PREVALENCE OF MASTITIS AND IDENTIFICATION OF CAUSITIVE PATHOGENS IN LOCAL AND CROSSBRED COWS IN DERA ISMAIL KHAN

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ABSTRACT: Clinical mastitis was diagnosed on the basis of clinical examination and subclinical mastitis by Surf Field Mastitis Test of milk samples from lactating cows (100 local and 100 crossbred) in the present study. All the milk samples were processed for isolation and identification of pathogens. In local cows, animal-wise prevalence of subclinical mastitis was 29% and clinical mastitis 7%. In crossbred cows, animal-wise subclinical mastitis was 41% and clinical mastitis was12%. Quarter-wise subclinical mastitis prevalence was 24.75% and 32% in local and crossbred cows respectively. Quarter-wise prevalence was higher in hindquarters than forequarters. Among the pathogens isolated from milk samples, *Staphylococcus aureus* showed the highest (43%) frequency, followed by *Streptococcus agalactiae* (22%), *E. coli* (19%) and Bacillus spp. (16%) in local cows. In crossbred cows, *Staphylococcus aureus*, *Streptococcus agalactiae*, *E. coli* and Bacillus spp. were isolated from 47, 28, 15 and 9% milk samples, respectively.

Key words: Cows, mastitis, quarter-wise prevalence, Surf Field Mastitis Test, pathogen.

INTRODUCTION

Mastitis is inflammation of mammary glands, primarily caused by bacteria or other microorganisms but also may be caused by stress and physical injuries (Wattiaux, 1999; Ruegg, 2001). Mastitis is a global problem of dairy animals, characterized by physical, chemical and micro-biological changes in the milk and pathological changes in the glandular tissue of the udder that may lead to inflammation of udder. Mastitis has been reported a serious health problem of livestock (Ahmad *et al*., 2001; Bachaya *et al*., 2011) and is responsible for heavy economic losses in dairy industry (Getahun *et al*., 2008; Bachaya *et al*., 2011; Yousaf *et al*., 2012) as it reduces milk yield, profit margins, and quality of milk and milk products in all dairy-producing countries of the world (Owens *et al*., 1997). It may result in termination of lactation and involuntary culling of dairy animals (McDowell *et al*., 1995) and also may transmit some important zoonotic diseases to humans such as tuberculosis, leptospirosis, brucellosis and gastroenteritis (Radostits*et al.,* 1994) and hence has great importance from public health point of view.

Mastitis has two forms, clinical mastitis and subclinical mastitis. In clinical mastitis udder shows all the five cardinal signs of inflammation (redness, heat, swelling, pain and loss of milk production) and hence can be detected without any laboratory test. However, isolation and identification of causative agent needs laboratory diagnosis. Whereas the subclinical form of mastitis is hidden and hence needs laboratory aid for diagnosis. Unhygienic environment, poor management, bad milking practices like inverted thumb method of milking and least preventive control measures against mastitis are major predisposing factors for the disease in countries like Pakistan (Arshad, 1999).The incidence rate of mastitis in various parts of Pakistan has been reported as 20-60% in cattle and buffaloes (Rasool *et al.* 1985; Bilal *et al*., 2004; Chishty *et al*., 2007). Subclinical mastitis is 3 to 4 times more common than the clinical mastitis and causes great losses in the dairy herds (Jasper *et al*., 1982; Merrill and Galton, 1989). This hidden form of mastitis is not observed by most of the dairy farmers and even ignored by the few (Mungube *et al*., 2004) that results in more economic losses (Mungube *et al*., 2005). Among the pathogens, *Staphylococcus aureus* has been reported one of the most prevalent mastitis causing pathogens in different parts of world (Getahun, 2006). It has been reported that a quarter with subclinical mastitis due to *S. aureus* lost an average of 34.5% of its potential milk production while the total milk yield loss per cow was estimated at 6.8% (Gebreyohannes *et al*., 2010). In Pakistan, *Staphylococcus aureus, Streptococcus agalactiae* and *Escherichia coli* are the most prevalent pathogens which are responsible for about 78% cases of mastitis in different parts of the country (Razzaq, 1998; Ahmed, 2001).

In Khyber Pakhtunkhwa province, livestock is significant part of economy that contributes 57.5% towards provincial GNP. In the province, total milk production during the year 2007-08 was 5.044 million tons while per capita availability was 141 kg per annum which is higher as compared to national level. Dera Ismail Khan is an agricultural district of the province with the highest livestock population and the major milk

producing district of the province as well (Govt. Pakistan, 2005- 2006). It has been reported that mastitis resulted in 22.5% premature culling of all culling during a 10 years period in local born and imported Holstein-Friesian cattle (Samiullah *et al*., 2000). A high incidence of sub-clinical mastitis in buffaloes in the area has been reported in our previous study (Akhtar *et al*., 2012).

Some studies have been conducted in different parts of country for mastitis prevalence in cows. However, no such study has been published for the area under study. The objective of this study was to determine the actual prevalence of clinical and subclinical mastitis in local and crossbred cows in D. I. Khan under field conditions. Additionally, causative pathogens were isolated and identified from milk samples. This study will be helpful to assess the incidence of mastitis in the area for future preventive measures to limit the disease. Identification of causative pathogens may help the practicing Vets for successful treatment of the disease.

