81 |
| Pet animal feeding | 1 | 2.70 |
| Others | 2 | 5.41 |

Table 2: Summary of respondents to mastitis history and other risk factors

| Characteristics | Frequency | Percentage |
|---|---|---|
| **Know causes of mastitis** | | |
| Yes | 17 | 38.64 |
| No | 27 | 61.36 |
| **Previous history of mastitis in farm** | | |
| Yes | 20 | 45.45 |
| No | 24 | 54.55 |
| **Diagnosis mastitis** | | |
| Milk colour and texture change | 37 | 84.09 |
| Udder change (swelling, hotness) | 3 | 6.82 |
| Screening (using milk test) | 2 | 4.55 |
| Decrease milk yield | 2 | 4.55 |
| **Teat lesion** | | |
| Present | 8 | 18.8 |
| Absent | 36 | 81.82 |
| Keep record of milk | | |
| Yes | 14 | 31.82 |
| No | 30 | 68.18 |
| **High producing cows prone to mastitis** | | |
| Yes | 34 | 77.27 |
| No | 10 | 22.73 |

respondents had previous history of bovine mastitis in their farm. Among the individuals who respond the presence of bovine mastitis in their previous exposure, 45% of them were answered as clinical mastitis. Total 37(84.09%) of the study individuals used to diagnose the presence or absence of bovine mastitis by looking milk colour and texture changes. According to the respondents, 81.82% of them didn't encounter any teat lesion relating to mastitis.

Table 3: Summary of respondents on screening, sample collection and drug usage

| Characteristics | Frequency | Percentage |
|---|---|---|
| **Practice screening test** | | |
| Yes | 6 | 13.64 |
| No | 38 | 86.36 |
| **Submitted milk sample** | | |
| Yes | 4 | 9.09 |
| No | 40 | 90.91 |
| **Name of drug used mastitis treatment** | | |
| Oxy TTC | 1 | 2.27 |
| Penstrip | 1 | 2.27 |
| Others | 1 | 2.27 |
| Do not know | 41 | 93.18 |
| **Use traditional medicine** | | |
| Yes | 10 | 22.73 |
| No | 34 | 77.27 |

On the other hand, only 31.82% of the respondents had practice of keeping record of milk yield and similarly 77.27% of them understand that high milk producer animals are prone to mastitis.

Further, questionnaire survey was also conducted to assess the experience of milk screening test using CMT, sample collection and drug usage for bovine mastitis (Table 3). Most of the respondents (86.36%) didn't have practices of milk screening using CMT. Due to this only 9.09% of respondents submit milk samples for bacteriological identification. Majority (93.18%) of the respondents don't know the name of drugs used for treatment of bovine mastitis. Furthermore, 22.73% of respondents used traditional medicine against bovine mastitis.

Efforts were also undertaken on knowledge gap assessment of the community regarding veterinary and public health importance of bovine mastitis (Table 4). About 45% of the respondents replied that the effect of bovine mastitis on animal production is interrelated with reduced milk yield followed by teat loss (15.91%). Public

Table 4: Knowledge gap assessment to bovine mastitis

| Characteristics | Frequency | Percentage |
|---|---|---|
| **Production problem associated with mastitis** | | |
| Reduced milk yield | 20 | 45.45 |
| Calf death | 3 | 6.82 |
| Animal culling | 2 | 4.55 |
| Teat loss | 7 | 15.91 |
| Reduced milk yield and Teat loss | 6 | 13.64 |
| Calf death and Animal culling | 6 | 13.64 |
| **Public problem associated with mastitis** | | |
| Poor quality of milk | 3 | 6.82 |
| Predisposing to zoonoses | 5 | 11.36 |
| Both | 36 | 81.82 |
| **Experiencing of mastitic cow** | | |
| Culling | 6 | 13.64 |
| Keeping in herd | 2 | 4.54 |
| Traditional treatment | 4 | 9.09 |
| Taking to vet. Clinic | 18 | 40.91 |
| Discard mastitic milk | 7 | 15.91 |
| Regular tick removal | 7 | 15.91 |

health importance of bovine mastitis was also acknowledged by most of the respondents (82%) as a result of both poor milk quality and predisposing to zoonotic diseases.

**CMT results:** Screening test was performed on those randomly selected study animals (Fig. 2). Out of 397 screened animals 246(61.96%) were positive for bovine mastitis where 25.94% of them were with moderate (++) degree of gel formation. Accordingly, high prevalence of bovine mastitis was documented from Kofel (73.87%) compared to Shashemenie (28.12%). Physical nature such as texture and odour of the milk collected during the study period were normal where as 1.26% of the collected milk had flexi and watery colour.

