RESEARCH ARTICLE

Prevalence of Subclinical Mastitis in Gir Cows in and around Junagadh District of Gujarat

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Abstract

The research was conducted to determine the prevalence of subclinical mastitis among Gir cows in the vicinity of Junagadh. A total 990 quarters of 250 lactating Gir cows were screened by using California mastitis test. Overall animal wise prevalence of SCM was 32.80% and quarter wise prevalence 22.32% in lactating Gir cows. The prevalence of subclinical mastitis was highest in the right fore quarter (28.40%), followed by the right hind quarter (24.29%), left fore quarter (19.43%), and left hind quarter (17.07%). SCM was more prevalent in the right side quarters (26.36%) compared to the left side quarters (18.26%) and fore quarters having a greater prevalence (23.94%) than hind quarters (20.69%). The animal wise and quarter wise prevalence of SCM in relation to age was highest in 5-7 year old Gir cows (38.78% and 27.32%). The animal wise and quarter wise prevalence of SCM in relation to lactation number was highest in fourth lactation (41.27% and 32.00%) and the least in sixth and above lactations (19.05% and 15.66%). The animal and quarter wise prevalence of SCM in relation to stage of lactation was highest in early lactation (41.41% and 27.74%) followed by mid lactation (30.34% and 21.47%) and late lactation (22.58% and 14.81%).

Key words: Gir cow, Lactation number, Lactation stage, Age, Prevalence, Subclinical mastitis.

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Introduction

Bovine mastitis is a common and economically significant disease in dairy animals worldwide. The term "mastitis" is derived from "mast" meaning breast and "itis" meaning inflammation. Mastitis causes significant financial losses due to abatement in milk yield at the occurrence of the disease and also throughout the rest of the lactation with compromised milk quality, discarding of milk, therapeutic management costs, and labour expenses. The severity of inflammation can be classified into a subclinical, clinical and chronic form. Subclinical mastitis (SCM) is most common type of mastitis in dairy herds, which affects 20 to 50 % of cows within the herd (Pitkälä *et al*., 2004). Approximately 70 to 80 % of losses occur due to SCM in dairy herds, among them 70 % is related to a decreased milk production because of irreversible damage of mammary tissues (Pillai *et al*., 2001). Even though tremendous breakthroughs in the understanding of the mastitis, subclinical mastitis remains a major dilemma in dairy herds, and the prevalence rates in many countries remain similar to those reported decades ago. Normally, the prevalence of subclinical mastitis is more common than clinical mastitis and more common in the cows as compared to buffaloes (Devi and Dutta, 2018) and it is more prevalent in the right quarters and hind quarters, especially the right hind quarter (Sharma *et al*., 2017). The aim of this study was to assess the prevalence of SCM in Gir cows within the vicinity of Junagadh, Gujarat.

Materials and Methods

A total of 250 lactating Gir cows were screened during the study period by California Mastitis Test (CMT). These cows belonged to the Cattle Breeding Farm, Junagadh and different organized and unorganized farms in and around Junagadh.

Clinical Examination of the Udder/ Teat/Milk

The udder and individual teats were subjected by manual palpation for variation or consistency in the size of a teat, atrophy, asymmetry and indurations of udder. The udder was inspected to rule out any unilateral or bilateral abnormalities. Teat ends were examined for any alterations such as ease

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of milking, patent teat orifice, scars and wounds. Milk was evaluated for both its quality, such as watery appearance of milk, blood staining, discoloration, pus, and any presence of flakes or clots and the quantity, *i.e.* decreased production.

California Mastitis Test

The milk samples from different quarters were subjected to a CMT to diagnose subclinical mastitis. CMT initially called cow-side field test was carried out during milking of cows as per the standard method. The basic principle of this test is that when CMT reagent is added to a milk sample somatic cells burst liberating the DNA and other cell contents. The proportion of somatic cells within gel influences its consistency. Released DNA from burst cells combines to produce a gel. The test was performed in a plastic paddle with four cups marked as LF, RF, LH, and RH. One strip of milk was drawn into plastic paddle. To this, equal amount of the CMT reagent was added. The contents were then mixed by gentle stirring for 10 to 20 second. Based on the reaction; the results were graded by the intensity of gel formation (Fig. 1) as 0 (Negative or no reaction), 1+ (Precipitate but no gel formation), 2+ (Precipitate thickens and forms gel towards the centre of the paddle) and 3+ (Distinct gel that adheres to the bottom of the paddle). The epidemiological status of subclinical mastitis in Gir cows was then worked out for animal wise, quarter wise, age wise, lactation number wise and lactation stage wise, and the frequency of SCM with respect to these factors calculated was tested for significance at $p<0.05$ using Chi-square test.

