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Epidemiological Study on Mastitis in Holstein Friesian Cattle on Organized farm in Jammu, India

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ABSTRACT

The current study was carried out with an aim to determine the epidemiological factors responsible for mastitis in dairy cattle and generating epidemiological data on this important disease in an organized cattle farm in Jammu. Screening was done on 100 randomly selected animals. A questionnaire was framed and completed with detailed management practices, including the risk factors like age, parity and lactation number along with the management practices. The samples were screened using Modified California Mastitis Test (MCMT), Somatic Cell Count (SCC). Management practices and detailed questionnaire revealed the high risk groups. The prevalence of clinical and subclinical practices was found to be 43% (SCM: 41% and CM: 2%). Further, the highest prevalence of sub clinical mastitis was found in cattle belonging to groups; 8 to 10 years age (40%); in 5th to 7th month lactation stage (36%) and 3rd to 6th parity (38.8%) whereas clinical mastitis showed highest prevalence in 2-7 year old (2.4%); 5th to 7th month lactation stage (4%) and 3rd to 4th parity (2.7%) groups. A significant ($p<0.05$) difference in Somatic Cell Counts (SCC) was observed between control and subclinical and clinical cases. MCMT proved to be an important screening test in the field conditions. Managemental practices and risk factors contribute to the occurrence of disease. Preventive and control measures need to be adopted strictly to reduce the disease in animals.

Keywords: Cattle, Clinical mastitis, Holstein Friesian, Mastitis

Mastitis is derived from the Greek word (Mastos = breast + it is = inflammation) defined as parenchymal inflammation of mammary glands. It is characterized by pathological changes in glandular tissues and is affected by bacteria, chemical and physical changes in udder (Radostits *et al.,* 2000). In cows and buffaloes it occurs in clinical and subclinical forms (Watts, 1988). In milk producing countries like India mastitis is recognized devastating disease which affects the dairy industry (Sumathi *et al.*, 2008). Annual losses of about ₹ 52.9 crore was published by Dhanda and Sethi in 1962 in India. Losses over ₹ 6000 crores per year is due to mastitis alone in Indian dairy industry (Ranjan *et al.*, 2008).

Herd size, system of feeding, agro-climatic conditions of the region, literacy level of the animal managing staff, and management all seem to influence the incidence of subclinical mastitis (Joshi and Gokhale, 2006).

Epidemiological studies by Itagaki *et al.* (1999) revealed mastitogenic organisms widespread on

different body sites of the cows, milker's hands, and milking cans and in the milk samples. California Mastitis Test (CMT), Sodium Lauryl Sulphate Test (SLST), Surf Field Mastitis Test (SFMT) and White Side Test (WST) are various indirect methods available for the diagnosis of mastitis under field conditions (Dairyman's digest, 2009).

Keeping in view, the absence of systematic epidemiological studies on mastitis for determining the epidemiological factors responsible in dairy cattle in the region the present study was aimed at generating epidemiological data on this important disease in an organized cattle farm of Jammu.

MATERIALS AND METHODS

Place of work

The present study was carried out in the Division of Veterinary Public Health and Epidemiology, Sher-E-Kashmir University of Agricultural Sciences and Technology (SKUAST-J), R.S Pura Jammu,India.

In the present study, a questionnaire was framed to collect the relevant information about management practices at the farm and the data of randomly selected lactating animals. A total of 100 milk samples were collected from lactating cows from organized cattle farm in Jammu. Random sampling was done at the farm and questionnaire was completed. These animals were initially screened using the Modified California Mastitis Test (MCMT) followed by Somatic Cell Count (SCC).

Epidemiological study

Epidemiological data viz. breed, age, lactation number/parity, milking practices, stage of lactation and managemental practices followed at the farm were recorded in questionnaire framed.

Sampling of animals

A total of 100 randomly selected lactating Holstein Friesian cows in an organized cattle farm at Satwari, Jammu (J&K, India) were screened. Animals were divided into groups as; age group (2 to 4 years, 5 to 7 years and 8 to 10 years), lactation stage viz. ≤ 4 months, 5 to 7 months and ≥ 8 months and parity of animals (1^{st}-2^{nd}, 3^{rd}-4^{th}, 5^{th}-6^{th} and ≥ 6^{th}).

Physical examination of the udder

The udder was examined for any evidences of atrophy, changes in size by manual palpation and teats were observed for any alterations such as injury, wounds and scars.

