

The Effect of Management Practices on Prevalence of Mastitis in Small Scale Dairy Farms in Nazareth, Ethiopia

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Abstract: The study was conducted to establish prevalence of mastitis and to determine potential management risk factors in smallholder dairy farms in Nazareth, Ethiopia. A total of 95 market oriented smallholder dairy farms and their 206 cows were investigated. Data were collected by using questionnaire survey, farm visit, animal examinations and California Mastitis Test (CMT) and microbiological examination. Aseptic collection of milk samples from all clinical and subclinical (CMT+) mastitis positive lactating cows were performed for microbiological assessment. Cow level prevalence of clinical and subclinical mastitis was 6.3% and 41.4% respectively. Of 91 milk samples 90.11% were positive for aerobic pathogenic bacteria. Duration of farming, poor drainage/slope of stable area, feed provision before milking, milking of clinical cows at any stage, farming practice as a side business were highly associated with mastitis. Although smallholder dairy farmers in the country were facing a lot of problems specially lack of technical know-how, there is great potential and opportunity for the development of the sector.

Key words: smallholder • Dairy cow • Mastitis • Prevalence • Risk factors

INTRODUCTION

In Ethiopia, the dairy sector has large potential for development and its growth is expected to continue for the next one to two decades due to the growth of income, increased urbanization and policy improvement [1]. Thus, the development of smallholder dairy production sector in the country contributes in poverty alleviation by generating income through self-employment. Cows represent the largest proportion of the cattle population of the country; however, the milk production does not satisfy the country's requirements due to multitude factors [2]. Disease of the mammary gland known as mastitis is the major contributing factor in the reduction of milk production [3, 4]. Mastitis in cows is the most commonly encountered problem within the range of 1.2 to 46.6% in different parts of Ethiopia [5-13].

MATERIALS AND METHODS

The target population for the study was all market-oriented smallholder dairy farms and their cows in Nazareth located in Oromia Region, Central Ethiopia from September 2006-June 2007. The sample size was determined with expected mastitis prevalence of 13.8% (reported in Debre Zeit by Mekonnen *et al.* [13] at 95% confidence interval and 5% precision level. According to Thrustfield [14] one stage cluster sampling method with predicted number of two animals per cluster were used to determine number of clusters to be sampled. To determine between clusters variance 11.6% and 13.8% mastitis prevalence by Mekonnen *et al.* [15] and [13] respectively were used. A total of 206 lactating cows from 95 market-oriented private smallholder dairy farms in Nazareth were investigated cross-sectionally to determine the magnitude

and risk factors of mastitis. Milk samples were collected from 91 dairy cows that were positive during clinical examination and CMT test for further bacteriological study. Information including age, parity, stage of lactation, previous history of mastitis, average daily milk production, leaking teat and antibiotic therapy of individual lactating cows were collected as cow data through a questionnaire format. Detail information on five clusters of risk factors (owner of the farm and their activities, milking practice, housing, hygiene and health) were obtained by interviews through questionnaire. The collected data were entered into Microsoft-Excel database software (Version 6.0, 2000) and analyzed using SPSS (SPSS release 11.5, 2002) statistical computer software programs.

RESULTS

Clinical examination of udder, teat and milk of 824 quarters revealed that 30(3.6%) were blind, 19(2.4%) were clinically positive and 775 quarters to be tested for subclinical mastitis using CMT test. The overall prevalence of mastitis was 62.1% at farm level while the cow level prevalence is 48%. Thus cow level prevalence of clinical and subclinical mastitis was 6.3% and 41.7% respectively and the quarter level prevalence were 2.4% and 22.3% of clinical and subclinical mastitis respectively (Table 1). 91 milk samples collected from positive cows either clinically or screening test were cultured and revealed 82(90.11%) samples were positive for aerobic bacteria.

Association between management practice and mastitis is shown in table 2. Prevalence of mastitis at cow level were significantly higher ($p < 0.05$) in farms with ≤ 4 years duration of farming, poor drainage/slope for stable area, feed provision before milking and milking of clinical cows at any stage. Farm owners that practice dairy farming as side business had high prevalence of mastitis ($p < 0.05$).

