

RESEARCH ARTICLE

Prevalence and haematobiochemical profile of resistant mastitis in dairy cows in and around Salem District, Tamil Nadu

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Received: 19 July 2025 / Accepted: 01 September 2025 / Published online: 23 December 2025

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Abstract: This study investigated the prevalence and characteristics of clinical mastitis in dairy cows, revealing a 13.17% prevalence rate. Jersey crossbred cows were found to be most susceptible, accounting for 85.23% of resistant mastitis cases, particularly those with parity 4-5 (51.70%). The incidence of mastitis showed seasonal variation, peaking during the rainy season with 35.23% of cases. The Left Front quarter was the most frequently affected (36.93%) and most cases occurred during the first 3 months of lactation (62.50%). Mastitis-affected cows showed significant haematological changes, with improvements observed after treatment. Notably, various haematological and biochemical parameters returned to near-normal levels post-treatment, indicating effective management of the condition. These findings highlight the importance of targeted management strategies to prevent and control mastitis in dairy cows.

Keywords: Cow, Dairy, Haemato-biochemistry, Prevalence, Resistant mastitis

Introduction

Mastitis is a significant health issue in dairy cows, causing economic losses and affecting animal welfare. It is an inflammation

of the mammary gland, often caused by bacterial infections. It can be manifested in clinical or subclinical forms, with clinical mastitis being characterized by visible changes in milk and udder health. Mastitis has been reported to result in significant productivity loss or reduction, affect the quality and quantity of milk yield, and force the culling of animals at an unacceptably young age (Ali et al. 2024).

According to studies in India, the prevalence of clinical mastitis in dairy cattle ranges from 4.77% to 18.74% (Bhat et al. 2017), with more recent research reporting a prevalence of 18% for clinical mastitis and 45% for subclinical mastitis (Krishnamoorthy et al. 2021). Routine haematologic analysis can be useful for predicting pathogen type and facilitating treatment decisions (Smith et al. 2001). Examining the concentration of bilirubin, albumin, glucose and cholesterol in the blood serum, as well as the activity of AST, ALT enzymes and the appropriate markers for liver function, both allow an overall assessment of liver status and provide information about the production potential of dairy cows (Djokovic et al. 2013). This study aimed to investigate the prevalence and characteristics of clinical mastitis in dairy cows, focusing on breed, parity, seasonal variation, quarter involvement, and lactation stage, as well as the impact of the disease on haematological and biochemical parameters.

Materials and Methods

The study was conducted at the Veterinary Clinical Complex Outpatient unit from January 2024 to May 2025, on cows exhibiting changes in the udder and milk. The cows with udder swelling and discolouration in milk were subjected to a detailed physical and clinical examination of the udder, teat, and milk (Rosenberger, 1979). Haematological parameters were analysed using an auto haematology analyzer (Haemaray5iVet, M/s Rayto Life & Analytical Sciences, Ltd., China). Serum biochemical profile was analyzed using a Semi-auto analyzer (A25bio systems, M/s. Biosystem SA, Spain). Electrolytes such as Sodium, Potassium and Chloride were measured using an Electrolyte analyzer (M/s Turbolyte, CPC Diagnostics Pvt. Ltd., India).

The milk samples were collected from the cows with clinical mastitis aseptically in a sterile container and sent to the

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laboratory for analysis, bacterial culture and isolation and antibiogram. Antimicrobial susceptibility test was carried out according to the Clinical and Laboratory Standards Institute guidelines (CLSI, 2019). The zone of inhibition was then measured and compared to CLSI guidelines to interpret the results as Sensitive (S), Intermediate (I), or Resistant (R). Multidrug resistance (MDR) was defined as resistance to at least one agent of three or more antimicrobial classes (Magiorakos et al. 2012). The study consisted of 264 cases, categorized into resistant mastitis (n=176), non-resistant (n=52), and culturally negative (n=36) (Fig. 1). From the resistant mastitis cases, 176 cows were selected and divided into four treatment groups: Group II A (n=43) received parenteral antibiotic treatment based on antibiotic sensitivity testing (ABST) results, Group II B (n=43) was treated with intramammary aqueous extract of *Tridax procumbens*, Group II C (n=43) received intramammary ethanol extract of *Tridax procumbens*, and Group II D (n=47) received integrative therapy combining antibiotics with either aqueous or ethanol extract of *Tridax procumbens*. A separate control group, Group I (n=47), was also included in the study. The data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994). The results were analysed based on one-way ANOVA (Kruskal-Wallis Test), Paired t²-test (Wilcoxon's rank test) and P<0.05 values were considered statistically significant.

Results and Discussion

A total of 35652 cases were registered from January 2024 to May 2025, of which 23674 were medicine cases. Out of which 3476 were related to dairy animals. Among the dairy animals, 264 were diagnosed with clinical mastitis, resulting in an overall prevalence rate of 13.17%. Mastitis cases recorded in this study from the Salem district of Tamil Nadu were depicted as a Google map (Fig. 1).

