Study on Prevalence of Bovine Mastitis on Cross Breed Dairy Cow Around Holeta Areas, West Shewa Zone of Oromia, Ethiopia

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Abstract: Across sectional investigation of bovine clinical and sub clinical mastitis was made on 195 Friesian zebu cross breed dairy cows, in three private owned large farms and 25 small holders in Holeta town of Wolmera district from September 2006 to June 2007 to estimate the overall prevalence rate of mastitis. Milk samples were collected from randomly selected cows and subject to screening test using California Mastitis Test (CMT) immediately after milking for both clinical and sub clinical cases. The screening test conducted using CMT revealed an overall prevalence of bovine mastitis in the studied areas was 44.1% i.e., 10.3% clinical and 33.8% sub clinical mastitis cases. Prevalence of mastitis based on CMT result during the study period was calculated at 47.5 and 40 % for large farms and small holders, respectively. The chi-square (x^2) was used to analysis different association between parity, stage of lactation and udder conformation in order to evaluate their association with mastitis. There was significant association between parity and mastitis ($p<0.05$) in cows. It was concluded that safety handling and production of raw milk is guided especially by avoiding and minimizing contamination during various stages of milk handling.

Key words: Cross sectional · California Mastitis test · Pendulous and screening

INTRODUCTION

Dairy production is a biologically efficiently system that coverts large quantities of roughage, the most abundant feed in the tropics to milk, the most nutrition food known to man. Whereas there is access to a market, dairying is preferred to meat production since it makes more efficient use of feed resources and provides a regular in come to the producer was described by Walshe,.. *et al.* [1]. Among many problems that face dairy enterprise in developing countries like Ethiopia in relation to milk production are in ability to get enough of it and inability to get compositional satisfactory milk for many potential consumers are mentioned by Hunter [2]. The underlying causes which are responsible for poor productivity of Livestock in Ethiopia countries are so numerous but the prevailing animal diseases, poor management system and poor genetic potential of the animals are recognized to be among the major constraints according to Wagner [3]. There is so many diseases which affect the health of animal reduce their production and have great economic importance. Schalm *et al.* [4]. reported that Various infections agent are involved as a causative agent of mastitis with bacterial pathogens covering the greater share Mastitis is the term applied to the inflammation of the mammary gland cause a great reduction in Animal productivity than any disease of dairy irrespective of species of the animal by Radostits *et al.* [5]. A number of reports indicated that mastitis is a serious problem in the dairy industry of Ethiopia. Nesru [6] reported a mastitis prevalence rate of 85.6 and 85.2% using California mastitis test and somatic cell counts respectively. Biru [7] reported a combined mastitis prevalence of 67.4% at cow level while Bishi [8] reported sub clinical mastitis prevalence 35.5 and 34.3% for small and large-scale farms respectively. Singh [9] reported that mastitis is the most costly disease and remains a serious economic problem for dairy industry for it influences both the quantity and quality of milk produced. Costs mainly arising from decreased milk production, increased veterinary bills and treatment cost, culling of affected animals at unacceptable age, altering the quality of milk and diminishes the dairy industry ability to compete in international markets [9]. In Welmera District though small dairy holders have long known mastitis locally, the disease has not been studied widely and information on

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the overall prevalence of the disease is inadequate. Therefore the current study was under taken with the objective of:

- To estimate the over all prevalence of bovine mastitis in cross breed dairy cow around Welmera district.
- To propose possible solution and recommendation for the control of the disease.

MATERIALS AND METHODS

Study Area: The study was conducted in Welmera district, West Shoa Zone of Oromia regional state is located 28 km West of Addis Ababa at 09°02 North latitude and 38°34 East longitude and altitude ranges from 2060-3380m.a.sl. The district is classified into two agro-climatic zone namely Dega 41%, Woyna Dega 59% with average temperature 21°c and annual rain fall 900-1100m having a bimodal rain fall pattern. The short rain occurring from March to April and long rains from July to October. The study was mainly focused on 3 different private owned farms and 25 owners of smallholder dairy producers found in Holeta town of Welmera district.

