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PREVALENCE AND AETIOLOGICAL PROFILE OF CLINICAL MASTITIS IN BUFFALOES: A HOSPITAL-BASED EPIDEMIOLOGICAL STUDY

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ABSTRACT:

An epidemiological investigation was carried out from March 2022 to February 2023 to determine the prevalence and aetiological pattern of clinical mastitis in buffaloes presenting to the Veterinary Clinical Complex, College of Veterinary and Animal Sciences, Udgir, Dist. Latur, Maharashtra. A total of 539 lactating buffaloes were screened, of which 88 were found positive for clinical mastitis, yielding an overall prevalence of 16.33%. The highest seasonal occurrence was recorded during the winter season (35.23%). Breed-wise analysis showed that Murrah cross buffaloes were the most susceptible (73.33%), followed by Jafrabadi (66.67%), Graded Murrah (44.26%), and Marathwadi (8.45%). The 3-5 year age group had the greatest prevalence (23.83%), whilst the first lactation accounted for the highest incidence (38.14%). Early lactation exhibited the most pronounced susceptibility (93.18%). Hind quarters were more frequently involved (50.00%) than fore quarters (40.34%). Gram-negative rods consistent with *E. coli* were the predominant bacterial isolates (44.58%), followed by *Staphylococcus* spp. (36.14%). Bacteria accounted for 93.98% of all confirmed cases. Yeast was detected in 3.61% of cases, and 2.41% of samples yielded no growth. The findings highlight the multifactorial nature of bubaline clinical mastitis and reinforce the need for breed-sensitive management strategies and targeted surveillance programmes.

Keywords:- Buffalo, bubaline mastitis, clinical mastitis, epidemiology, mammary gland, Marathwada

INTRODUCTION :

India is home to the world's largest buffalo population, with 109.85 million animals constituting approximately 20.47% of the country's total livestock of 536.76 million (20th Livestock Census, 2019). Buffaloes are indispensable to the national dairy economy, contributing nearly 55% of the total milk produced in the country. Any condition that adversely affects the mammary gland, therefore, has direct and far-reaching implications for productivity, farmer livelihoods, and the broader dairy industry.

Mastitis, an inflammatory condition of the mammary gland, is recognised as the most economically consequential disease of dairy animals worldwide. Its impact extends well beyond the immediate episode: affected animals experience reduced milk output, deteriorated milk quality, elevated somatic cell counts, and, in severe cases, permanent loss of quarter function. The disease imposes substantial costs through antibiotic expenditure, discarded milk, elevated culling rates, and public health concerns arising from antimicrobial residues (Kossaibati and Esslemont, 1997; Kurjogi and Kaliwal, 2011; Blosser, 1979). In India specifically, a study in Odisha found that each clinical mastitis episode resulted in a total milk loss of 130.05 litres per animal, translating to a financial loss of approximately ₹7,824/-, of which 88.42% was attributable to reduced yield and 11.57% to discarded milk (Das et al., 2018).

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Based on the nature and intensity of the inflammatory response, bovine and bubaline mastitis may be classified as per-acute, acute, sub-acute, subclinical, or chronic. Contagious pathogens such as *Staphylococcus aureus* and *Streptococcus agalactiae*, together with environmental organisms including coliforms, *Streptococcus uberis*, and yeasts, represent the primary aetiological spectrum (Fagiolo and Lai, 2007). A meta-analysis of 17 Indian studies encompassing 17,873 crossbred cows estimated the pooled prevalence of clinical mastitis at 16.08% (95% CI: 11.69-21.72) on a cow basis (Bangar et al., 2016), and the pooled prevalence of *Staphylococcus* spp., *Streptococcus* spp., and *Escherichia coli* was reported at 45%, 13%, and 14%, respectively (Krishnamoorthy et al., 2017). Despite this breadth of data for crossbred cattle, systematic studies specifically profiling bubaline clinical mastitis in the Marathwada region of Maharashtra remain limited. The present study was, therefore, undertaken to determine the prevalence of clinical mastitis in buffaloes attending the Veterinary Clinical Complex, Udgir, and to characterise its distribution across district, season, breed, age, lactation number, stage of lactation, and udder quarter, along with a broad aetiological identification of the causative organisms.

