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## Epidemiological studies of mastitis in cows reared under different managemental system in and around Parbhani

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#### Abstract

India is a premier milk producing country of the world and fabulously rich in dairy cows. Diseases of dairy cows achieve greatest importance and amongst which mastitis possesses highest clinical and economical significance. Therefore, the present epidemiological investigation was carried out to know the prevalence of mastitis in cows reared under different managemental conditions. The cow population was screened in and around Parbhani district of Marathwada region of Maharashtra, various organized and unorganized farms, gaushalas, local dairy farms and those belonging to dairy unit of College of Veterinary and Animals science, MAFSU, Parbhani. In the present research work, a total of 3152 quarter milk samples from 788 milking cows were screened for mastitis by using reference test as somatic cell count (SCC) while modified california mastitis test (MCMT), pH and electrical conductivity (EC) as indirect diagnostic tests. The overall prevalence of mastitis in lactating cows was 31.21% detected by SCC. The prevalence of subclinical mastitis was observed four times more (25.63%) than clinical mastitis (5.58%). Prevalence of mastitis in cows maintained under conventional housing system (39.55%) was found higher than loose housing system (29.51%). The prevalence of mastitis in HF cross was 39.01% while prevalence in native breeds was 29.52% detected. The prevalence of mastitis was observed highest in adult age group (39.44%), following in young age group (31.66%) and least in old age group (21.43%). The prevalence of mastitis in cows was highest in early lactation stage (35.25%), following mid lactation stage (29.69%) and least in late lactation stages (18.82%). The prevalence of mastitis in first to third, fourth to sixth and in more than seven lactation numbers were 26.36%, 51.61% and 16.28% respectively. The prevalence of mastitis was recorded highest in Left Hind quarter as 36.04%, following RH, LF and RF quarters were as 29.95%, 20.81% and 15.99% respectively. Prevalence of mastitis in was found highest in two quarters as 81.71%, following three, one and four quarters were as 13.01%, 3.25%, and 2.03% respectively.

**Keywords:** Cow, epidemiological study, prevalence, mastitis, Parbhani

#### Introduction

Milk is one of the most important foods of human being and is recognised globally as a complete diet due to presence of essential components required for human health. India is a premier milk producing country of the world and fabulously rich in dairy cows. Diseases of dairy cows achieve greatest importance and amongst which mastitis possesses highest clinical and economical significance. Mastitis is an inflammation of the parenchyma of the mammary gland regardless of the cause and is characterized by a range of physical and chemical changes in the milk and pathologic changes in the glandular tissue<sup>[3]</sup>. Clinically mastitis is classified into two categories - clinical mastitis and sub-clinical mastitis. Sub-clinical mastitis is characterized by the no visual changes in the quarter(s) and milk, or the existence of inflammation without presence of gross signs<sup>[14]</sup>. Subclinical mastitis (SCM) in cows is more prevalent in India (varying from 10-50%) than clinical mastitis (1-10%). Average loss of milk yield due to subclinical mastitis is up to 17.5%<sup>[12]</sup>. Subclinical form of mastitis in dairy cows is more important due to 15-40 times more prevalent than the clinical form, its long duration, difficult to detect, perpetual economic loss for longer duration, adverse effect on milk quality which usually goes unnoticed and of not properly attended, leads to clinical form of mastitis<sup>[13]</sup>. Inadequate sanitation, hygiene and veterinary services were found to be predisposing factors associated with prevalence and spread of subclinical mastitis in cows<sup>[15]</sup>. Diagnosis of subclinical mastitis is much more difficult as there are neither visual abnormalities in the milk nor inflammatory changes in the mammary gland.

Hence early diagnosis of subclinical mastitis is very essential for minimizing economical losses due to mastitis. Hence, the present epidemiological investigation was undertaken with the objective to record prevalence of mastitis in cows reared under different managemental system in and around Parbhani.