Prevalence of Mastitis

The prevalence of mastitis is presented in Table 1.

Age

The age-wise distribution of mastitis in cows revealed that the majority of resistant mastitis cases (55.11%, 97/176) and non-resistant mastitis cases (51.14%, 45/88) were observed in cows aged 5-6 years. Cows aged 3-4 years accounted for 31.25% (55/176) of resistant mastitis cases and 38.64% (34/88) of non-resistant mastitis cases, while cows aged >6 years had the lowest prevalence, with 13.64% (24/176) and 10.23% (9/88) in resistant and non-resistant mastitis groups, respectively. This was in agreement with Sharma et al. (2010), who reported that the 3- to 6-year-old cows had a high prevalence (55.10%), followed by >6 years of age and <3 years-old cows.

Breed

The breed-wise distribution of mastitis cases showed that the majority of cases were observed in Jersey crossbred animals, with 85.23% (150/176) and 80.68% (71/88) in the resistant and non-resistant mastitis groups, respectively. The Holstein Friesian crossbred accounted for 14.77% (26/176) and 19.32% (17/88) of resistant and non-resistant mastitis cases, respectively. Contradictorily, Chandrasekaran et al. (2015) reported that the incidence of resistant mastitis was high in Holstein Friesian crossbreed, followed by the Jersey crossbreed and the non-descript. This breed variation may be more of a Jersey crossbred that was reared in this locality.

Parity

The parity-wise distribution of mastitis in cows showed that most resistant mastitis cases (51.70%, 91/176) occurred in cows with parity 4-5, while most non-resistant mastitis cases (48.86%, 43/88) were found in cows with parity 1-3. Cows with parity 6-10 had the lowest prevalence, with 8.52% (15/176) in resistant mastitis and 5.68% (5/88) in non-resistant mastitis groups. Chandrasekaran et al. (2015) reported that the highest incidence of resistant mastitis occurred during the early stage of the third lactation. The present study agrees with previous reports indicating that the rate of clinical mastitis is higher in cows with greater parity (Verbeke et al. 2014), particularly in the fourth parity (30%), followed by the third and fifth parities (Bhat et al. 2017). The chances of clinical mastitis increase with higher parity, likely because milk production gradually rises from the first parity onward and peaks at the fourth parity. As milk production increases, udder immunity decreases, and the diameter of the teat canal widens, with a loosening of the sphincter. This makes it easier for environmental pathogens to enter and proliferate due to the decreased udder immunity (Tufani et al. 2021).

Season

The season-wise distribution of mastitis cases showed that the majority of resistant mastitis cases (35.23%, 62/176) were observed during the rainy season, while the majority of non-resistant mastitis cases (38.65%, 34/88) were observed during the summer season. The post-monsoon season had the lowest prevalence, with 14.20% (25/176) and 17.05% (15/88) in resistant and non-resistant mastitis groups, respectively.

Number of Quarters Affected

The distribution of mastitis cases based on the number of quarters affected revealed that the majority of cases were observed in one quarter, with 64.77% (114/176) and 54.55% (48/88) in resistant and non-resistant mastitis groups, respectively. Two quarters were affected in 22.73% (40/176) and 28.41% (25/88) of cases, three quarters in 9.09% (16/176) and 9.09% (8/88) of cases and four quarters in 3.41% (6/176) and 7.95% (7/88) of cases. Vipul et al. (2020) reported that the maximum number of subclinical mastitis cows had only single quarter infection (51.02 %) followed by two

quarters (21.43 %), three quarters (16.33 %) and all four quarters (11.22 %).

Treated vs untreated cows

The distribution of mastitis in cows based on medication showed that the majority of cases were treated, with 71.59% (126/176) and 76.14% (67/88) in resistant and non-resistant mastitis groups, respectively. Untreated cases accounted for 28.41% (50/176) and 23.86% (21/88) of resistant and non-resistant mastitis cases, respectively.

Month of Lactation

The distribution of mastitis cases based on the month of lactation revealed that the majority of cases were observed during the first 3 months of lactation, with 62.50% (110/176) and 62.50% (55/88) in resistant and non-resistant mastitis groups, respectively. The 4–5-month lactation period had 21.02% (37/176) and 19.32% (17/

88) of cases, and the 6–10-month lactation period had 16.48% (29/176) and 18.18% (16/88) of cases. The prevalence of mastitis decreased as the month of lactation increased.

Month-wise

The month-wise distribution of mastitis cases showed (Fig.3) that the majority of resistant mastitis cases (42.61%, 75/176) occurred between May and August, followed by September to December (34.09%, 60/176), and January to April (23.30%, 41/176). In contrast, non-resistant mastitis cases were more evenly distributed, with the highest frequency between May and August (36.36%, 32/88), followed by January to April (35.23%, 31/88) and September to December (28.41%, 25/88).