MATERIAL & METHODS

This prospective, hospital-based observational study was conducted over a period of 12 months, from March 2022 to February 2023, at the Veterinary Clinical Complex, College of Veterinary and Animal Sciences, Udgir, District Latur, Maharashtra. Buffaloes brought for treatment on the basis of clinical signs consistent with mastitis including swelling and heat of one or more quarters, abnormal milk, and pain on palpation were included in the study. Whilst the animals were referred primarily from Latur, Nanded, Parbhani, and Bidar districts, cases from Beed and Osmanabad were also screened.

A total of 539 lactating buffaloes were examined, and 88 were confirmed as clinical mastitis cases. Each animal was assessed and categorised according to the following variables: district of origin, season of presentation, breed, age group (3-5 years, 6-8 years, 9-11 years, and over 11 years), number of lactations (1st through 8th, and dry animals), stage of lactation (early: 0-4 months; mid: 4-8 months; late: over 8 months), and the udder quarter(s) involved (right fore, right hind, left fore, and left hind). The seasons were defined as monsoon (June-September), post-monsoon (October-November), winter (December-February), and summer (March-May).

Bacterial Detection

Milk samples collected aseptically from affected quarters were inoculated in loopful quantities onto Brain Heart Infusion (BHI) Agar and incubated aerobically at 37°C for 18-24 hours. Following incubation, discrete colonies were subcultured, and thin smears were prepared and stained by Gram's method for microscopic evaluation. In instances where BHI Agar yielded no visible growth, the samples were further inoculated onto Corn Meal Agar to facilitate detection of yeast. Isolates were provisionally identified on the basis of colony morphology, Gram-staining characteristics, and microscopic appearance.

RESULTS AND DISCUSSION

The findings pertaining to the distribution of clinical mastitis across district, season, breed, age group, lactation number, stage of lactation, and udder quarter are summarised in Table 1; the distribution of quarters affected in Table 2; and the broad aetiological classification in Table 3.

District-wise Prevalence

The highest absolute number of clinical mastitis cases was recorded in Latur district (51 of 345 screened; 14.78%), reflecting the fact that this

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district contributed the largest proportion of animals to the study. In terms of case prevalence within each district, Bidar recorded the highest rate (24.00%), followed by Parbhani (22.22%), Nanded (18.25%), and Latur (14.78%). No clinical mastitis cases were encountered among animals from Beed and Osmanabad districts. The overall prevalence of 16.33% observed in the present study is broadly consistent with the 12%, 13.6%, and 18.17% prevalence figures reported by Ali *et al.* (2015), Ali *et al.* (2014), and Charaya *et al.* (2018), respectively, for buffaloes in other parts of the Indian subcontinent. Higher prevalence values reported by Dhakal *et al.* (2007) (93.52%), Baloch *et al.* (2018) (39.95%), and Singh *et al.* (2018) (52.33%), as well as lower figures from Farooq *et al.* (2008) (9.32%), Sharma *et al.* (2018) (9.38%), and Patbandha *et al.* (2016) (4.6%), reflect the considerable influence of geography, management systems, and study design on reported rates.

Seasonal Distribution

Clinical mastitis was most commonly recorded during the winter season, with 31 cases representing 35.23% of all positive animals. Monsoon (27.27%), post-monsoon (22.73%), and summer (14.77%) followed in decreasing order. The predisposition during winter aligns with observations by Jingar *et al.* (2014) and may be related to cold stress operating under typical loose-housing management conditions, where declining ambient temperature and low Temperature Humidity Index (THI) during nights may compromise local teat-end defence mechanisms and broader systemic immunity (Singh et al., 2021). By contrast, Dhakal *et al.* (2007) and Bhanot *et al.* (2012) identified summer and monsoon, respectively, as peak seasons, attributing these patterns to teat soiling from muddy floors and increased fly burdens, these factors less pronounced under Marathwada's dry, semi-arid winter conditions.