**Material and Methods**

In the present research project, a total of 3152 quarter milk samples from 788 milking cows in and around Parbhani from various organized and unorganized farms, gaushalas, local dairy farms and those belonging to dairy unit of College of Veterinary and Animals science, MAFSU, Parbhani were screened for mastitis by using somatic cell count (SCC) test as reference and modified california mastitis test (MCMT), pH and electrical conductivity (EC) as indirect diagnostic tests. The dairy cow population of native breed and cross breed from both conventional and loose housing systems was screened for detecting normal and elevated levels of SCC in the milk. The cows were grouped into different category viz. young, adult and old, based on their age. The cows in lactation below three months after calving were taken as in their early lactation; those in between three to six months were taken as in their mid-lactation and above six months were taken as in their late lactation. The cows in very early and very late lactation were excluded from the study due to false positive results. The data pertaining to managemental system, breed, age, lactation number, stage of lactation, milk yield, clinical abnormality of mammary gland and physical abnormality of milk was collected.

**Results and Discussion**

The clinical mastitis (CM) causes apparent physical

abnormalities occur not only in mammary gland like change in shape and size but also in milk like change in color and consistency. In subclinical mastitis (SCM) gross change in udder and milk is not noticed but the first pathological change noticed is the migration of leucocytes into milk as a result of increased permeability of udder capillaries to inflammatory reaction. The intensity of inflammation can be estimated quantitatively by SCC and qualitatively by CMT, pH and EC. In the present research work, a total of 3152 quarter milk samples from 788 milking cows were screened for mastitis by using reference test as somatic cell count (SCC) while modified california mastitis test (MCMT), pH and electrical conductivity (EC) were as indirect diagnostic tests. In the present study overall animal wise prevalence of mastitis was recorded by SCC as 31.21%. These findings are in agreement with Gupta *et al.* (2017) who recorded an overall prevalence of 43%. Among 788 cows 44 outwardly manifested signs of mammary gland inflammation with significantly higher SCC indicating prevalence rate of 5.58 (44/788) as a clinical mastitis. The present finding is in accordance with Gupta *et al.* (2017) who reported prevalence of CM as 2%. Out of 788, 202 cows revealed raised somatic cell count without any clinical manifestations indicating prevalence rate as 25.63 percent (202/788) of subclinical mastitis (SCM) in cows. Similar findings were presented by Islam *et al.* (2011) [11] and Daimi *et al.* (2005) [4] who reported prevalence of SCM as 29% and 32%. While higher prevalence of SCM was recorded by Sri Balaji and Saravanan (2017) [16], Gupta *et al.* (2017), Harini and Sumathi (2011) [9], Hedge *et al.* (2013), Bhikane *et al.* (2010) [1], Bhojar *et al.* (2009) [2], Sudhan *et al.* (2005) and Dasohari *et al.* (2017) [6] who reported as 57%, 41%, 75%, 45%, 56.10%, 61.11%, 43.33% and 66.18% respectively.

**Table 1:** Prevalence of mastitis in cows detected by various diagnostic tests

Sr. No.	Mastitis	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	Subclinical	788	202	25.63	184	23.35	152	19.28	134	17.01
2	Clinical	788	44	5.58	44	5.58	44	5.58	44	5.58
Overall			246	31.21	228	28.93	196	24.87	178	22.59

In housing system-wise prevalence of mastitis in cows total 134 cows managed under conventional housing system and 654 cows reared under loose housing system were screened for prevalence of mastitis. Prevalence of mastitis in cows maintained under conventional housing system was found 39.55% (53), 35.82% (48), 29.85% (40) and 26.11% (35)

using SCC, MCMT, pH and EC respectively. Prevalence of mastitis in cows reared in loose housing system was 29.51% (193), 27.52% (180) 23.85% (156) and 21.86% (143) determined by SCC, MCMT, pH and EC respectively. Higher prevalence of mastitis in conventional housing system might be due to frequent contact of udder to the floor.

**Table 2:** Housing system-wise prevalence of mastitis in cows

Sr. No.	Managemental system	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	Conventional	134	53	39.55	48	35.82	40	29.85	35	26.11
2	Loose	654	193	29.51	180	27.52	156	23.85	143	21.86

In breed-wise prevalence of mastitis in cows a total 141 HF cross cows and 647 native breed cows were screened for mastitis. The prevalence of mastitis in HF cross was 39.01% (55), 34.04% (48), 31.20% (44) and 28.37% (40) detected by SCC, MCMT, pH and EC respectively. Similar findings were presented by Islam *et al.* (2011) [11], Guha and Gera (2011),

Dar *et al.* (2014) [5] who reported prevalence of mastitis in cross breed as 36.46%, 28.63%, 38.80% respectively. Higher prevalence was recorded by Sri Balaji (2017) [16] and Dar *et al.* (2014) [5] as 60.52% 74.61% respectively. The prevalence of mastitis in native breeds was 29.52% (191), 27.82% (180), 23.48% (152) and 21.33% (138) was diagnosed by SCC,

MCMT, pH and EC respectively. Similar findings were recorded by Islam *et al.* (2011) [11] and Dar *et al.* (2014) [5] who reported prevalence of mastitis in native breed as 24.61%

and 13.50% respectively. The higher prevalence of mastitis was recorded in cross breed which might be due to high milk production and low immunity.