Position of quarters

The position of quarters affected by mastitis in cows showed varying frequencies. In resistant mastitis cases, the most

Table 1: Prevalence of mastitis in cows (n=264)

Parameters	Resistant Mastitis (n=176)		Non-Resistant Mastitis (n=88)	
	Number	Percentage	Number	Percentage
Age (years)				
	3-4	55	34	38.64
	5-6	97	45	51.14
	>6	24	9	10.23
Breed				
	Jersey crossbred	150	71	80.68
	Holstein Friesian crossbred	26	17	19.32
Parity				
	1-3	70	43	48.86
	4-5	91	40	45.45
	6-10	15	5	5.68
Season				
	Summer	49	34	38.65
	Winter	40	16	18.18
	Rainy	62	23	26.14
	Post monsoon	25	15	17.05
No. of quarters affected				
	One	114	48	54.55
	Two	40	25	28.41
	Three	16	8	9.09
	Four	6	7	7.95
Treated and Untreated Cases				
	Treated	126	67	76.14
	Untreated	50	21	23.86
Month of Lactation				
	1-3 months	110	55	62.50
	4-5 months	37	17	19.32
	6-10 months	29	29	18.18

Fig 1. Prevalence of mastitis (n=264)

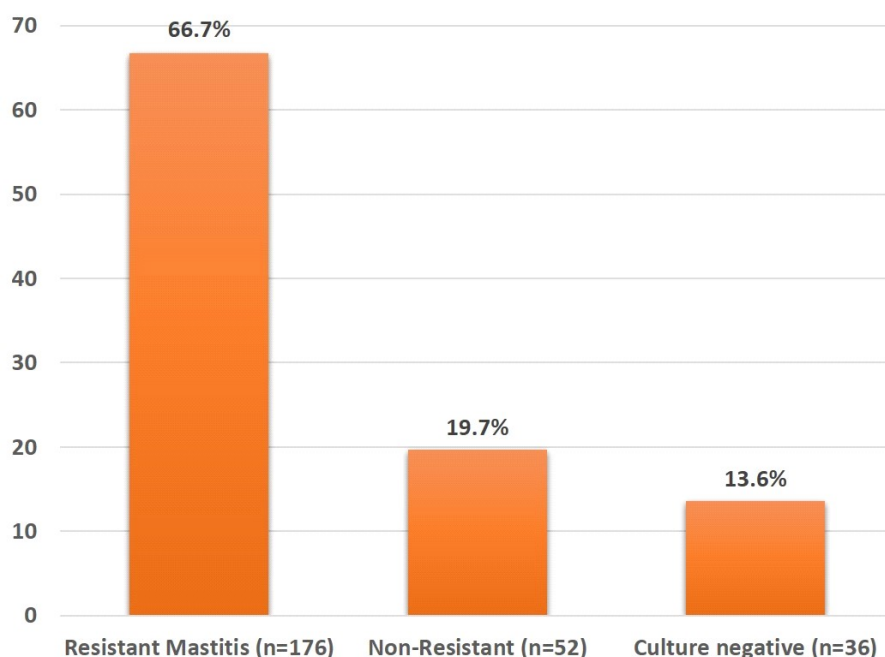


Table 2 Mean ± SE of Haematology values of healthy and mastitis-affected cows

Parameters	Group I (n=47)	Group II A (n=43)	Group II B (n=43)	Group II C (n=43)	Group II D (n=47)	P -value
Hb (g/dl)	8.78 ^a ± 0.12	7.42 ^b ± 0.19	7.10 ^b ± 0.16	7.26 ^b ± 0.20	6.94 ^b ± 0.22	<0.001
PCV %	26.18 ^a ± 0.39	22.14 ^b ± 0.33	22.35 ^b ± 0.49	22.07 ^b ± 0.50	22.27 ^b ± 0.47	<0.001
RBC (10 ⁶ /ul)	5.07 ^a ± 0.14	4.09 ^b ± 0.17	4.16 ^b ± 0.12	3.99 ^b ± 0.15	4.13 ^b ± 0.17	<0.001
WBC (10 ³ /ul)	7.53 ^a ± 0.23	13.06 ^b ± 0.60	14.63 ^b ± 0.97	14.05 ^b ± 0.85	13.68 ^b ± 0.71	<0.001
PLT (10 ⁵ /ul)	3.48 ± 1.67	3.14 ± 1.60	3.19 ± 2.08	3.51 ± 1.89	3.04 ± 1.15	0.188
Neutrophils (%)	44.09 ^a ± 0.64	70.75 ^b ± 1.08	72.29 ^b ± 1.29	68.96 ^b ± 1.11	71.52 ^b ± 1.35	<0.001
Lymphocytes (%)	48.62 ^a ± 0.76	22.78 ^b ± 1.18	21.81 ^b ± 1.18	24.00 ^b ± 1.24	24.14 ^b ± 1.77	<0.001
Monocytes (%)	4.27 ± 0.36	4.01 ± 0.38	4.25 ± 0.44	3.76 ± 0.34	3.83 ± 0.31	0.813
Eosinophils %	1.82 ± 0.31	1.78 ± 0.32	1.50 ± 0.30	1.97 ± 0.34	1.53 ± 0.21	0.788
Basophils (%)	1.41 ^a ± 0.26	0.79 ^b ± 0.18	0.42 ^b ± 0.08	0.64 ^b ± 0.09	0.48 ^b ± 0.06	<0.001

