Scholar's Advances in Animal and Veterinary Research, 3(3): 119-125
ISSN(p): 2409-5281
ISSN(e): 2410-1540
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Research Paper

Effect of Season on Occurrence of Caprine Mastitis in Beetal Faisalabadi in and Around Faisalabad

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ARTICLE HISTORY

Received: July 22, 2016
Revised: August 18, 2016
Accepted: August 30, 2016

Key Words:
Mastitis
Goat
Season
Pathogen

A B S T R A C T

Mastitis in goats, analogous to dairy cattle, is one of the most significant diseases of economic importance, worldwide. For the proposed study 25 Beetal Faisalabadi goat farms comprising 10-20 goats in radius of 25 km was included. Sampling was done during two kidding season first in September-October and second in February-March. The epidemiological data, including goat breed, age, parity, stage of lactation, amount of milk, length of lactation period and farming system were recorded. These selected herds were screened out by SFMT and positive milk samples were aseptically collected. Samples from infected goats were subjected to microbiological assays. On the basis of results of sampling, screening and microbiological analysis of milk samples it was revealed that mastitis is more in summer season as compared to winter season. In

To Cite This Article: RASHID, M., M.I. SALEEM*, F. DEEBA, M.S. KHAN, S.A. MAHFOOZ, G. ABBAS, A.A. BUTT and ABBAS, M.W. (2016). Effect of season on occurrence of caprine mastitis in beetal Faisalabadi in and around Faisalabad. Scholar's Adv. Anim. Vet. Res., 3(3): 119-125.

winter the occurrence of mastitis in beetal Faisalabadi was 21.68% and in summer it was 25.70%. Bacteriological examination of mastitic milk samples revealed that *Staphlococcus* spp was the major etiological agent of caprine mastitis in Beetal Faisalabadi goats during both season. Statistical results of the study has showed that age, teat length, teat end, teat symmetry, distance between teat length and floor, stage of lactation and udder shape has significant effect on caprine mastitis ($p<0.05$). Parameters like season, udder washing, condition of floor, farm hygiene, milk practices and housing has no significant effect on mastitis ($p>0.05$).

INTRODUCTION

Goat has been aptly dubbed as *"poor man's cow"*. Pakistan is ranked as third in goat production after China and India (Khan *et al*., 2008). Goat rearing is commonly practiced by a large population of rural population of Pakistan. Goat milk is considered significant in supplying nutrition to human babies as well as to underprivileged families. In Pakistan, dairy goat is the main economical source for poor farmers. In Pakistan, Population of goat is 66.6 million that producing 822 thousand tons of milk and production of mutton is 657 thousand tones (Anonymous, 2014-2015).

Mastitis is a general term which refers to inflammation of mammary tissues without concerning the cause and is abundantly present in high producing buffalo, cattle, sheep and goat in all over the world (Watts, 1988). It is characterized by physical, chemical, pathological and bacteriological alteration in milk and mammary tissue (Samad, 2001). There are many causative organisms and predisposing factors genetic and non-genetic have been contributed towards caprine mastitis with *staphylococcus* as the major etiological agent (Ibrahim *et al*., 2009). Non genetic predisposing factors such as poor hygiene measures , poor management, teat injuries and wrong milking methods are known to play an important role in the invading of bacterial pathogen in the glands and occurrence of disease (Majic *et al*., 1993). Subclinical form of mastitis (SCM) is more abundantly prevalent in goat as compared to clinical form and is of more duration and adversely affect the quality of milk (Schultz and Ward, 1978). A nearly detection of hidden form of mastitis is pivotal since changes in milk/udder occur much faster than becoming clinically evident (Islam *et al*., 2012).

Mastitis has 2 forms viz., clinical and subclinical. The course of the disease may be hyper-acute to chronic and prevalence of subclinical mastitis (SCM) is more common which typically involves 15-40 % of goats in affected flock (McDougall *et al*., 2002; Silanikove *et al*., 2014). The SCM precedes to clinical mastitis with 5-10% annual incidence (Leitner *et al*., 2009). TZ LINE 1 Dairymen and veterinarians easily diagnose clinical mastitis by udder and milk examination while the diagnosis of subclinical mastitis is always a challenge in livestock lactating animal management and in veterinary practice. An early detection of subclinical mastitis is pivotal since changes in milk/udder set much earlier than becoming clinically evident (Islam *et al*., 2012). Subclinical mastitis is predominant form of caprine mastitis, due to the reason of more number of cases of subclinical mastitis. The diagnosis of mastitis largely depends on direct tests which depend upon the leukocyte count of milk. In the present state of knowledge it seems practicable and valuable to define mastitis as a disease characterized by presence of significantly increased number of leukocyte contents in milk from affected mammary glands. In context of milk these leukocytes are called as somatic cells. The increase somatic cell count is almost all the cases a reaction of tissue towards injury and is preceded by changes

in milk which are the direct results to damage mammary tissue (Radostits *et al*., 2006).