**Table 3:** Breed-wise prevalence of mastitis in cows

Sr. No.	Breed	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	HF Cross	141	55	39.01	48	34.04	44	31.20	40	28.37
2	Native	647	191	29.52	180	27.82	152	23.49	138	21.33

In age-wise prevalence of mastitis in cows a total 379 cows of young (3.5-6 years), adult (6-8 years) and old (more than 8 years) were screened for mastitis. The prevalence of mastitis in young age group was 31.66% (120), 29.55% (112), 26.38% (100) and 24.54% (93) diagnosed by SCC, MCMT, pH and EC respectively. In adult age group, prevalence was found 39.44% (84), 35.68% (76), 29.11% (62) and 26.29% (56) using SCC, MCMT, pH and EC respectively. While in old

age group prevalence of mastitis was noticed 21.43% (42), 20.41% (40), 17.35% (34) and 14.79% (29) detected by SCC, MCMT, pH and EC respectively.

The present findings are in agreement with Dar *et al.* (2010) who found prevalence as 12.30% in young, 71.53% in adult and 16.15% in old age group respectively. Gupta *et al.* (2017) recorded higher prevalence of mastitis in old age (40%) followed by adult (31.7%) than young age group (22.7%),

**Table 4:** Age-wise prevalence of mastitis in cows

Sr. No.	Age (Year)	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	3.5-6 (Young)	379	120	31.66	112	29.55	100	26.38	93	24.54
2	6-8 (Adult)	213	84	39.44	76	35.68	62	29.11	56	26.29
3	>8 (Old)	196	42	21.43	40	20.41	34	17.35	29	14.79

In lactation stage-wise prevalence of mastitis in cows a total 383 cows of early lactation (1-3 month), 320 cows of mid lactation (4-6 month) and 85 cows of late lactation (more than 7) were screened for mastitis. The prevalence of mastitis in cows of early lactation stage was 35.25% (135), 32.89% (126), 27.68% (106) and 25.85% (99) detected by SCC, MCMT, pH and EC respectively. The prevalence in mid lactation was 29.69% (95), 27.50% (88), 24.69% (79) and 21.87% (70) diagnosed by SCC, MCMT pH and EC

respectively. The prevalence of mastitis in late stage of lactation was 18.82% (16), 16.47% (14), 12.94% (11) and 10.59% (9) identified by SCC, MCMT, pH and EC respectively. Bhikane *et al.* (2010) [1] recorded more prevalence in 4<sup>th</sup> to 5<sup>th</sup> month (70%) followed by 1<sup>st</sup> to 3<sup>rd</sup> month of lactation (30%). The high rate of infection during early lactation stage might be due to the change in physiological processes which lead to reduced immunity of cow leads to more susceptible to contagious pathogens.

**Table 5:** Lactation stage-wise prevalence of mastitis in cows

Sr. No.	Lactation Stage (Month)	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	Early (1-3)	383	135	35.25	126	32.89	106	27.68	99	25.85
2	Mid (3-6)	320	95	29.69	88	27.50	79	24.69	70	21.87
3	Late (6-9)	85	16	18.82	14	16.47	11	12.94	9	10.59

In lactation number-wise prevalence of mastitis in cows a total 516 cow of first to third lactation, 186 cows of four to six lactation and 86 cows of lactation number seven and above was screened for mastitis. The prevalence of mastitis in first to third lactation was 26.36% (136), 24.61% (127), 20.93% (108) and 19.96% (103) detected by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in fourth to sixth lactation was 51.61% (96), 47.85% (89), 42.47% (79) and

36.56% (68) was diagnosed by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in more than seven lactation was 16.28% (14), 13.95% (12), 10.46% (9) and 8.14% (7) identified by SCC, MCMT, pH and EC respectively. The high rate of mastitis in fourth to fifth lactation may be due to fact the high milk production occur during that period.