Means with atleast one common superscript within classes don't differ significantly (p>0.05). Hb – Haemoglobin, PCV – Packed cell volume, RBC – Red blood cell, WBC – White blood cells, PLT – Platelet

commonly affected quarter was the Left Front (LF), accounting for 36.93% of cases, followed by multiple quarter involvements such as LF-LH (13.64%) and LF-LH-RF-RH (15.34%). Similarly, in non-resistant mastitis cases, LF was the most frequently affected quarter, with 30.68% of cases, followed by LF-LH (14.77%) and LF-LH-RF-RH (7.95%).

The findings on quarter susceptibility to mastitis are varied, with some studies suggesting that front quarters are more prone to mastitis due to greater exposure to bacterial pathogens and increased susceptibility to injury (Patel and Trivedi, 2015). However, others report contrasting results, with some finding hindquarters more affected, particularly right hindquarters, possibly due to anatomical location and fecal pollution (Vipul et al. 2020; Sandeep et al. 2024). These differences may be attributed to factors like management practices, breed, and stage of lactation,

highlighting the need for further research to understand these dynamics and develop targeted prevention strategies.

Haematology

The mean values of haematology results of healthy and mastitis-affected cows are given in Table 2. Mastitis-affected cows exhibited significant haematological alterations compared to healthy cows (Group I). Notably, reductions in haemoglobin levels were observed in Group II A (7.4 g/dl), Group II B (7.1 g/dl), Group II C (7.2 g/dl), and Group II D (6.9 g/dl) compared to Group I (8.8 g/dl). Similarly, packed cell volume (PCV) was lower in Group II A (22.1%), Group II B (22.4%), Group II C (22.1%) and Group II D (22.3%) than in Group I (26.1%).

The mastitis-affected groups also showed significant changes in leukocyte counts, with elevated white blood cell (WBC) counts in Group II A (13.1 x 10³/μl), Group II B (14.6 x 10³/μl), Group II C

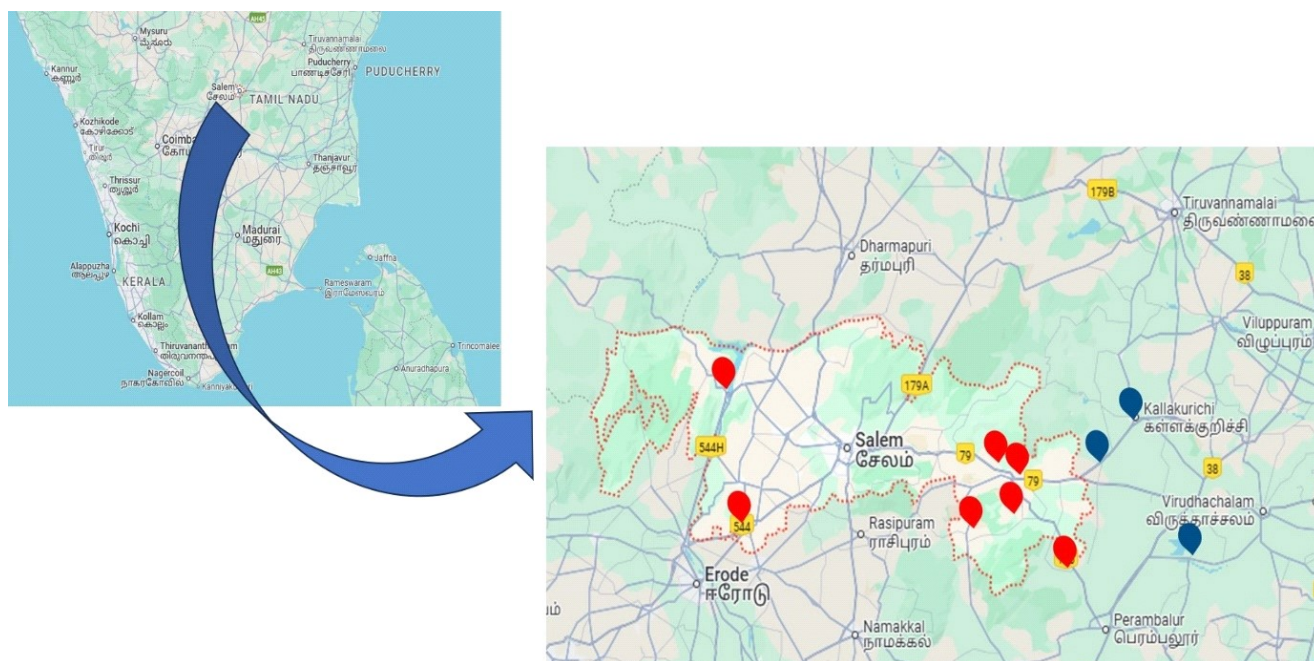


Fig 2. Map of the Salem district (situated between 7.91°N and 13.64°N latitude and 76.16°E and 80.81°E longitude), and the nearby districts in the Tamil Nadu region, India. This region comprises 14 taluks, of which 7 taluks are marked with red dots and 3 nearby regions are marked with blue dots, indicating recorded cases of mastitis. (Courtesy - Google Maps).