Diagnosis of mastitis depends upon the appearance of clinical signs, increased number of somatic cell count and identification of mastitis causing pathogen in the milk (Droke *et al*., 1993). Mastitis can be treated by the use of antibiotics through intramuscular as well as by intra mammary route followed by the identification of responsible pathogen as well as antibiotic sensitivity test to ensure proper treatment. In sheep mastitis can be treated by the use of intra-mammary infusion of antibiotic in combination of penicillin, nafcillin and dihydrostreptomycin that could be effective in treating mastitis after lambing (Chaffer *et al*., 2003).

MATERIALS AND METHODS

Epidemiological study: About 25 goat's farm comprising 10-20 goats was included for epidemiological study. Epidemiological data including breed, age, parity, stages of lactation, amount of milk, stage of pregnancy, housing and management conditions like previous deworming, vaccination, disease and treatment history was recorded. Other information regarding previous milk production and mastitis control measures (post milking teat dipping and dry period antibiotic therapy) were also be recorded.

Screening in all selected goat farms for clinical and subclinical mastitis was done via surf field mastitis test (SFMT). Sampling was done in two episodes (two consecutive lectation) first one in September-October and second will be in February-March. During screening SFMT positive milk samples (mastitic milk sample) was collected in sterile glass vials for isolation and identification of mastitic pathogen in milk.

Identification of mastitis: Clinical and subclinical mastitis was detected by physical examination of udder and Surf-Field Mastitis Test (SFMT), in all milking animals of selected goat farms (Muhammad *et al*., 2010). The results was interpreted as N for negative when milk remain liquid and T for traces when a slight slime formed and was seen by tripping the paddle back and forth, while scores of 1+ consider as weak positive, 2+ was considered as distinct positive and 3+ will be considered as strong positive for subclinical mastitis (Muhammad *et al*., 1995).

Microbiological examination of milk samples: Briefly, the mastitic milk sample mixed thoroughly and about 0.01 mL of milk was streaked onto blood agar and MacConkey's agar plates, with a sterile platinum rhodium loop. The inoculated plates was then incubated at 37°C for 24 h. An udder quarter was considered infected if 5 or more alike colonies were present on the plate. The representative colony of the microorganisms was isolated and streaking onto fresh blood agar plate. Catalase-positive, Gram-positive coccal isolates was presumptively be identified as Staphylococci or Micrococci and subjected to the tube coagulase test and STAPH-Trace system (API staph kit). Organisms other than Staphylococci were identified as per criteria recommended by National Mastitis Council, Inc. USA.

Statistical analysis: Data was analyzed by logistic regression model and chi square analysis (Minitab 16. 16.2.4.4).

RESULTS

Association of different parameters with caprine mastitis

Teat end: Teat end has significant effect on caprine mastitis ($p<0.05$). In summer 16 mastitis positive goats has inverted teat end and 39 goats has pointed

teat end likewise in winter 14 mastitis positive goats has inverted teat end and 35 goats has pointed teat end.

Stage of lactation: Stage of lactation has significant effect on caprine mastitis ($p<0.05$). In summer 35 mastitis positive goats were in early stage of lactation, 04 in late stage of lactation and 16 were in mid stage of lactation likewise in winter 19 goats were in early stage of lactation, 06 were in late and 24 were in mid stage of lactation.

Teat symmetry: In summer 37 mastitis positive goats has asymmetrical teats and 18 goats has symmetrical teats likewise in winter 26 mastitis positive goats has asymmetrical and 23 goats has symmetrical teats. Teat symmetry has significant effect on caprine mastitis ($p<0.05$).

Udder shape: Statistical data showed that udder shape has significant effect on caprine mastitis ($p<0.05$). In summer out of total mastitis positive goats 14 goats has bowl shape udder, 23 has cylindrical shape udder and 18 goats has round shape udder likewise in winter 20 goats has bowl shape udder, 16 has cylindrical udder and 13 goats has round shape udder.

Teat length: In summer out of total mastitis positive goats, 20 goats has teat length between 4 to 5.5 inch and 35 goats has teat length between 6 to 9 inch likewise in winter 15 goats has teat length between 4 to 5.5 and 34 goats has teat length between 6 to 9 inches. Collected data showed that teat length has significant correlation with mastitis (<0.05).

Age: Age of the goat has significant effect on caprine mastitis($p<0.05$).. In summer out of total mastitis positive goats, 43 goats has age between 1.5 to 3.5 years and 19 goats has age between 4 to 6 years likewise in winter 32 goats has age between 2 to 3.5 years and 17 goats has age between 4 to 6 years.

Remaining all parameters like season, udder washing, condition of floor, milking practices and housing has non-significant effect on mastitis ($p>0.05$).

Season: Season has no significant effect on mastitis, it has >0.05 statistical p value. In summer out of total 213 goats, 55 goats were mastitis positive likewise in winter out of total 226 goats, 49 goats were mastitis positive.

Etiological agents: Major etiological agent of caprine mastitis during both season were *Staphylococcus spp* that were identified by culturing mastitic milk samples on blood agar and MacConkey agar plates and on the basis of cultural characteristics and biochemical test and furthermore with the help of api Staph kit. *Staphylococcus aureus*, *Staphylococcus xylosus*, *Staphylococcus simulans*, *Staphylococcus auricularis* and *Staphylococcus hyicus* these are *Staphylococcus spp* and other included Bacillus and E.coli that were rare.

