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# Study on Prevalence and Associated Risk Factors of Mastitis in Small Holder Dairy Farms at Lemo Woreda, Southern Ethiopia

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**Abstract**
A cross sectional study was carried out to investigate the prevalence of mastitis in dairy cattle and associated risk factor at Hadiya zone Lemo Woreda from February 2016 to August 2016. One hundred twenty (120) lactating cows which are managed under small scale dairy holder farmers which have 1 to 6 cows were sampled. Risk factors like Age, Breed, parity, stage of lactation, udder hygiene and floor type was recorded during sampling. 120 animals and 480 udder quarters were tested for subclinical and clinical mastitis by using CMT (California mastitis test) and clinical observation. The result of the study shows that 53.3% (64/120) were positive for mastitis. The result of the study indicates also 23.5% (12/64) of the mastitis were clinical and 76.5% (49/64) were subclinical mastitis in the study area. From 480 quarters that were tested for mastitis, 276 quarters which is 57.5% (276/480) were positive. Out of the risk factors assessed udder hygiene and floor type has statistically significant association to the infection rate of mastitis ($P<0.05$). The other risk factors have no significant association in this study. The finding of the current study reviles that there is high rate of mastitis infection in smallholder dairy farms in Lemo Woreda. Therefore farm owners require to practices hygienic milking, the culling of chronically infected cows, good housing management and effective dairy cattle nutrition to promote good cow health.
**Keywords:** Bovine, mastitis, prevalence, subclinical, clinical

## 1. Introduction

Ethiopia is a largely rural country with an agrarian economy. Livestock are of economic and social importance both at the household and national levels, and have in the past provided significant export earnings (Gebre Mariam *et al.,* 2013). Livestock development in Ethiopia is constrained, amongst other important factors, by a widely distributed disease (Wondwosen, 2003).

Mastitis can be considered as welfare, food safety and economic problem. Mastitis can cause chemical and bacteriological changes in milk and pathological changes in the mammary gland of the udder (Idriss *et. al.,* 2013). Various infectious agents numbering more than twenty different groups including bacterial, viruses, yeast, fungi and rickettsia with bacterial being the major cause have been reported (Biffa et al., 1999).

Mastitis is usually classified as clinical and sub clinical based on aetiopathological findings and observation, clinical mastitis is further classified as per acute, chronic and gangrenous mastitis. It is most often sub clinical mastitis refers to inflammation of the mammary gland in the absence of visible gross lesion in the udder or it s secretion with the presence of pathogenic microorganisms and usually high number of somatic cells in the milk (Radostitis *et al*., 2007). Subclinical mastitis is a major problem affecting dairy animals all over the world. It causes enormous losses for breeders and consequently influences the national income of the country (Ahmed and Mohammed, 2009).

The invisible changes in subclinical mastitis can be recognized indirectly by several diagnostic methods including the California mastitis test (CMT), the Modified White Side test (MWT), SCC, pH, chlorine and catalase tests. These tests are preferred to be screening tests for subclinical mastitis as they can be used easily, yielding rapid as well as satisfied results (Lesile *et al.,* 2002). The CMT gives an indirect estimate of SCC because it based upon a gelling reaction between the nucleic acid of the cells and a detergent reagent. The CMT was chosen in several investigations because it is more perfect, efficient and reliable than other field and chemical tests for diagnosis of subclinical mastitis (Ahmed and Mohammed, 2009). The current study was performed to determine the prevalence of clinical and subclinical mastitis and associated risk factors of mastitis.

## 2. Methodology

### *2.1. Study Area Description*

The study was conducted at Lemo district of Hadiya zone, Southern Nations, Nationalities and peoples' Regional State (SNNPRS). The area is located about 230 km south-west of Addis Ababa and 175km (direction) from the

 

regional city Hawassa. It is geographically located between $7^0$22' and $7^0$45'N and 37$^0$40'and 38$^0$E of longitude. It has 35 Kebeles (KAs) among which 3 are rural-urban towns. Total land of the Woreda covers 34,973 ha. Topographic feature of Lemo district is mostly undulating to flat land (95%). The area falls within an altitudinal range of elevation 1900-2720 m.a.s.l (LWARDO, 2009).