($14.1 \times 10^3/\mu\text{l}$), and Group II D ($13.7 \times 10^3/\mu\text{l}$) compared to Group I ($7.5 \times 10^3/\mu\text{l}$). Neutrophils were also elevated in these groups (68.9-75.1%) compared to Group I (44.1%). Conversely, lymphocyte counts were lower in Group II A (22.9%), Group II B (21.8%), Group II C (24%) and Group II D (24.1%) than in Group I (48.6%).

Recruitment of neutrophils into the mammary gland and neutrophil function are altered in the periparturient period, which may also contribute to the occurrence of mastitis in early-lactation cows (Weiss, 2010; LeBlanc, 2020). Acute inflammation is generally accompanied by leukocytosis, rather than leukopenia. In the present study, neutrophilia was due to inflammation of the udder tissue and not due to stress. With acute mastitis, large numbers of segmented neutrophils are moved from the circulation into the infected mammary tissue, causing leukopenia. Braun et al. (2021) reported that the leukocyte count and particularly the segmented neutrophil count were lower in the acute mastitis-affected cows that were examined on the first day of disease compared with cows that were referred and sampled at a later stage of illness or when the cases worsened. Braun et al. (2021) also reported that cows with acute mastitis caused by Gram-negative and Gram-positive bacteria did not differ significantly in total leukocyte, segmented and band neutrophil, monocyte and lymphocyte counts.

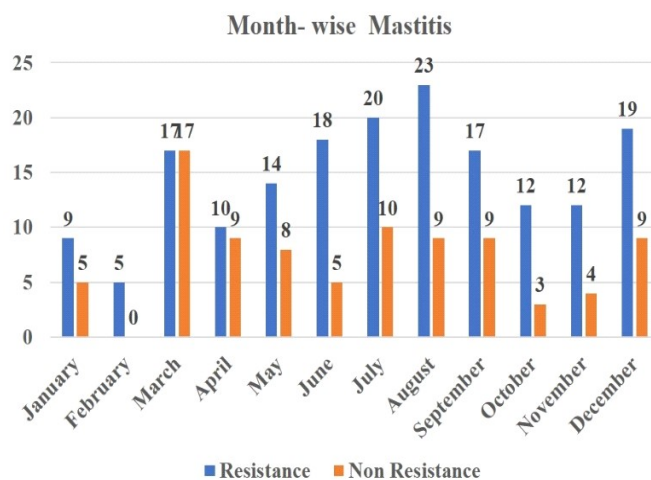
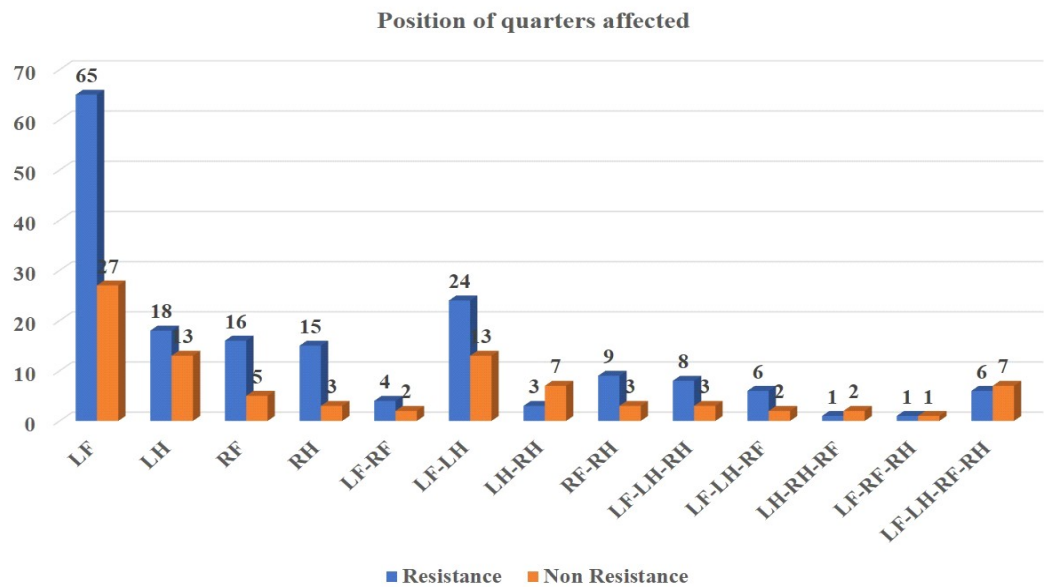