Table 1: Prevalence of mastitis

	Prevalence (%)		
	Clinical	Subclinical	overall
Farm level	13.7	61.1	62.1
Cow level	6.3	41.7	48.0
Quarter	2.4	22.3	27.1

Table 2: Association of management practices with mastitis

Factor and category	Mastitis			
	%	χ^2	df	p
Farm owners activity				
Only dairy farming	41.6	5.51	1	0.021**
Dairy farming plus other	58.0			
Work force				
Hired labor	43.6	2.51	1	0.113
Family member	55.1			
Duration of farming				
≤ 4 years	64.1	2.89	2	0.016**
5-8 years	40.7			
≥ 9 years	42.6			
Floor				
Concrete	44.2	2.46	2	0.296
Stone layer	50.9			
Soil	45.8			
Stable drainage/slope				
Good	40.1	6.02	2	0.049**
Fair	41.2			
Poor	58.2			
Feed provision before milking				
Yes	58.2	6.77	1	0.009**
No	25.0			
Introduction of calf				
Yes	58.5	3.11	1	0.078
No	44.4			
Lubricant application				
Yes	53.2	1.83	1	0.177
No	43.8			
Stage of mastitic cow milking				
First	45.5	15.66	1	0.000**
Last	33.7			
Any stage	66.2			

DISCUSSION

Even if clinical form of mastitis easily detected by many respondents, subclinical mastitis cases were undetected due to lack of awareness on the disease. Subclinical mastitis was the major problem but incidentally

it seemed unnoticed despite the fact that it causes great economical loss by decreasing milk production. Usually Ethiopian farmers especially smallholders are not well informed about the invisible loss from subclinical mastitis since dairying is mostly a sideline business [7]. This is also true in the study area none of the respondents has knowledge about subclinical mastitis and none of the farms screened their cows for subclinical mastitis except seeking professional assistance at the time of clinical cases.

Clinical mastitis prevalence at cow level was 6.3% that is comparable with that of Bishi [16] and Mungube *et al.* [12] who reported 5.3% and 6.6% respectively in Addis Ababa. However, the present study was higher than that reported by Gizat [11] who reported 3.9%. The prevalence was much lower than 25.1% of Workineh's *et al.* [11] report at Addis Ababa. Mastitis is a complex disease and the difference in results is usually due to differences in management practices between the farms.

Subclinical mastitis is defined as an inflammation of the udder that is not visible under physical examination of the udder, thus it requires a diagnostic test for detection, mostly on milk SCC using different reagents like CMT. During subclinical mastitis microorganisms are usually present in the milk and SCC are elevated [17]. The CMT provides cheap and reliable method to estimate SCC of individual quarters. This study has shown high prevalence (41.7%) of subclinical mastitis in smallholder dairy farms when compared with previous reports of 34.3% in Addis Ababa by Bishi [16] and 34.4% by Gizat [11] in Bahir Dar. The high prevalence of subclinical mastitis may be attributed to improper milking hygiene, poorhouse hygiene lack of use of postmilking teat dipping and practicing of milk by contract laborers. According to Radostits *et al.* [17] contamination of milkers hands, washing the whole udder and absence of drying of the teats or udder increased the incidence of staphylococcus species that were common practice in the study area. The improper milking hygiene practiced by family members and contract laborers in the study area is due to lack of knowledge about subclinical mastitis and its economic implications on milk production. This study has revealed subclinical mastitis is unfamiliar problem amongst smallholders in Nazareth. Similar to other studies [18; 7, 9; 10; 11, 12] this study shows that subclinical mastitis is overwhelming problem compared to clinical mastitis. In Ethiopia the subclinical mastitis received little attention

and effects have been concentrated on the treatment of clinical mastitis while the high economic loss could come from subclinical mastitis [19]. Because of its insidious nature, the subclinical mastitis might be among the causes of sub optimal milk production that is evident in many smallholder farms. In most of the results in this study shows that the average milk production is lower in variables where mastitis prevalence is higher. According to Radostits *et al.* [3] an infected cow and quarter shows 30% and 15% reduction in milk yield respectively.

Risk factors, which influence the prevalence of mastitis, were outlined as animal, pathogenic and environment and management risk factor (17). Prevalence of mastitis at cow level were higher in those farms < 4 years duration of farming, poor drainage/slope for stable area, feed provision before milking and milking of clinical cows at any stage. Farms at operation for a short period of time (< 4 years) had no enough awareness on farming practices and also they usually buy a starter animal (cows with more than one parity) from smallholders which are usually as a cull due to different reasons. These cows may be positive for subclinical mastitis in the previous farm. Poor drainage/slope of the stable area results accumulation of liquid such as urine and water used for cleaning of udders during milking. The liquid material mixed with the feces of the cows that led to dirty udder and teat. The environmental bacteria such as *E. coli* and other got access to enter trough teat canal and result infection. In the study area where there is no awareness on standard procedure in milking practice, milking of mastitic cow at any stage may result transmission of contagious bacteria with in a herd. In the other hand activities before milking like provision of feed usually concentrates before milking favor the mastitis problem. Animals that were given concentrate after milking will stay at stand that gives enough time for teat closure. Partly this problem may be associated with the milking hygiene because in most of the farms concentrate were provided after pre milking preparation such as washing of udder and teat. This may give a chance to transfer the bacteria from the feed to teat.

If milk production in the study area has to be improved, creation of awareness and control of mastitis through proper milking hygiene such as use of hot water to rinse the towels, individual towels for each cow and quarter, post-milking teat disinfection and proper treatment of mastitis cases is important.

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