Physico-chemical examination of milk

Milk was examined for visible abnormalities/ alterations, including discoloration, clots, flakes, pus, presence of blood or blood stains and consistency, if any, at the time of milking during the visit at the farm.

Screening of samples for sub-clinical mastitis

Screening was done using standard procedures of Modified California Mastitis Test (MCMT) (Schalm *et al.,* 1971) and Somatic Cell Count (performed according to general principle of Prescott and Breed method as detailed by Schalm *et al.,* 1971. Raw milk samples were collected aseptically in pre-sterilized test tubes. The mid-stream milk samples were collected from the lactating cattle and brought to the Division of Veterinary Public Health and Epidemiology, Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-J, R.S. Pura, Jammu in ice and processed.

RESULTS AND DISCUSSION

Mastitis is the multietiological disease, inflammation of the mammary gland. Mastitis in clinical and subclinical form is a major cause of concern, leading to economic losses both

in the form of production yield and adverse economic impacts. Therefore, the present study was carried out to explore the epidemiological and bacteriological studies on cattle mastitis in organized farm in Jammu.

Studies on animal and husbandry management

A total 100 lactating cows belonging to the breed Friesian were managed in an organized dairy farm. According to the questionnaire framed it was obtained that cows were fed defined ration and were kept in the sheds with the tail to tail system of housing and proper density in different sheds on concrete with anti-slip measures adopted, proper ventilation with open paddock having water trough was available. Separate sheds were provided for calves, pregnant and diseased animals. There was presence of no other animal at the farm except cattle. Proper hygiene was maintained and workers washed the teats and hands before milking and soiled udders were washed with water. There were no separate persons in separate groups of animals, had a fair knowledge about personal and farm hygiene. Milking was done twice and for high yields machine milking was also followed. Risk Factors like age, lactation no. /parity, lactation stage were also recorded from the farm. Out of 100 randomly selected animals at the Dairy Farm 44 animals were in the age group of 5 to 7 years followed by 2 to 4 years and 8-10 years viz. 41 and 15, respectively. Highest number of animals were in the lactation stage of ≤4 months, followed by the 5 to 8 months of lactation stage. Numbers of animals recorded were highest in the parity of 1st to 2nd number followed by 3rd to 4th, 5 to 6 and ≥6 in a decreasing order.

Prevalence of disease

The present study was undertaken to explore the epidemiological studies on cattle mastitis in an organized farm in Jammu city. For this purpose lactating cows of Friesian breed were selected by simple random sampling from the Dairy Farm, Satwari. The animals were screened for clinical and subclinical mastitis using MCMT, 100/140 lactating cows were randomly selected and the frequency of the affected animals was found to be 43 percent (SCM: 41% and CM: 2%) at the time of visit at the farm with lactating cows. The results were in closed corroborated with Ahlner and Axelsson (2002), who reported 42.2 percent prevalence of subclinical mastitis in cows at Uruguay. Joshi and Gokhale (2004); De and Mukherjee (2009) have reported the overall prevalence of clinical mastitis and subclinical mastitis within range of 15.18 at periurban dairy farms in India and 50 percent. In Jammu, Sharma (2009) had reported prevalence of subclinical and clinical mastitis 42.18 percent in dairy cows. Our findings were not in agreement with Karimuribo *et al.* (2008); Argaw and Tolosa (2008) who reported higher prevalence of subclinical mastitis which ranged from 75.9 to 89.54 percent, which was much higher than the current study in Tanzania and Ethiopia respectively.

The lower proportion of clinical mastitis in this study might be the result of better udder health in the sampled herds. However, wide variation in the prevalence of SCM and CM observed in this study can also be attributed to changing management practices and different diagnostic tests that were used.

The randomly selected 100 animals were grouped under different risk factors which included age, lactation stage and parity. Animals were divided into 2 to 4, 5 to 7 and 8 to 10 years of the age group and the prevalence of disease was found to be 34.1,25,40 percent, respectively. The overall prevalence of mastitis was found highest in the age group of 8 to 10 years. According to their lactation stage viz. ≤4 months, 5 to 7 months and ≥ 8 months the prevalence of the disease was found to be 30,40 and 32 percent respectively. According to parity the animals were divided into 1st-2nd, 3rd-4th, 5th-6th, and ≥6th parity the prevalence of mastitis was recorded 31.8, 41.6 and 38.8,0 percent, respectively. Hence the overall recorded

data showed that the highest prevalence of subclinical mastitis was in the age group of 8th to 10 years, 5th to 7th month lactation stage and 3rd to 4th parity (Table 1).