Fig. 3. Month-wise prevalence of resistance mastitis

The mean values of haematology results of pre- and post-treatment of mastitis-affected cows are given in Table 3. After treatment, mastitis-affected cows showed significant improvements in various hematological parameters. Notably, RBC count increased significantly in Group II A (from 5.2 ± 0.2 to $6.1 \pm 0.3 \times 10^6/\mu\text{L}$, $p < 0.01$), Group II C (from 5.1 ± 0.2 to $6.0 \pm 0.3 \times 10^6/\mu\text{L}$, $p < 0.01$) and Group II D (from 5.0 ± 0.2 to $6.2 \pm 0.3 \times 10^6/\mu\text{L}$, $p < 0.01$), while Group II B showed a significant elevation (from 5.3

Fig. 4. Position quarters affected in resistance mastitis



± 0.2 to 5.8 ± 0.3 × 10⁶/μL, p<0.05). PCV values increased highly significantly in Group II A (from 22.1 ± 0.5 to 25.4 ± 0.6%, p<0.01) and Group II D (from 22.3 ± 0.5 to 26.1 ± 0.6%, p<0.01) and significantly in Group II B (from 22.4 ± 0.5 to 24.5 ± 0.6%, p<0.05) and Group II C (from 22.1 ± 0.5 to 24.8 ± 0.6%, p<0.05). WBC count showed an overall highly significant improvement (p<0.01). Differential leukocyte counts also improved, with highly significant increases in neutrophils, lymphocytes, and basophils (p<0.01) across all groups. Monocyte counts increased significantly in Group II A, Group II C and Group II D (p<0.01) and significantly in Group II B (p<0.05). Eosinophil counts showed highly significant improvements in Group II A and Group II D (p<0.01) and significant increases in Group II B and Group IIC (p<0.05). However, haemoglobin and platelet values did not show significant changes (p>0.05).

Serum Biochemistry

The mean values of serum biochemistry are given in Table 4. Mastitis-affected cows exhibited significant biochemical changes compared to healthy cows. Notably, AST levels were significantly (p<0.01) elevated in Group II A (144.9 ± 7.1 U/L), Group II B (145.8 ± 7.4 U/L), Group II C (146.2 ± 6.7 U/L) and Group II D (149.6 ± 7.5 U/L) compared to healthy cows (80.3 ± 2.3 U/L). Similarly, glucose levels were highly significantly (p<0.01) increased in Group II A (80.7 ± 4.9 mg/dl), Group II B (86.4 ± 6.0 mg/dl), Group II C (86.7 ± 5.0 mg/dl) and Group II D (82.3 ± 5.0 mg/dl) compared to healthy cows (56.7 ± 2.1 mg/dl). Conversely, calcium levels were highly significantly (p<0.01) reduced in Group II A (6.7 ± 0.5 mg/dl), Group II B (6.5 ± 0.2 mg/dl), Group II C (6.7 ± 0.3 mg/dl) and Group II D (6.5 ± 0.2 mg/dl) compared to healthy cows (12.2 ± 0.4 mg/dl). However, no significant differences were observed in total protein, albumin, globulin, ALP, BUN, creatinine, phosphorus,

magnesium, sodium, potassium, and chloride levels between mastitis-affected and healthy cows.

The mean values of serum biochemistry of mastitis-affected cows pre- and post-treatment are given in Table 5. After treatment, mastitis-affected cows showed significant biochemical changes. Notably, AST values were significantly reduced (p<0.01) across all groups. Calcium values were highly significantly elevated (p<0.01) in all groups post-treatment. Post-treatment showed a highly significant reduction in Group II C (p<0.01) and significant reductions in Group II A, Group II B, and Group II D (p<0.05). However, no significant differences were observed in total protein, albumin, globulin, ALP, BUN, creatinine, phosphorus, magnesium, sodium, potassium and chloride levels post-treatment (p>0.05). These findings agree with the previous reports Sawsan et al. (2017) reported that a significant decrease in serum ALT level, calcium level in mastitis cows compared to healthy cows. They also reported that no significant difference in total protein or protein fractions. Shimaa et al. (2022) reported that a significant increase in catalase and total protein was associated with a significant decrease in Ca level recorded in subclinical mastitis cows compared with healthy counterparts. Akkuş et al. (2023) reported that the glucose and total cholesterol were significantly higher in four quarters affected by subclinical mastitis cows than in other quarters affected by cows.