Total number of samples collected in summer were 213 out of total collected samples number of mastitic positive samples were 55 and number of mastitic negative samples were 158 similarly total number of samples collected during winter season were 226 and out of total samples number of mastitic positive samples in winter were 49 and number of mastitic negative samples were 177. Etiological agents that were isolated from mastitic positive milk samples during summer season are 99% coagulase negative staphylococcus (CNS) and among these most abundantly founded CNS species was S. hyicus 46.7% and then S. simulans 26.7%, S.aureus was 13.3%, and S.auricularis was also 13.3%. Similarly Etiological agents that were

Table 1: F table (season, response)

Season	Response	Summer	Winter
Summer	No	158	0
	Yes	55	0
Winter	No	0	177
	Yes	0	49

Table 2: Logistic Model Analysis of parameters

Parameters	Df	Deviance	AIC	LRT	Pr (>Chi)
Teat end	1	358.69	362.69	122.003	<2.2e-16***
Teat symmetry	1	364.67	358.67	116.016	<2.2e-16***
Stage of lactation	2	366.41	372.41	114.280	<2.2e-16***
Udder washing	1	480.26	484.26	0.430	0.512^{NS}
Teat length	2	442.93	446.93	37.757	8.015e-10***
Age	2	447.08	451.08	33.612	6.729e-09***
Teat shape	3	461.72	469.72	18.972	0.0002771***
Milk practices	1	480.68	484.68	0.012	0.9121009^{NS}
Udder shape	2	425.47	431.47	55.223	1.020e-12***
Floor type	1	469.03	473.03	11.656	0.0006399***
Housing	2	480.05	486.05	0.636	0.7276215^{NS}
Farm hygiene	2	470.42	476.42	10.273	0.0058777**
Floor Condition	1	469.03	473.03	11.656	0.0006399***
Season	1	479.65	483.65	1.040	0.3079344^{NS}

*** (significant), NS (non-significant), e-09***(highly significant)

Table 3: Frequency and percentage of bacterial isolates (Summer and winter)

Pathogen	Summer	%	Winter	%
S. aureus	2	13.3	1	11.1
S. hyicus	7	46.7	5	55.5
S. simulans	4	26.7	0	0
S. auricularis	2	13.3	0	0
S. xylosus	0	0	3	33.3

isolated from mastitic positive milk samples during winter season are 99% coagulase negative staphylococcus (CNS) and among these most abundantly founded CNS species was S. hyicus 55.5%, S. xylosus 33.3% and S. aureus was 11.1%.

DISCUSSION

Twenty five flocks of goat were selected in and around Faisalabad for two season winter and summer. A total of approximately 439 goats were screened out during both season, 226 in winter and 213 in summer. Milk samples were collected from 439 goats. A thorough physical examination and manual palpation was done to diagnose udder abnormalities. Prevalence of udder abnormalities including mastitis, udder edema, extra teats, blind halves, asymmetrical udder and teat lesions were observed. Surf Field Mastitis Test was used for the grading of severity of mastitis as N (negative), T (traces), P1 (mild clumping), P2 (moderate clumping) and P3 (heavy clumping). Clinical and subclinical mastitis was detected by complete physical examination of udder and Surf-Field Mastitis Test (SFMT), in all milking animals of selected goat farms. SFMT scores N were considered as negative and T was also considered as normal due to intra cytoplasmic particles in goat milk, while scores of 1+ consider as weak positive, 2+ considered as distinct positive and 3+ was considered as strong positive for subclinical mastitis.

In the present study along with milk sampling of animals for mastitis different parameters like, housing, floor type, condition of floor, drainage system, Farm hygiene, drinking water, feeding, mineral supplement, vaccination, deworming, udder washing and milking practices related with farm management and breed, strain, age, parity, lactation number, stage of lactation, body condition score, teat symmetry, udder shape, teat shape, teat end, teat length, distance of teat tip from ground, teat injury, supernumerary teat, udder edema, SFMT score, milk taste and milk color related with individual animal were also recorded to access the predisposing factors of mastitis. Among these parameters, season, housing, condition of floor, floor type, farm hygiene, udder washing, milking practices, teat symmetry, udder shape, teat shape, teat end, stage of lactation, age, teat length and distance of teat tip from ground were found to be closely associated with mastitis and acting as a predisposing factors for mastitis.

Statistical results of the study has showed that age, teat length, teat end, teat symmetry, stage of lactation, udder shape, teat shape, floor type and farm hygiene has significant effect on caprine mastitis ($p<0.05$). Parameters like season, udder washing, condition of floor, milk practices and housing has no significant effect on mastitis ($p>0.05$). Pathogen that were isolated from mastitic milk samples during summer are S. aureus was 13.3% S. hyicus 46.7%, S. simulans 26.7% and S. auricularis 13.3% and during winter S. aureus 11.1%, S. hyicus 55.5% and S. xylosus 33.3%. Major etiological agent of caprine mastitis during both season were Staphylococcus species.

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