*2.2. Study Design*

A cross sectional study was conducted to determine the prevalence rate of mastitis in dairy cow from February 2016 to August 2016 in 24 small holder dairy farms. Physical and clinical examinations of udder and CMT screening test was conducting on the study animals. During sample collection and processing risk factors like Age, Parity, Breed, Udder hygiene, Stage of lactation and Floor type were recorded.

*2.3. Study Population*

The study population consists of 120 dairy cows which are found in 24 small holder dairy farms and have herd size of 1 to 6 dairy cows.

*2.4. Physical Examination of Udder*

The udder was first examined and then through palpation to detect possible fibrosis, cardinal sign of inflammation, visible injury, thick infestation, atrophy of the tissue as well as swelling of the supra mammary lymph node and also the color, viscosity and general appearance of milk secreted from each quarter were examined for the presence of any milk change and mastitis according to Quinn *et al.,* (2002).

*2.5. California Mastitis Test*

California mastitis test that is one of the best way to detect subclinical mastitis which is very simple, can be performed at milking time, gives instant result and is economical, that had a four compartment plastic paddle and CMT reagent are the only supplies we need to conduct the test. The udder, especially teats were cleaned and dried by a sterile towel before sample collection. Each teat was scrubbed with cotton moistened with 70% ethyl alcohol. The first squirt of milk was discarded then after about 2ml of milk from each quarter was placed in each of four shallow cups of CMT plastic paddle. The procedure that we need to follow while performing CMT encompasses after the first squirt of foremilk is removed and then drowning of one or two squirts of milk per quarter are collected in each paddle compartment from each quarter into separate cups of (4) plastic paddle, tilting the paddle to equalize milk quantities in the cup, adding equal amount of commercial reagent to each cup and rotating the paddle to mix and observe change in color as well as gel formation with 10 to15 seconds. After approximately 10 seconds the score was read while to continuing to rotate the paddles, result were recorded based on the thickness of the gel formed by CMT reagent milk mixture. The result of the test was indicated on the basis of gel formation. The interpretation (grades) of the CMT was evocated and the results graded as 0 for negative and trace 1, 2 and 3, for positive (Quinn *et al.,* 2002).

*2.6. Data Analysis*

The data derived from the study was coded properly and entered into Microsoft excel spread sheet. The data was then exported and analyzed using SPSS version 20. Chi-square test was applied to determine the association of risk factors at $P \leq 0.05$.

**3. Result**

The results of the current study show the overall prevalence of mastitis in the dairy farms was 53.3% (64/120). The result of the study indicates that 23.5% (12/64) of the mastitis were clinical and 76.5% (49/64) were subclinical. At the quarter level of 480 active quarters tested for the diagnosis of mastitis, 276 quarters which was 57.5% (276/480) were positive to CMT. The overall prevalence of mastitis at individual cow and quarter level was presented in Table 1.

Table 1: Prevalence of mastitis per individual and quarter level

| Type | Total number tested | Total number affected | Total percentage (%) |
|---|---|---|---|
| Cows | 120 | 64 | 53.3 |
| Quarter | 480 | 276 | 57.5 |

Prevalence of mastitis related to specific risk factors were determined as the proportion of affected cows out of the total examined. Age, parity, stage of lactation, udder hygiene, breed and floor type were the six risk factors that were considered in these study. From these risk factors only udder hygiene and floor type has statistically significant association with the infection rate of mastitis ($P < 0.05$). Muddy soil floor house had higher prevalence of mastitis then the rest. The other risk factor which includes age, parity, breed, stage of lactation has no statistically significant association with the prevalence rate of mastitis ($P > 0.05$) (Table 2). Even though these risk factors do not show significant association statistically there is prevalence different among the

 

different categories of the risk factors. From stage of lactation; mid stage of lactation had higher prevalence 65.9% than 48.7% and 41.2% late and early lactation stage respectively, in the breed category crossbreeds had a high prevalence rate (57.2%) than local cattle's (52.2%) and also the data shows that multiparous and older cows have high infection rate. The prevalence of mastitis based on various factors at cow and quarter levels was presented in Table 2 and Table 3 respectively.