Study Population: According to the census result of Ethiopian agricultural sample enumeration [10], the total cattle population of Oromia regional state and West Shoa Zone was estimated to be 18,035,686 and 2,431,376 respectively. The majority of cattle population is indigenous (99.26%) with the exception of 106,225 (0.58%) hybrids and 27220 (0.15%) exotic breed. The total cattle population of Welmera District as obtained from Welmera district Agricultural office during the year 1999 E.C was 205,365 cattle are found in the district. The selected 3 farms and 25 owners of smallholder that participating in the study had 142 and 180 cross breed dairy cows respectively.

Study Design

Study Type: Across sectional type of study was carried out from September 2006 to June 2007 in Welmera district of West Shoa Zone of Oromia regional state. The prevalence rate of sub clinical mastitis at the cow level was calculated using the formula described by Wasserstein [11], as follow.

$$Prevalence\ rate\ =\ \frac{No.\ of\ cows\ with\ sub\ clinical\ mastitis}{Total\ no.\ of\ cows\ at\ risk\ at\ a\ particular\ po\operatorname{int}in\ time}\ *\ 100$$

Sampling Procedure: From Holeta town of Welmera district three different private owned farms was

purposively selected and 25 owners of small holding that had Friesian zebu cross breed cows were randomly selected for this study. Simple random sampling was carried out to select 195 lactating crossbreed cows from the total of small holders and farms in the study areas. The consideration during the sample size determination include 95% confidence interval, 5% precision and 85% prevalence from the previous studies in similar study areas.

Sample size was calculated using the formula described by Thrusfield [12].

$$n\ =\ \frac{1.96^2 * p * (1-p)}{d^2}$$

Where n = Sample size
P = Expected prevalence
d = Desired absolute precision

Thus the desired sample size for P=0.85 was 195 lactating cows.

Data Collection

Questionnaire Survey: A structured questionnaire was prepared and information regarding farm attributes and cow attributes was collected. The cow attributes include age, parity, stage of lactation, previous history of mastitis, teat lesions, thick infection and other relevant information related farm attributes include herd size, farm hygiene and hygienic practices before, during and after milking and others.

California Mastitis Test (cmt): Strict aseptic procedures were used when collecting milk samples in order to prevent contamination with microorganism present on the skin of cows, flanks, udder and teats, on the hands of the sampler and in the environment. Udders and especially teats was cleaned with 70% ethyl alcohol and dried before sample collection.

The California mastitis test was carried out as screening test for somatic cell count to detect sub clinical mastitis. A small amount of milk from each quarter is squired into shallow cups in the CMT paddle, an equal amount of the commercial CMT reagent was added to each cup. A gentle circular motion was applied to the mixture in horizontal plane for 15 seconds. Finally, the reaction was interpreted.

Diagnosis of Mastitis: Gross abnormalities indicated the clinical form of the disease was detected by physical

examination of the udder for the presence of swelling, pain, hotness and in duration. Inspection of milk performed for discoloration, consistency and presence of clots, which are characteristic of clinical mastitis and sub clinical mastitis cases, was defined by screening apparently normal milk using CMT test.

Statistical Analysis: Descriptive statistics was used to summarize the data generated from the study areas. The chi-square (X^2) was used to assess any significant association between farms and sub clinical mastitis in the different farms and small holders.

RESULTS

Questionnaire Survey: The result from the questionnaire survey showed that no warm water used for washing the udders and milk equipment cleaning in farms and in small holders in the studied areas. The private owned dairy farms used pipeline water for washing the udder of the cows. One to two towels used for cleaning purpose for all cows in each private farm. None of the udders properly dried after washing. Some small holders wash the udder of their cows while other not washes at all. Hand milking is practiced and each workers milks on average 8 cows in all farms. There is no washing of hand between milking of any two cows. Pre-milking udder washing is present in three farms while post teat dipping is practice only in farm 1.The morning and evening milk was delivered with out cooling from private farms and small holders to Hotels and local consumers in the town immediately after milking. In all farms, animals are allowed to graze for about two to three hours every day and maintained in doors in tie stall barns for the rest of the day. However, in small holders, some animals kept out the door in grazing land around the town and others kept in door in tie stall as practiced in the farms. The total number of lactating cows in each private farm and in small holders used for prevalence study was shown in table 1.