MATERIALS AND METHODS

The lactating local and crossbred cows were randomly selected for sampling in Dera Isamil Khan city and its surrounding villages. All the animals used for this study were hand milked and no preventive mastitis control measures were adopted for these animals. Milk samples from 100 local and 100 crossbred cows were aseptically collected. Samples collected from apparently mastitis free cows were subjected to determine subclinical mastitis by Surf Field Mastitis Test (Muhammad *et al*., 1995) and microbiological examination for isolation and identification of causative pathogen (National Mastitis Council Inc, 1990). Three percent surf solution (pH = 10.3) was prepared by adding three grams of commonly used detergent powder (Surf Excell®, Lever Brothers, Pakistan) in 100 mL of water. Quarter milk samples and surf solution were then mixed in equal quantities in petri-dishes separately for each quarter. The change in consistency of milk (gel formation) indicated mastitis that was recorded as positive sample, while no change in consistency of milk indicated mastitis free that was recorded as negative sample. Milk samples collected from clinically affected quarters were processed directly for bacterial isolation and identification (National Mastitis Council Inc, 1990).

RESULTS AND DISCUSSION

Animal-wise prevalence of subclinical mastitis was 29% and clinical mastitis 7% in local cows. In crossbred cows, animal-wise subclinical mastitis and clinical mastitis was 36% and 12% respectively (Figure 1). Sub clinical mastitis was observed in 24.75% (99/400) and 32% (128/400) quarters in local and crossbred cows respectively. In local cows the affected quarters were: 19 (19.2%) right fore, 25 (25.3%) right hind, 23(23.2%) left fore and 34(34.3%) left hind quarters. In crossbred cows infected quarters were: 23 (18%) right fore, 31(24.2%) right hind, 29 (22.7%) left fore and 45 (35.2%) left hind (Table1).Thus there was higher incidence in crossbred than local cows. Among the quarters, hind-quarters were found more susceptible than fore-quarters. In case of fore-quarters, there was higher incidence in crossbred cows than local cows and among fore-quarters, right fore-quarter was found more susceptible. Similar results have been reported by Saini *et al*. (1994).

In case of clinical mastitis, the total number of quarters affected in local cows was 8% (32/400). Out of these, 4(12.5%) was right fore, 8(25%) right hind, 8(25%) left fore and 12(37.5%) left hind quarters. Among crossbred cows, 48(12%) quarters were affected. Out of these, 8(16.7%) was right fore, 12(25%) right hind, 11(22.9%) left fore and 17(35.4%) left hind-quarter (Table 2). There was higher incidence in hind-quarters in local cows than crossbred cows and among hind-quarters, left hind-quarters were found more susceptible. In case of fore-quarters, also there was higher incidence in crossbred cows than local cows and among fore-quarter, left fore-quarter was found to be more susceptible (Saini*et al*.,1994).The overall prevalence of mastitis was lower in local cows as compared to the crossbred cows. This lower prevalence might be attributed to genetic characteristics, teat size and structure of teat.

The major pathogens isolated from milk samples were *Staphylococcus aureus* 28(45%), followed by *Streptococcus agalactiae* 14(23%), Escherichia coli 11(18%) and Bacillus spp. 9(14%) in local cows. In crossbred cows, *Staphylococcus aureus* 41(49%), *Streptococcus agalactiae* 25(30%), *Escherichia coli* 11(13%) and Bacillus spp. 6(8%) were isolated. Similar results were observed by Memon *et al*. (1999) that the major pathogenic organism in mastitis was *Staphylococcus aureus* (38%), followed by *Streptococcus uberus* (13%), *Escherichia coli* (11%) and Klebsiellap neumoniae (11%). Bhalerao *et al*. (2000) noted the major pathogenic organism as *Staphylococcus aureus* (54.55%), followed by Streptococci (36.36%), Escherichia coli (4.55%) and Klebsiella (2.27%). It is important to note that *S.aureus* is the major pathogen causing mastitis in this area that has been reported to cause an average 34.5% loss to potential of milk production in subclinical mastitis (Gebreyohannes *et al*., 2010). Similar results have been reported for the causative pathogens that are most prevalent and responsible for about 78% cases of mastitis in different parts of the country (Razzaq, 1998; Ahmed 2001).

It was concluded that prevalence of clinical and sub-clinical mastitis was higher in crossbred than local cows, prevalence of sub-clinical mastitis was higher than clinical mastitis, Hind-quarters were more susceptible to

mastitis than forequarters and *Staphylococcus aureus* is major cause of mastitis in the area of study.

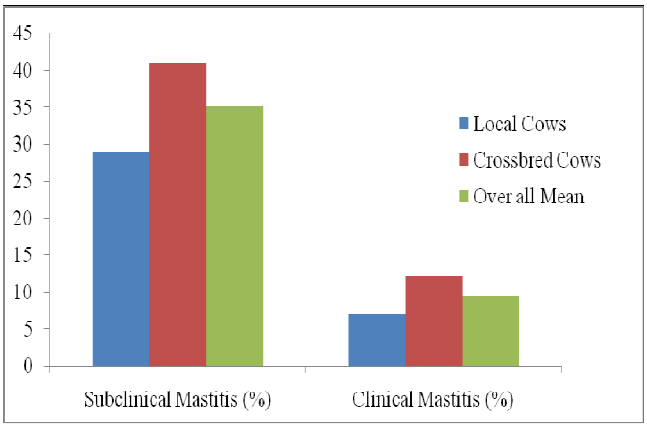

Figure 1: Animal wise mastitis in local and crossbred cows

Table 1: Quarter-wise (%) sub-clinical mastitis in local and crossbred cows in D. I. Khan

Animals	Right fore	Left fore	Right hind	Left hid	Total
Local cows	19.2	23.2	25.3	34.3	24.75
Crossbred cows	18	22.7	24.2	35.2	32

Table 2: Quarter-wise (%) clinical mastitis in local and crossbred cows in D. I. Khan

Animals	Right fore	Left fore	Right hind	Left hid	Total
Local cows	12.5	25	25	37.5	8
Crossbred cows	16.7	22.9	25	35.4	12

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