The AST and ALT activities were significantly different in subclinical mastitis cows as the number of infected quarters increased. With the increase in the number of infected quarters, the activities of liver enzyme parameters increased significantly (Akkuş et al. 2023). Activities of AST and ALT enzymes increase with the elevation in CMT score (Qayyum et al. 2018). The results of the present study are consistent with above previous

Table 3 Mean ± SE of Haematological values of mastitis-affected cows before and after treatment

Parameters	Group II A (n=39)		Group II B (n=18)		Group II C (n=29)		Group II D (n=35)		P - value
	Before	After	Before	After	Before	After	Before	After	
Hb (g/dl)	7.39 ± 0.21	7.41 ± 0.24	7.11 ± 0.21	7.62 ± 0.43	7.46 ± 0.24	7.32 ± 0.28	7.21 ± 0.25	7.41 ± 0.07	0.603
PCV %	22.05 ± 0.35	26.03 ± 0.91	22.50 ± 0.76	26.51 ± 1.27	22.23 ± 0.57	26.36 ± 0.90	22.15 ± 0.57	26.80 ± 0.74	<0.001
RBC (10 ⁹ /ul)	4.23 ± 0.17	5.22 ± 0.14	4.26 ± 0.177	5.33 ± 0.31	3.82 ± 0.18	5.44 ± 0.23	4.01 ± 0.19	5.42 ± 1.88	<0.001
WBC (10 ³ /ul)	12.87 ± 0.65	8.43 ± 0.34	14.67 ± 1.09	8.48 ± 0.59	14.42 ± 1	8.38 ± 0.41	14.04 ± 0.81	8.15 ± 0.38	<0.001
PLT (10 ⁹ /ul)	315.36 ± 16.53	346.28 ± 23.15	307.17 ± 36.29	413.22 ± 33.64	356.93 ± 25.75	404.24 ± 28.37	316.77 ± 11.63	374.69 ± 22.09	0.038
N (%)	70.96 ± 1.15	14.16 ± 1.00	72.76 ± 1.95	14.56 ± 1.63	68.80 ± 1.33	12.51 ± 1.22	71.54 ± 1.65	14.21 ± 1.08	<0.001
L (%)	22.51 ± 1.25	60.97 ± 4.31	21.40 ± 1.63	21.40 ± 1.63	24.71 ± 1.52	67.44 ± 3.60	24.74 ± 2.25	64.02 ± 4.09	<0.001
M (%)	3.93 ± 0.41	10.89 ± 1.20	4.13 ± 0.71	10.26 ± 2.01	3.26 ± 0.42	10.85 ± 1.47	3.66 ± 0.32	10.42 ± 1.34	<0.001
E %	1.88 ± 0.35	3.97 ± 0.41	1.3 ± 0.3	1.29 ± 0.33	1.90 ± 0.44	4.31 ± 0.56	1.56 ± 0.26	3.92 ± 0.45	<0.001
B (%)	0.84 ± 0.2	2.81 ± 0.27	0.43 ± 0.18	2.66 ± 0.39	0.69 ± 0.11	2.78 ± 0.34	0.53 ± 0.08	2.69 ± 0.29	<0.001

Where, P<0.05 – Significant, P<0.01 – Highly Significant, P>0.05 - Not significant; Hb – Haemoglobin, PCV – packed cell volume, RBC – Red blood cell, WBC – White blood cells, PLT – Platelet, N – Neutrophils, L - Lymphocytes, M - Monocytes, E - Eosinophils, B – Basophils.

Table 4 Mean ± SE of serum biochemical values of healthy and mastitis-affected cows

Parameters	Group I (n=47)	Group II A (n=43)	Group II B (n=43)	Group II C (n=43)	Group II D (n=47)	P - value
Total Protein (g/dl)	6.68 ± 0.12	6.75 ± 0.22	6.66 ± 0.10	6.59 ± 0.25	6.78 ± 0.15	0.950
Albumin (g/dl)	3.34 ± 0.09	3.48 ± 0.07	3.30 ± 0.08	3.41 ± 0.08	3.32 ± 0.06	0.487
Globulin (g/dl)	3.34 ± 0.10	3.55 ± 0.12	3.35 ± 0.11	3.45 ± 0.14	3.46 ± 0.12	0.762
AST (U/L)	80.29 ± 2.35	144.99 ± 7.05	145.88 ± 7.44	146.27 ± 6.72	149.61 ± 7.54	<0.001
ALP (U/L)	92.89 ± 5.54	97.47 ± 13.14	87.33 ± 7.06	95.22 ± 6.84	95.09 ± 9.89	0.940
BUN (mg/dl)	10.47 ± 0.84	10.47 ± 0.75	10.33 ± 0.83	10.79 ± 0.76	10.14 ± 0.68	0.984
Creatinine (mg/dl)	0.97 ± 0.28	0.86 ± 0.03	0.88 ± 0.06	0.87 ± 0.07	0.83 ± 0.03	0.377
Calcium (mg/dl)	12.17 ± 0.38	6.68 ± 0.47	6.54 ± 0.16	6.67 ± 0.27	6.49 ± 0.21	<0.001
Phosphorus (mg/dl)	6.84 ± 0.19	6.28 ± 0.27	6.28 ± 0.25	6.38 ± 0.25	6.73 ± 0.28	0.351
Magnesium (mg/dl)	5.28 ± 0.49	5.48 ± 0.36	5.0 ± 0.16	5.08 ± 0.15	4.91 ± 0.10	0.685
Glucose (mg/dl)	56.72 ± 2.06	80.74 ± 4.96	86.49 ± 6.00	86.70 ± 5.02	82.28 ± 4.5	<0.001
Na (mEq/L)	144.37 ± 0.80	144.17 ± 0.66	145.78 ± 0.73	143.08 ± 1.15	144.80 ± 0.76	0.263
K (mEq/L)	4.37 ± 0.04	4.48 ± 0.05	4.48 ± 0.05	4.46 ± 0.05	4.53 ± 0.06	0.29
Cl (mEq/L)	99.70 ± 2.05	97.02 ± 3.01	93.03 ± 4.12	95.27 ± 3.64	93.61 ± 3.78	0.621