Results and Discussion

Overall Prevalence of SCM

According to animal wise perspective, 82 out of 250 Gir cows acquired subclinical mastitis, showing the overall prevalence of 32.80%. This finding was very close to the findings (31.40 to 33.30%) of Mourya *et al.* (2020), Balemi *et al.* (2021), and Singh *et al.* (2021). However, a higher prevalence of subclinical mastitis (43.00 to 70.19%) was reported by Lahamge *et al.* (2019) Ndahetuye *et al.* (2020), and Bhandari *et al.* (2021). The present low prevalence of SCM may be attributed to various factors including the selection of animals, season, management practices of the farm, prevention of mastitis strategies adopted in particular farm. Various other factors like herd size, milking method practiced, agro-climatic conditions of the region, disparities in socio-cultural practices, marketing of milk, education level of the animal owner and feeding pattern also affect the prevalence of subclinical mastitis in the herd.

The overall quarter wise prevalence of subclinical mastitis was 22.32 % (221 out of 990, there were 10 blind teats) in lactating Gir cows. The current finding was similar to that (16.25 to 20.18 %) recorded by Mourya *et al.* (2020), Bhandari *et al.* (2021) and Sardare *et al.* (2022). Contrast to our observation, Geleta *et al.* (2019), Lahamge *et al.* (2019), Ndahetuye *et al.* (2020), Ahmed *et al.* (2021) observed higher quarter wise prevalence rates of 33.27 to 47.52 %. The low quarter wise prevalence of SCM in present study was probably due to higher number of quarters (990) tested.

Individual Quarter wise Prevalence of SCM

The prevalence of subclinical mastitis was highest in right fore quarter (28.40%, 71/250) followed by right hind quarter (24.29%, 60/247), left fore quarter (19.43%, 48/247), whereas the lowest prevalence of subclinical mastitis was in left hind quarter (17.07%, 42/246) (Table 1). The current results aligned with those of Geleta *et al.* (2019), who stated that the prevalence of subclinical mastitis was highest in right front quarter followed by right hind, left front and left hind (50.78, 48.43, 46.61 and 44.27 %, respectively, amongst 384 quarters each). With contradiction to our findings, Ahmed *et al.* (2021) reported the fluctuating prevalence of SCM among quarters, with the highest prevalence (41.00%) in right hind quarter, followed by the left hind quarter (38.00%), the right fore quarter (34.40%) and the least in left forequarter (31.60%).

When left and right quarters were compared, the prevalence of subclinical mastitis was highest in the right side quarters (26.36%, 131/497) compared to left side

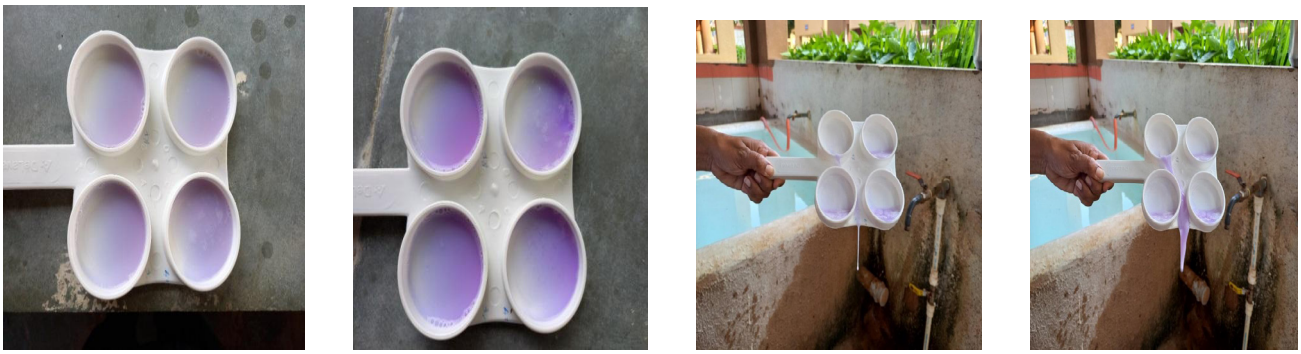

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Fig. 1: California mastitis test grading