**Table 6:** Lactation number-wise prevalence of mastitis in cows

Sr. No.	Lactation Number	Cow screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)
1	1-3	516	136	26.36	127	24.61	108	20.93	103	19.96
2	4-6	186	96	51.61	89	47.85	79	42.47	68	36.56
3	>7	86	14	16.28	12	13.95	9	10.46	7	8.14

In quarter type-wise prevalence of mastitis in cows a total 3152 quarters, 788 each viz., left-fore (LF) quarter, left hind (LH) quarter, right-fore (RF) quarter and right hind (RH) quarter were screened for mastitis. The prevalence of mastitis in LF quarter was 15.99% (126), 13.96% (110), 11.17% (88) and 10.02% (79) detected by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in LH quarter was 28.93% (228), 27.66% (218), 23.73% (187) and 22.33% (176) diagnosed by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in RF quarter was 12.81% (101), 11.93% (94), 10.02% (79) and 8.88% (70) diagnosed by SCC, MCMT, pH and EC respectively. The prevalence of mastitis

in RH quarter was 22.33% (176), 20.68% (163), 18.78% (148) and 16.24% (132) diagnosed by SCC, MCMT, pH and EC respectively. Similar findings were recorded by Bhikane *et al.* (2010) <sup>[1]</sup> and Bhojar *et al.* (2009) <sup>[2]</sup> who reported quarter wise prevalence as 37.78%, 23.91% in RH, 26.08%, 39.13% in LH, 21.73%, 17.39% in RF and 17.39%, 19.56% in LF respectively. The higher incidence of SCM in left side quarters could be ascribed to the fact that cows mostly sit on right side with the result these quarters are frequently exposed to dung and soil moreover due to pressure of the body of animal the milk dribbles out through the teats and thus increasing their susceptibility.

**Table 7:** Quarter type-wise prevalence of mastitis in cows

Sr. No.	Type of Quarter	Quarter screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (mS/cm)	
			Quarter positive	Prevalence (%)	Quarter positive	Prevalence (%)	Quarter positive	Prevalence (%)	Quarter positive	Prevalence (%)
1	LF	788	126	15.99	110	13.96	88	11.17	79	10.02
2	LH	788	228	28.93	218	27.66	187	23.73	176	22.33
3	RF	788	101	12.81	94	11.93	79	10.02	70	8.88
4	RH	788	176	22.33	163	20.68	148	18.78	132	16.24
Total		3152	631	20.02	585	18.56	502	15.93	457	14.49

In quarter number-wise prevalence of mastitis in one quarter was 01.01% (8), 00.76% (6), 00.63% (5) and 0.51% (4) detected by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in two quarter was 15.10% (119), 14.09% (111), 12.05% (95) and 11.04% (87) diagnosed by SCC, MCMT, pH and EC respectively. The prevalence of mastitis in three quarter was 11.55% (87), 11.04% (87), 9.77% (77) and 8.76% (69) identified by SCC, MCMT pH and EC respectively. The prevalence of mastitis in all four

quarters was 3.55% (28), 3.04% (24), 2.41% (19) and 2.28% (18) SCC, MCMT, pH and EC respectively. In current study two quarter infection was more followed by three quarters. Sudhan *et al.* (2005) reported prevalence 74.36%, 10.26%, 12.82% and 2.57% in one quarter, two quarter, three quarter and four quarter respectively. The difference in quarter wise prevalence of mastitis is probably due to the fact that predisposing factors like injury, defective sphincters and so forth could vary from quarter to quarter.

**Table 8:** Quarter number-wise prevalence of mastitis in cows

Sr. No.	Quarter distribution	Cows screened	Diagnostic tests							
			SCC (x10 <sup>3</sup> )		MCMT		pH		EC (MS/cm)	
			Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows positive	Prevalence (%)	Cows Positive	Prevalence (%)
1	One quarter	788	8	01.01	6	00.76	5	00.63	4	0.51
2	Two quarter	788	119	15.10	111	14.09	95	12.05	87	11.04
3	Three quarter	788	91	11.55	87	11.04	77	9.77	69	8.76
4	Four quarter	788	28	3.55	24	3.04	19	2.41	18	2.28
Total			246	31.21	228	28.93	196	24.87	178	22.59

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