Table 2: Prevalence of mastitis on cow level and associated risk factors

| Risk factor | Category | Number of animals tested | Number of positive animals | Infection rate (%) | P -value |
|---|---|---|---|---|---|
| Age | Young (<6 years) | 42 | 18 | 43 | 0.910 |
| | Old (> 6 years) | 78 | 46 | 59 | |
| Parity | Primiparous | 46 | 21 | 45.6 | 0.184 |
| | Multiparous | 74 | 43 | 58.9 | |
| Stage of lactation | Early (< 90days) | 34 | 14 | 41.2 | 0.680 |
| | Mid (90-180 days) | 47 | 31 | 65.9 | |
| | Late (>180 days) | 39 | 19 | 48.7 | |
| Udder hygiene | Good | 33 | 10 | 30.3 | 0.02** |
| | Poor | 87 | 54 | 62 | |
| Breed | Local | 92 | 48 | 52.2 | 0.644 |
| | cross | 28 | 16 | 57.2 | |
| Floor type | Good concert | 18 | 5 | 27 | 0.020** |
| | Bad concert | 31 | 12 | 38.4 | |
| | Muddy soil | 71 | 47 | 66.1 | |

**P < 0.05 shows statically significant association

Table 3: Prevalence of mastitis per quarter level and associated risk factor

| Risk factor | Category | Number of quarters tested | Number of positive quarters | Infection rate (%) |
|---|---|---|---|---|
| Age | Young (<6 years) | 168 | 37 | 22 |
| | Old (> 6 years) | 312 | 105 | 33 |
| Parity | Primiparous | 182 | 39 | 21.2 |
| | Multiparous | 298 | 83 | 28 |
| Stage of lactation | Early (< 90days) | 136 | 23 | 16.9 |
| | Mid (90-180 days) | 188 | 63 | 33.5 |
| | Late (>180 days) | 156 | 31 | 19.8 |
| Udder hygiene | Good | 132 | 15 | 11.8 |
| | Poor | 348 | 111 | 31.8 |
| Breed | Local | 368 | 66 | 17.9 |
| | cross | 112 | 27 | 24.1 |
| Floor type | Good concert | 72 | 5 | 7 |
| | Bad concert | 124 | 18 | 14.5 |
| | Muddy soil | 284 | 81 | 28.6 |

## 4. Discussion

Bovine mastitis is the important disease which affects the profitability of the dairy industry. The overall prevalence of mastitis in the present study was 53.3% (64/120). The finding of current study is in agreement with the report of Birhanu *et al.,* (2013) and Zeryehun *et al.,* (2013) which was (54%) and 55.1% respectively. In other hand the finding of the study was slightly lower than the previous report of Bishi (1998) (69.8%) and Mekibib *et al.* (2010) (71%) who reported from different farms in and around Addis Ababa and Holeta areas and also the of the current study was higher than report of Nessru, H., (1997) and Endale *et al.* (2016) with the rate of 25% and 32.92% respectively. The prevalence of clinical mastitis was 23.5% in the current finding which was in agreement with previous studies by Workineh *et al.* (2002) 21% in two major stated owned dairy farm at Rapi and Debre Zeit, Ethiopia and Birhanu, S (1997) 19.8% in dairy farm from Dire Dawa Administrative Council Eastern Hararghe Zone. The current finding was higher than the reports of Birhanu *et al.,* (2013) which was (12.1%). The variability in the prevalence of bovine mastitis among the reports could be attributed to difference in management system, breed considered, level of production and differences in study methods. Environmental factors such as unhygienic housing, warm and humid weather, and the general lack of farm cleanliness and sanitation, may account for the observed high prevalence of environmental pathogens. On the other hand, deficient milking procedures, poor hygiene and treatment practices could contribute to a high prevalence of

 

contagious pathogens (Kivaria et al., 2004).