quarters (18.26%, 90/ 493), whereas irrespective of side the fore quarters had greater prevalence (23.94%, 119/497) than hind quarters (20.69%, 102/493). A highly significant difference ($p<0.01$) was found in the quarter wise prevalence between the individual quarter dispositions (Table 1). These findings corroborated with Karabasanavar *et al*. (2019) that the right side quarters (60.80%) were comparatively more affected than the left side quarters (39.20%); whereas fore quarters (52.90%) showed higher prevalence of subclinical mastitis than hind quarters (47.10%). The highest prevalence of subclinical mastitis observed in right side quarters could be due to the fact that the cows reclined on the right side sitting posture, which widens the teat canal due to pressure exerted by the body of the cows on the right side quarters, hence, it provides disclosure to entrance of microorganism from dung, soil and environment contamination. It could also be attributed to a common milking practice among milkers, *i.e.,* initial handling of the right front quarter when milking the animal, which might have increased the risk of infection.

Subclinical mastitis was distributed differently by quarter, and in descending order of frequency it was recorded in three quarters, two quarters, four quarters, and one quarter (Table 2). This prevalence of SCM varied significantly ($p<0.01$), three and two quarters of an udder being affected more frequent than any one or all four quarters.

Age wise Prevalence of Subclinical Mastitis

The animal wise prevalence of SCM according to age was observed highest in 5-7 years of age (38.78%). The quarter wise prevalence of SCM in lactating Gir cows with relation to age was showed a significant difference ($p<0.01$) among various groups and it was highest in 5-7 years of age (27.32%) (Table 3). This finding was quite similar to that of Bhuiyan *et al*. (2020), who reported that age wise prevalence of subclinical mastitis was higher in cows more than 5 years (30.73%) than the 3-5 years age (26.67%). Similar findings were made by Tiwari *et al*. (2022), who observed that cows aged between 4-8 years were more susceptible to subclinical mastitis than cows in other age groups. During the age of 5-7 years, the animals were typically in their 3rd to 5th lactation, which is associated with higher milk yield and increased stress, making them more susceptible to infections. Younger cattle are less susceptible to subclinical mastitis than other age group of cattle because younger cattle have effective inherent host defence mechanism, while in older cattle there is less milking practice with decrease milk yield and minimum handling of the animals may diminish the chance of infection.

Lactation Number wise Prevalence of Subclinical Mastitis

The lactation number or parity was taken from first to sixth and above lactation number. The animal wise overall

Table 1: Prevalence of subclinical mastitis in alliance to quarter disposition

Rating	Quarter's Position	Number of quarters Screened	Number of quarters positive	Prevalence (%)
Individual quarter	Right fore	250	71	28.40
	Right hind	247	60	24.29
	Left fore	247	48	19.43
	Left hind	246	42	17.07
Side of quarters	Right side quarters	497	131	26.36
	Left side quarters	493	90	18.26
Position of quarters	Fore quarters	497	119	23.94
	Hind quarters	493	102	20.69
	$X^2 = 21.86$	df= 7	P= 0.002	
		990	**221**	**22.32**

$p < 0.01$= Highly significant

Table 2: Quarter wise distribution of subclinical mastitis

S. No.	Quarter's distribution	No. of cows screened	No. of cows positive	Prevalence (%)
1	Single quarter	250	8	3.20
2	Two quarters	250	22	8.80
3	Three quarters	250	39	15.60
4	Four quarters	250	13	5.20
	$X^2 = 29.60$	df= 3	p= 0.000002	

$p < 0.01$= Highly significant

prevalence of subclinical mastitis according to lactation number was observed highest in fourth lactation (41.27%) and third lactation (37.25%). This was followed by first lactation (31.03%), fifth lactation (30.77%), second lactation (26.67%) and the lowest prevalence was observed in sixth and above lactations (19.05%) (Table 4).