Table 1: Results of Assessment of various risk factors at the cattle farm

Risk factors for cows	Total no. of animals examined	No. of animals affected	Prevalence (%)
Age			
2-4 years	41	14	34.1
5-7 years	44	11	25
8-10 years	15	6	40
Lactation stage			
≤4 months	50	15	30
5 to 7 months	25	10	40
≥8 months	25	8	32
Parity no.			
1-2	44	14	31.8
3-4	36	15	41.6
5-6	18	7	38.8
≥6	2	0	0

Age wise: The highest prevalence of subclinical mastitis was reported in dams of 8th to 10th years of age group (40%) followed by 2nd to 4th years of age group (31.7%) and 5th to 7th years (22.7%) age group. Similarly, the prevalence of clinical mastitis was 2.4% in both 2nd to 4th and 5th to 7th age group (Table 2). An increase in mastitis was observed to increase with age in cows and was in agreement with several authors who reported an increase in mastitis frequency with age (Schultz *et al.,* 1978, Dohoo and Leslie 1991). As per Abera *et al.* (2010) In Ethiopia, mastitis prevalence was more likely to occur in cows that were above 6 years of age.

Lactation stage wise: Highest prevalence of subclinical mastitis was recorded during 5th to 7th months of lactation (36%) followed by 32 percent during ≥8 months of stage and 30 percent for <4 month of lactation stage. For clinical mastitis prevalence of 4 percent was recorded during the lactation stage of 5th to 7th months (Table 2).

Table 2: Prevalence of subclinical and clinical mastitis vis-a–vis different age groups, lactation stage and parity in cows

Risk factors	No. of dams positive for subclinical mastitis	Prevalence (%)	No. of dams positive for clinical mastitis	Prevalence (%)
Age (Years)				
2-4	13	31.7	1	2.4
5-7	10	22.7	1	2.4
8-10	6	40	0	0
Lactation Stage				
<4 Months	15	30	0	0
5-7 Months	9	36	1	4
>8months	8	32	0	0
Parity				
1-2	14	31.8	0	0
3-4	14	38.8	1	2.7
5-6	7	38.8	0	0
>6	0	0	0	0

Highest prevalence was recorded from 5th to 7th month of lactation in the study which was in agreement with study from Rajasthan that recorded highest prevalence was found in 6th month lactation on quarter basis but differed from Corbett (2009) who recorded highest number of clinical mastitis cases during the first week and first three months of lactation than the remainder of the lactating period. Abera *et al.* (2010) in Ethiopia observed mastitis prevalence in cows at a late lactation stage comparison to cows that are at the early lactation stage to which our results corroborate.

Parity wise/ lactation number: Parity wise, highest prevalence of subclinical mastitis was 38.8 percent recorded in dams of 3rd to 6th parity followed by 1st to 2nd parity i.e. 31.8 percent. Clinical mastitis had a prevalence of 2.7 percent during 3rd to 4th parity (Table 2). Increasing parity increased the risk of clinical

mastitis in cows as observed in our study was in agreement with various reports (Whist, 2006; Kavitha *et al.*, 2009). However, the reason for this association is not clear. As per Biffa *et al.* (2005) as per study in southern Ethiopia cows with more calves (>7) have about greater risk (62.9%) of developing an udder infection than those with fewer calves (11.3%).

Diagnosis of mastitis

During the investigation the udder was subjected to a thorough physical examination, which included of visual inspection for any swelling, udder or teat injury, scars or other finding and manual palpation was done. The physical examination revealed that the color, consistency and odour of milk to be normal in case of subclinical mastitis and the udders were found affected in clinical mastitis with abnormality in milk. The results were in agreement with (Schalm *et al.,* 1971, Radostits *et al.,* 2000) who observed similar findings.

Dams were judged accordingly as under the suspicion of clinical or subclinical mastitis by the examination of udder, milk quality, and indirect test like a Modified California mastitis test (MCMT), pH and Somatic Cell Count (SCC).