California Mastitis Test (cmt): CMT was performed simultaneously with the milking time at the side of the cow to examined 195 lactating cows. After with drawing of the first two or three streams of milk about 2.5ml of the fore milk was collected from each quarter into shallow cups in the CMT paddle. An equal amount of the CMT reagent was added. Then the paddle was rotated gently in a circular pattern for 15 second so that the milk and reagent mix well. Immediately the reactions were scored and the paddle was rinsed and shaken of excess moisture. The CMT were scored and interpreted. Both zero and T score considered to indicated absence of interamammary infection while CMT scores 1, 2 and 3 were considered as positive indication of the infection. The interpretation result of CMT finding of 0, T, 1, 2 and 3 was indicated as 49, 33, 26, 19 and 9 respectively.

Prevalence Study: Clinically affected udders were painful upon palpation, swollen, red and hard in consistency. They had abnormal secretion with discolored milk and apparently normal mammary glands. The only means of determine the presence of sub clinical mastitis was through screaming test result (CMT). From 195 cows screened during this study 86 (44.1%) were CMT positive out of which 21 (50%), 18(47.4%), 9 (45%) and 38(40%) were from farms 1, 2, 3 and small holders respectively. Prevalence was calculated based parity, stage of lactation and udder conformation in order to evaluate their association with mastitis. prevalence of both clinical and sub clinical mastitis based on CMT result during the study period was calculated at 10.3% and 33.8% respectively for cows included in the study. The results were summarized table 2.

There was significant association between parity and mastitis ($p<0.05$) in cows. The effect of parity influence the occurrence of mastitis in cows is show in table 3.

The prevalence of mastitis was not significantly influenced by the sage of lactation ($P>0.05$). It was however, highest at ≥ 9 month and above months after the on set of lactation table 4.

Table 1: Study animals for prevalence

Farms and small holders	Total no of lactating cows farms and small holders	No of cows investigated for prevalence
Farm 1	58	42
Farm 2	49	38
Farm 3	35	20
Small holders	180	95
Total	322	195

Table 2: Prevalence of clinical and sub clinical mastitis in dairy cows

Farms and small holders	Total no examined	No of mastitis positive			Prevalence (%)		
		Clinical	Sub clinical	Total	Clinical	Sub clinical	Total
Farm 1	42	5	16	21	11.9	38.1	50.0
Farm 2	38	4	14	18	10.5	36.8	46.3
Farm 3	20	2	7	9	10.0	35.0	45.0
Small holders	95	9	29	38	9.5	30.5	40.0
Total	195	20	66	86	10.3	33.8	44.1

$X^2 = 63$, df = 3, P <0.05

Table 3: Trend of mastitis with respect to parity no in cows

Parity Group	No of cows	Status of mammary gland		Prevalence (%)
		Mastitis	Non-mastitis	
1	65	14	51	21.5
2	50	24	26	48.0
3	44	23	21	52.3
>4	36	25	11	69.4
Total	195	86	109	44.1

$X^2 = 24.24$, df = 3, P <0.05

Table 4: Prevalence Mastitis in relation to lactation stages in cows

Stage of lactation	Cows	Status of mammary gland		Prevalence (%)
		Mastitis	Non-mastitis	
1-2 months	50	22	28	44.0
3-4 months	46	20	26	43.5
5-6 months	41	18	23	43.9
7-8 months	28	12	16	42.9
>-9 months	30	14	16	46.7
Total	195	86	109	44.1

$X^2=0.22$, df=4, P<0.05

Table 5: Prevalence of mastitis at difference of udder conformation in dairy cow

Udder conformation	Status of udder			Percent (%)
	Infected	Normal	Total	
Pendulous	15	5	20	75.0
High up	71	104	175	40.6
Total	86	109	195	

$X^2 = 8.3$, df = 1, P > 0.05

Animals with pendulous udder showed higher incidence of mastitis (75%) than cows with non-pendulous udder (40.6%) and there was significant (P<0.05) different between the two categories (Table 5).