The quarter wise overall prevalence of subclinical mastitis in relation to lactation number was observed highest in fourth lactation followed by third lactation, first lactation, fifth lactation and second lactation and least in sixth and above lactation. There was a significant difference ($p<0.01$) in the quarter wise prevalence of SCM according to lactation number (Table 4). The present finding supported the earlier observations of Shelke *et al*. (2019), that the prevalence of subclinical mastitis on the basis of somatic cell count was more in 4-6 lactation (32.66%, 65/119) than 1-3 lactation (25.73%, 88/342) and more than seven lactation (17.64%, 9/51), while Mourya *et al*. (2020) discovered similar trend of a higher prevalence in fourth parity.

Lactation Stage wise Prevalence of Subclinical Mastitis

The lactation stage was divided in 3 groups, *i.e.* early lactation (1 to 3 months), mid lactation (3 to 6 months) and late lactation (6 months and onwards till drying off). The animal wise and quarters wise prevalence of SCM observed significant variation ($P<0.01$) among different groups and it was highest in early lactation (41.41% and 27.74%) in Gir cows (Table 5). The present finding has very close alignment with the reports of Tiwari *et al*. (2022) and Yimam *et al*. (2020), who stated that

Table 3: Animal wise and quarter wise prevalence of subclinical mastitis in relation to age

	Animal wise prevalence			Quarter wise prevalence		
Age group	**Number of cows Screened**	**Number of cows Positive**	**Prevalence (%)**	**Number of quarters Screened**	**Number of quarters Positive**	**Prevalence (%)**
3-5 years	57	18	31.58	228	43	18.86
5-7 years	142	55	38.78	560	153	27.32
>7 years	51	09	17.65	202	25	12.38
Chi-square test	$X^2 = 7.62$ df= 2 p= 0.02			$X^2 = 21.17$ df= 2 p = 0.000025		

$p < 0.05$= Significant, $p < 0.01$= Highly significant

Table 4: Animal wise and quarter wise prevalence of subclinical mastitis in relation to lactation number

	Animal wise prevalence			Quarter wise prevalence		
Number of lactations	**Number of cows Screened**	**Number of cows Positive**	**Prevalence (%)**	**Number of quarters Screened**	**Number of quarters Positive**	**Prevalence (%)**
First Lactation	29	9	31.03	116	23	19.83
Second Lactation	60	16	26.67	240	41	17.08
Third Lactation	51	19	37.25	199	44	22.11
Fourth Lactation	63	26	41.27	250	80	32.00
Fifth Lactation	26	8	30.77	102	20	19.61
Sixth and above Lactation	21	4	19.05	83	13	15.66
Chi-square test	$X^2 = 5.43$ df= 5 P= 0.37			$X^2 = 20.280$ df= 5 P= 0.001		

$p < 0.01$= Highly significant

Table 5: Animal wise and quarter wise prevalence of subclinical mastitis in relation to stage of lactation

	Animal wise prevalence			Quarter wise prevalence		
Stage of lactation	**Number of cows Screened**	**Number of cows Positive**	**Prevalence (%)**	**Number of quarters Screened**	**Number of quarters Positive**	**Prevalence (%)**
Early Lactation	99	41	41.41	393	109	27.74
Mid Lactation	89	27	30.34	354	76	21.47
Late Lactation	62	14	22.58	243	36	14.81
Chi-square test	$X^2 = 6.52$ df= 2 P= 0.004			$X^2 = 14.69$ df= 2 P= 0.0006		

$p < 0.01$= Highly significant

prevalence of subclinical mastitis was higher in early lactation stage (37.80 and 29.80 %) followed by mid lactation (36.80 and 14.29 %) and late lactation (25.40 and 11.11 %, respectively). The high prevalence at an early lactation stage may be due to the lack of a dry cow regime and early infection related with delayed neutrophils diapedesis in to the mammary gland. Rapid post-partum physiological changes in the mammary tissue cause reduced udder resistance associated with negative energy balance that leads to higher prevalence of SCM in the primiparous cows.

Conclusion

In the present study the overall prevalence of SCM in Gir cows was observed to be 32.80 % on an animal basis and 22.32 % on a quarter basis. On an individual quarter wise the highest prevalence of subclinical mastitis was observed in the right forequarter, right-sided quarters and forequarters. In Gir cows, the prevalence of subclinical mastitis was found to be highest in the age group of 5-7 years, particularly in the fourth lactation number and early lactation stage.

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