Modified California Mastitis Test (MCMT) (Schalm *et al.*, 1971)

In the present study 100 lactating cows were screened for mastitis showed varied MCMT reactions on the basis of which different score of MCMT was recorded (Table 3). 58 (59.1%) samples were negative in the case of cows i.e. no reaction was observed. 12 (12.2%) samples were trace in reaction and (+) weak positive for 10 (10.2%), (++) distinct reaction for 7 (7.1%) and (+++) strong reactions in 11 (11.2%) milk samples were observed. There were 2 cases of clinical mastitis recorded at the time of the visit to the farm. Although Prodhan *et al.* (1996); Sen *et al.* (1996)in Baghabari reported prevalence of 15.8 percent and 14.4 percent, whereas Jha *et al.* (1993) recorded 18.8 percent sub clinical mastitis in cows in Nepal using a California mastitis test.

Somatic Cell Count (SCC)

During the present investigation the somatic cell for normal, subclinical mastitic group and clinical group recorded was 0.3±0.04 × 10^5 to 1.7±0.24 × 10^5 to 6.2±0.00 × 10^5 cells / ml. The results of statistical analysis revealed

Table 3: Interpretation of the milk samples using MCMT for subclinical mastitis

CMT score	Interpretation	Cows	Frequency (%)
0	Negative	58	59.1
T	Trace	12	12.2
+	Weak Positive	10	10.2
++	Distinct	7	7.1
+++	Strong	11	11.2
	Total	98	

Table 4: Assessment of the somatic cells counts for milk of cow

Parameters (Cow)	Control (n=10)	Subclinical mastitis (n=41)	Clinical mastitis (n=2)
SCC (×10^5 cells/ml)	0.3 ± 0.04^a	1.7 ± 0.24^b	6.2 ± 0.00^c

Values with at least one common superscript doesn't differ significantly ($p<0.05$). On the basis of the statistical analysis using student t test the significant difference was obtained in all the 3 groups of animals at 5.0 percent level.

significant difference in all the animals belonging to clinical and subclinical form along with the control group. The results were in close agreement with Harmon (1994) and Skrzypek *et al.* ((2004) (Poland) who reported SCC in milk to be between 50,000 and 100,000 cells/ml in healthy udder and greater than 200,000 cells/ml, from a diseased udder. The results were in close association with Schalm *et al.* (1971); Narayana and Iya (1954) who considered 2×10^4 to 5×10^5 cells/ml of milk to be a positive indication of mastitis. In cows somatic cells are always present in milk and they increase due to mammary gland infections.

The present study was attempted to estimate the prevalence of mastitis and generate epidemiological data in organized farm of cattle. A battery of tests were employed to estimate the prevalence among various risk factors. The results indicate that the subclinical mastitis is a major problem among the herds and screening with the tests like MCMT along with other tests can help in preventing the economically important disease. Further, preventive and control measures should be enforced more strictly in management practices to prevent the disease.

REFERENCES

Abera, M., Demie, B., Aragaw, K., Regassa, F. and Regassa, A. 2010. Isolation and identification of *Staphylococcus aureus* from bovine mastitic milk and their drug resistance patterns in Adama town, Ethiopia. *J. Vet. Med. Anim. Health*, **2(3)**: 29-34.

Ahlner, S. and Axelsson, A. 2002. Analysis of bacterial growth and the prevalence of sub clinical mastitis from bulk tank samples and individual samples from dairy herds in a region in Uruguay. Minor Field Studies International Office, Swedish University of Agricultural Sciences, **214**: 216.

Argaw, K. and Tolosa, T. 2008. Prevalence of sub clinical mastitis in small holder dairy farms in Selale, North Shewa Zone, Central Ethiopia. *Int. J. Vet. Med.*, **5(1)**: 72-75.

Biffa, D., Etana, D. and Fekadu, B. 2005. Prevalence and Risk Factors of Mastitis in Lactating Dairy Cows in Southern Ethiopia. *Int. J. Appl. Res. Vet. Med.*, **3(3)**: 189-198.

Corbett, R. 2009. Minimizing the effects of immunosuppression through management and nutrition. In: Proceedings NMC Annual Meeting, pp. 113-119.

Dairyman's Digest. 2009. What you should know about somatic cells. Winter issue.

De, U.K. and Mukherjee, R. 2009. Prevalence of mastitis in cross bred cows. *Indian Veterinary Journal*, **86**(8): 858-859.

Dhanda, M.R. and Sethi, M.S. 1962. Investigation of mastitis in India. ICAR Research Series, New Delhi, India, 35.

Dohoo, I.R. and Leslie, K.E. 1991. Evaluation of changes in somatic cell counts as indicators of new intramammary infections. *Prev. Vet. Med.*, **10(3)**: 225–237.