Mastitis, the inflammation of mammary gland is one of the most important economical diseases of dairy cattle. Clinical and sub clinical form of the disease is found to be common in Ethiopia, contagious pathogens were found to be more common than environmental pathogens. Clinical form of the disease is not difficult to diagnose but subclinical forms may be more difficult and need herd survey to investigate the disease incidence. Several indirect tests are employed ensure the presence of inflammatory exudates and cells in infected milk such as California Mastitis Test (CMT) and Somatic Cell Count (SCC) (Hirsh and Zee, 1999).

Udder and teat disinfection was practiced by some farm owners. In most of the farms (housing and milking practice) plays a significant role in the incidence of bovine mastitis. It was observed that farms with poor housing and milk practice showed higher incidence of mastitis (Quinn *et al*., 2002).

In the present study, the overall prevalence of subclinical bovine mastitis was 61.96% which is by far higher than the report elsewhere (Nesru, 1999; Bitew and Prasad, 2011) who reported the prevalence of subclinical cases as 25.2% (at Bahir Dar) and 32.2% (in the urban

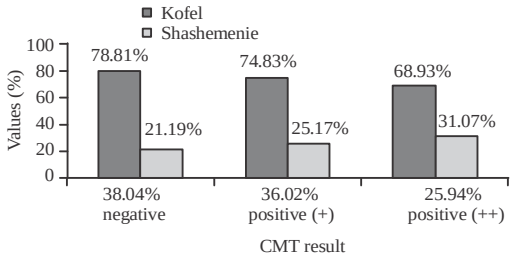


Fig. 2: CMT result of bovine mastitis by collection site

and peri-urban dairy farms at Addis Ababa), respectively. However, the current prevalence is comparably in line with 46.6% reported by Mungube *et al*. (2005). The variability in the prevalence of bovine mastitis between reports could be attributed to differences in management of the farms, breeds considered or technical know-how of the investigators (Radostits *et al*., 2000, 2007). The higher prevalence of bovine mastitis in the present study farm may also be due to management practices and infectious agents having different causes, degrees of intensity and variations in duration and residual effects.

In most reports including the present study, clinical mastitis is far lower than subclinical mastitis (Biffa *et al*., 2005; Sori *et al*., 2005; Almaw *et al*., 2008; Lakew *et al*., 2009; Haftu *et al*., 2012). This could be attributed to little attention given to subclinical mastitis as the infected animal shows no obvious symptoms and secrets apparently normal milk and farmers, especially small holders are not well informed about invisible loss from sub clinical mastitis. In Ethiopia, the subclinical forms of mastitis received little attention and efforts have been concentrated on the treatment of clinical cases (Almaw *et al*., 2008). That is why about 55% of the respondents replied that the previous occurrence of bovine mastitis was subclinical type.

In addition sub-clinical mastitis has been reported to be higher than clinical mastitis owing to the defense mechanism of the udder which reduces the severity of the disease (Radostits *et al*., 2007).

In the current finding, we try to identify that the nature of floor of animal house whose bedding was made of concrete (29.55%), stony (11.36%), soil (56.82%) and others (2.27%), respectively with the floor inclination of sloppy (38.64%) and leveled (61.36%). This kind of report also done by Mekibib *et al*. (2010) but with different percentage of floor made of concrete and stony which accounts 42, 52%, respectively and similar result of soil.

With regard to the milking system, most of dairy farm owners were used to wash their cow before milking, however, this finding is higher than reported (63.33%) by Kasim in Borana pastoral and agro-pastoral areas (Kasim, 2011). Again, most respondents wash their hands, udder and teat and used towel for drying the teat before and after milking their cows which is also comparable higher than reported by Benta (2011) and Kasim (2011).

The presence of teat lesion in the study area was lower than reports made by Benta (2011) and higher than reported by Mekibib *et al*. (2010). The knowledge of farm owners to history of mastitis was assessed and reported with previous history of mastitis (45.45%) in their farms. This result is higher than (11.5%) reported by Biffa *et al*. (2005). This all variations may be due to the difference in management of milking system, housing, serious follow up of the disease that could have great role to minimize the associated risk factor of mastitis.

## CONCLUSION

In conclusion, the present study revealed considerable prevalence of mastitis that were associated with the potential risk factors (housing and management system of dairy farms) and poor understanding of the consequence of the disease.

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