From the six risk factors only udder hygiene and floor type has statistically significant association with the prevalence rate of mastitis (P <0.05). Muddy soil floor house had higher prevalence of mastitis then the rest. The other risk factor which includes age, parity, breed, stage of lactation has no statistically significant association with the prevalence rate of mastitis (P> 0.05). Kivaria et al., (2004) in their studies stated that most of the risk indicators were not found to be statistically significantly associated with the occurrence of subclinical mastitis possibly due to sample size and the presence of confounders, which support this study in which most of the risk factors were not statistically significantly associated even though there is a distinct difference in the infection rate of mastitis among the risk factors considered.

The prevalence of mastitis was affected by floor condition in the current finding; cow kept on good concrete floor has less affected than bad concrete and muddy soil floor with their prevalence 27 %, 38.4% and 66.1% respectively. The floor was a potential source for mastitis organisms to enter the udder through the teat orifice mainly the cow remained on the floor all the day. Poor hygiene may result in increased exposure and transmission of mastitis pathogens during milking (Kivaria et al., 2004). According to the result of this study good udder hygienic measure had a great importance in the occurrence of mastitis infection in the study area which results 30.3% prevalence in good hygiene than 62% in poor hygiene. Zeryehun *et al.,* (2013) also found that owners who practiced using towel after and before milking had a lesser chance of development of bovine mastitis than those who did not use towel and cow managed under poor hygienic condition had risk of contracting the disease than those managed in good hygienic condition, which support the finding of this study. Dirty teats and udders, as a result of moisture, mud and manure in the environment of the cow, are considered to be sources of environmental bacteria in milk. Hygiene scores of cows provide visible evidence of exposure to these potential sources (Schreiner and Ruegg, 2003).

Considering stage of lactation in the present study the mid stage lactation has high rate of infection of mastitis (65.9%) when compared with late stage and early stage of lactations with prevalence of 48.7 and 19.8% respectively. This finding is not in agreement with finding of Zeryehun *et al.,* (2013) who reported higher infection rate (87.2%) during the early lactation stage as compared to mid lactation stage that accounted for 65.9% and for late lactation 73.1%. The variation in the effect of the stage of lactation between the difference studies might be related to difference in age, parity and breed of the animal sampled and the lactating cows in the stage variation in milk yield.

On the other hand parity has its own influence on the prevalence of mastitis mainly on subclinical cases. Cows with many calves have high rate of infection 58.9% than the cows having few calves which is 45.6% in the present study. This finding is in agreement with report of Zeryehun *et al.,* (2013) who stated cows having greater than 5 calves were more affected than those with fewer and moderate calves. Result of this study also agree with the research findings by Sargeant, *et al,* (1998) and Busato *et al,* (2000) who found that the risks of clinical and subclinical mastitis increase significantly with advancing age of the cow, which approximates to the parity number.

At the breed difference the cross breed cows were more susceptible or low resistant which has (60.9%) infection rate which is higher than locals (51%). It depends on mainly the genetic potential of the breed to disease resistance, the challenge of adaptability to environments and the anatomical size of the udder in the cross breed is large that easily contaminated with contaminants (Payne and Wilson 1999). Considering age in this study the advanced age has 59% infection rate than the lower age which has 47%. This finding is in agreement with the report of Zeryehun *et al.,* (2013) who reported higher prevalence in adult cows (93.2%) than young adults (65%).

## 5. Conclusions

The Result of this study shows that, there was a high prevalence of mastitis infection in smallholder dairy farms in the study area. Both clinical and sub clinical mastitis are generally arises from the agents which contaminate the udder and teats at all and also by milkier itself. The pre disposing factors for the occurrence of mastitis are management, environment and the animals itself. Therefore practices which includes hygienic milking, dry cow treatment, culling of chronically infected cows as much as possible, adequate feed and nutrition should be practiced by the farmers to promote health of the cow and to prevent mastitis.

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