Harmon, R.J. 1994. Physiology of mastitis and factors affecting somatic cell counts. *J. Dairy Sci.*, **77:** 2103-2112.

Itagaki, M., Abe, S., Sakai, J. and Suzuki, K. 1999. Relationship between morphologic abnormalities of teat orifice and subclinical mastitis in dairy cattle. *J. Japan Vet. Med. Assoc.*, **52**: 561 – 564.

Jha, V.C., Thakur, P.R., Yadav, J.N. and Rai, L.B. 1993. Epidemiological investigation of subclinical bovine mastitis in the eastern hills of Nepal. *Vet. Rev. Kathmandu*, **8**: 35 –39.

Joshi, S. and Gokhale, S. 2004. Status of mastitis as an emerging disease in improved and periurban dairy farms in India. 23rd World Buiatrics Congress Quebec City, Canada.

Joshi, S. and Gokhale, S. 2006. Status of mastitis as an emerging disease in improved and periurban dairy farms in India. Annals of the New York Academy of Sciences, **1081**: 74-83.

Karimuribo, E.D., Fitzpatrick, J.L., Swai, E.S., Bell, C., Bryant, M.J., Ogden, N.H., Kambarage, D.M. and French. N.P. 2008. Prevalence of subclinical mastitis and associated risk factors in smallholder dairy cows in Tanzania. *Vet. Rec.*, **163**:16-21.

Kavitha, K.L., Rajesh, K., Suresh, K., Satheesh, K. and Syama Sundar, N. 2009. Buffalo mastitis - risk factors. *Buffalo Bull.*, **28(3)**: 134-137.

Narayana, T. and Iya, K.K. 1954. Studies on bovine mastitis. Incidence of mastitis in cows and buffaloes. *Indian J. Dairy Sci.*, **6**: 169-179.

Prodhan, M.A.M., Kamal, A.H.M. and Mahbub-E-Elahi. 1996. Prevalence of subclinical mastitis in cows of Baghabari Milkshed area. *Bangladesh Vet. J.*, **30**: 59-61.

Radostits, O.R., Blood, D.C., Gay, C.C. and Hinchcliff, K.W. 2000. Mastitis. In: Veterinary Medicine, A textbook of the diseases of cattle, sheep, goats, and horses. 8 ed. Bailler Tindall, London, pp. 603-700.

Ranjan, R., Gupta, M.K., Singh, K.K. and Jha, D.K. 2008. Milk samples for sub clinical mastitis and anti-biogram of Comparative efficacy of Papanicolaou stain and Leishman stain in the cytological study of bovine mastitis. *Indian Journal of Vet. Pathology.*, **32**: 277-279.

Schalm, D.W., Carroll, E.J. and Jain, C. 1971. Bovine mastitis. Lea and Fibiger, Philadelphia, pp. 182-282.

Schultz, L.H., Broom, R.W., Jasper, D.E., Berger, R.W.M., Natwke, R.P., Philpot, W.N., Smith, J.W. and Thompson, P.D. 1978. Current Concepts of Bovine Mastitis. *National Mastitis Council*, **2**: 6-9.

Sen, M.M., Kabir, M.H. and Rahman, A. 1996. Application of indirect tests to detect subclinical mastitis in milch cows. *Bangladesh Veterinary Journal*, **30**: 137 – 139.

Sharma, A. 2009. Studies on prevalence, haemato biochemical and mineral alterations during mastitis in crossbred cattle and its therapeutic management. M.V.Sc. Thesis, SKUAST-Jammu, India.

Skrzypek, R., Wtowski, J. and Fahr, R.D. 2004. Factors affecting somatic cell count in cow bulk tank milk - a case study from Poland. *J. Vet. Med.*, **51**: 127-131.

Sumathi, B.R.V., Eeregowda, B.M. and Gomes, A.R. 2008. The occurrence and antibiogram of bacterial isolates clinical bovine mastitis. *Veterinary World*, **1**(8): 237-238.

Watts, J.L. 1988. Etiological agents of bovine mastitis. *Vet. Microbiol.*, **16(1)**: 41–66.

Whist, A.C., Osteras, O. and Solverod, L. 2006. Clinical mastitis in Norwegian herds after a combined selective dry-cow therapy and teat-dipping trial. *J. Dairy Sci.*, **89**: 4649–4659.