The problem of mastitis has a negative impact on the production and productivity of cows in dairy farms and small holders in the studied areas.

DISCUSSION

The study carried out to estimate the overall prevalence of bovine sub clinical mastitis in selected farms 1,2,3 and small holders in Holeta town revealed a prevalence rate of 38.1, 36.8, 35 and 30.5 respectively during the period of the study for all cows included in this

study. There was no significant association between farms and small holders in the occurrence of mastitis. This infection rate was comparable with the finding of Tesfu *et al.* [13] who reported prevalence rate of 38.9% in a survey carried out on mastitis in dairy herd of in the central high land of Ethiopia. Prevalence figures have been worked out for the dairy farms and small holders of Holeta town being surveyed during the period of study from September 2006 to June 2007 was shown in table 3 above.

Mastitis is the most costly disease and remains serious economic problems for dairy production since it influences both the quantity and quality of milk produced indicated by the Singh [9]. Insufficient equipment and hand cleaning, especially at milking time was a major cause of milk contamination. In this study pre-milking udder preparation play an important part in the contamination of milk during milking. Adequate udder preparation especially drying of the udder and hygienic milking technique, together with the use of disinfected milk equipment considerably improve the milk hygienic quality. Washing of the udder and proper drying of the udder was not well practiced in smallholder of dairy producers in the town. Avoiding use of contaminated water for udder washing, addition of sanitizing solution to washing water, squiring of milk from each quarter and effective post milking teat dip is not well exercised in the studied areas to decrease the rate of new infection.

The high prevalence rate of sub clinical mastitis in farms 1 could be associated with poor management practice such as poor sanitation of dairy house and unhygienic milking procedures. It was observed that dairy cows with non-pendulous udder are less mastitis and cows with larger or pendulous udder are more susceptible to mechanical injuries which predisposing to infection. There are so many factors, which arose active cases of mastitis and in some respect favoring bacteria infection of the udder are hosing, bedding unsatisfactory milking machine, poor milking technique, teat and/or udder injuries and nutrition irregular and incomplete milking and introduction of unsterilized instruments up to the teat canal are mentioned by Beleschner [14].

Breed, lactation stage, physiological states of the mammary gland, parity number and udder conformation of the cows are among host risk factors influencing bovine mastitis. High yielding cows are more susceptible to mastitis owning to dilution of the udder defense mechanisms. Similarly, dairy cows are at advancing age, which is none lactating and those at early and late stages of lactation are at great risk to mastitis.

The observational study conducted from September 2006 to June 2007 to establish the status of clinical and sub clinical mastitis in private owned dairy farms and small holders in Holeta town of Welmera district revealed a high prevalence of sub clinical mastitis cause a significant economic loss. Farmers and herd managers are only concerned with clinical farm of mastitis and often are unaware of the status of sub clinical infection in their herds. The factors accounting for the high prevalence of the disease in the study areas were improper management systems such as uncleaned dairy houses and poor housing system, treatment of only over clinical cases, improper milking produce, absence of dry cow therapy, negligence on post milking teat dipping and lack of herd health monitoring.

From the study, it was concluded that safety handling and production of raw milk is guided especially by avoiding and minimizing contamination during various stages of milk handling. Warrants chosen attention in view of the foregoing remarks the following solution and recommendation was for warded to control the disease.

- To reduce the spread of infection of sub clinical mastitis at the time of milking proper washing, drying and disinfection of the udders and milkers hands before milking every cow is essential. In addition, post milking teat dipping should be used to control contagious pathogens.
- Sub clinically infected cows should be treated during the dry period (dry cow therapy) for economic and efficacy reason.
- Culling of older cows and cows infected with chronic mastitis, to eliminate the potential source of pathogens, which cause disease.
- Periodic monitoring of infection status of the udder should be under taken as well as positive animals treated accordingly.
- Infected animals and their respective quarters should be milked last stage.
- A positive collaborative relationships has to be established between the regional agricultural office, regional veterinary laboratories and the farm owners so that they can be made aware of the impact of mastitis on their economy and public health risks and also what correction measures to be taken on it.

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