Means with atleast one common superscript within classes don't differ significantly (p>0.05). Na – Sodium, K – Potassium, Cl – Chloride

Table 5 Mean ± SE of Serum biochemical values of mastitis-affected cows before and after treatment

Parameters	Group II A (n=39)		Group II B (n=18)		Group II C (n=29)		Group II D (n=35)	
	Before	After	Before	After	Before	After	Before	After
Total Protein (g/dl)	6.81±0.24	6.81 ± 0.09	6.63±0.19	6.88 ± 0.61	6.54±0.33	6.60±0.25	6.90 ± 0.18	6.82 ± 0.11
Albumin (g/dl)	3.51±0.07	3.41±0.04	3.28±0.14	3.41±0.05	3.45±0.10	3.42±0.06	3.34±0.08	3.44±0.04
Globulin (g/dl)	3.60±0.13	3.39±0.11	3.34±0.21	3.46±0.15	3.47±0.18	3.42±0.12	3.56±0.14	3.38±0.12
AST (U/L)	145.07±7.66	47.97±5.46	149.60±9.71	49.26±7.95	146.97±8.33	54.25±5.83	152.01±6.93	52.48±5.86
ALP (U/L)	95.42±13.85	54.72±6.08	87.07±10.74	53.78±8.65	88.71±8.01	67.48±9.48	95.01±11.41	57.63±6.60
BUN (mg/dl)	10.24±0.79	10.43±0.64	10.44±1.05	10.26±1.10	11.27±0.96	11.11±0.82	10.37±0.78	10.58±0.74
Creatinine (mg/dl)	0.86±0.03	0.73±0.03	0.82±0.04	0.77 ± 0.07	0.83±0.04	0.75±0.04	0.87±0.03	0.75±0.04
Calcium (mg/dl)	6.50±0.48	16.11±0.63	6.72±0.3	15.7±0.9	6.77±0.33	16.04±0.59	6.45±0.25	16.45±0.56
Phosphorus (mg/dl)	6.24±0.30	6.51±0.19	6.11±0.34	6.50±0.32	6.47±0.3	6.6±0.30	6.80±0.03	6.63±0.20
Magnesium (mg/dl)	5.59±0.40	3.58±0.16	4.55±0.14	3.48±0.17	4.98±0.16	3.81±0.26	5.01±0.11	3.53±0.17
Glucose (mg/dl)	78.26±5.01	62.00±2.22	86.17±9.00	62.56 ± 3.38	92.79±5.90	61.86±2.11	82.26±5.28	63.06 ± 2.27
Na (mEq/L)	144.16±0.68	143.84±0.60	144.38±1.16	143.33±0.91	142.72±1.57	144.24±0.82	145.29±0.96	143.86±0.71
K (mEq/L)	4.49±0.05	4.32±0.03	4.42±0.08	4.34±0.04	4.46±0.08	4.36±0.05	4.53±0.06	4.33±0.03
Cl (mEq/L)	96.59±3.31	101.22±0.86	90.17±6.88	100.21±1.19	95.35±4.43	101.57±0.96	90.83±4.98	101.10±0.88

Where, P<0.05 – Significant, P<0.01 – Highly Significant, P>0.05 - Not significant; Na – Sodium, K – Potassium, Cl – Chloride

published literature, suggesting that the liver metabolic load may have increased due to the number of affected quarters.

Conclusions

This study found a 13.17% prevalence of clinical mastitis in dairy cows, with higher rates in Jersey crossbreds (85.23%), cows with parity 4-5 (51.70%), and during the rainy season (35.23%). The Left front quarter was most affected (36.93%) and most cases occurred in the first 3 months of lactation (62.50%). Significant haematological and biochemical changes were observed, improving after treatment. In conclusion, knowing the prevalence of mastitis and variations in haematology and serum biochemistry helps in strategic planning of the prevention and treatment of mastitis in dairy cows with resistant mastitis.

Acknowledgment

All authors are thankful to the Dean, Veterinary College and Research Institute, Salem, Tamil Nadu, TANUVAS – 636 112, for providing facilities to carry out this study.

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