Breed-wise Prevalence

Breed was a significant determinant of mastitis occurrence. Murrah cross buffaloes exhibited the highest prevalence (73.33%), followed by Jafrabadi (66.67%), Graded Murrah (44.26%), and Marathwadi buffaloes (8.45%). No cases were recorded in Nagpuri or Pandharpuri animals, though sample sizes for these breeds were very small. These data are consistent with earlier reports by Dhakal *et al.* (2007), who documented a 93.52% prevalence in Murrah crosses, and with the observation of Sentitula *et al.* (2012) reporting 48.72% in Murrah buffaloes. The finding of a positive relationship between milk yield and susceptibility to mastitis, wherein high-yielding exotic and crossbred animals face greater risk, which has been well established, and is supported by Srinivasan *et al.* (2013) and Constable *et al.* (2017). Indigenous Marathwadi buffaloes, which are considerably lower yielders, appear to be substantially more resistant under the same management conditions.

Age-wise and Lactation-wise Prevalence

The youngest age group (3-5 years) contributed the largest proportion of clinical mastitis cases (23.83%), with declining prevalence in the 6-8 year (12.23%) and 9-11 year (12.50%) groups. Animals over 11 years of age were unaffected. When viewed alongside lactation data, the pattern becomes clearer: the first lactation recorded the highest prevalence (38.14%), with a generally declining trend thereafter, barring a secondary rise at the third lactation (20.00%). These observations accord with earlier reports by Dhakal *et al.* (2007), who found the highest mastitis frequency (51.60%) at first calving, and by Bhanot *et al.* (2012) and Charaya *et al.* (2018), who documented a pronounced burden in the first two lactations. The plausible explanation is that subclinical intramammary infections, which are prevalent on farms during early reproductive life, may undergo conversion to overt clinical

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disease during the first few lactations. Additionally, Jaglan *et al.* (2022) noted that in some settings, higher parity was associated with increased risk owing to wider teat orifices and immunosuppression; this variability underscores that no single factor operates in isolation.

Two dry animals (1.41%) were diagnosed with clinical mastitis; both were in advanced pregnancy approaching term. It is probable that intramammary infections established during the preceding lactation persisted during the dry period and progressed to clinical expression as mammary secretions commenced in the periparturient phase, creating conditions conducive to bacterial proliferation.

Stage of Lactation

The stage of lactation exerted a striking influence on mastitis occurrence. Early lactation (0-4 months) accounted for 93.18% of all clinical mastitis cases, while mid and late lactation contributed only 2.27% each. Dry animals comprised the remaining 2.27%. This distribution is consistent with the findings of Ali *et al.* (2014). The physiological explanation is well established: the periparturient period is associated with immunosuppression, rapid escalation in milk secretion, exposure to diverse environmental pathogens at calving, and mobilisation of body reserves, all of which impair local and systemic defence mechanisms and render the mammary gland particularly vulnerable to colonisation by mastitis pathogens.

Table 1: Prevalence of clinical mastitis in buffaloes across various risk factors.

Sr. No.	Risk Factor	No. of Buffaloes Screened	Positive Buffaloes No.	Positive Buffaloes (%)	% of Positive Cases (n=88)
A. District					
1	Latur	345	51	14.78	57.95
2	Nanded	126	23	18.25	26.14
3	Bidar	50	12	24.00	13.64
4	Beed	6	0	0.00	0.00
5	Parbhani	9	2	22.22	2.27
6	Osmanabad	3	0	0.00	0.00
B. Season					
1	Monsoon	200	24	12.00	27.27
2	Post-monsoon	75	20	26.67	22.73
3	Winter	167	31	18.56	35.23
4	Summer	97	13	13.40	14.77
C. Breed					
1	Marathwadi	438	37	8.45	42.05
2	Murrah (Graded)	61	27	44.26	30.68
3	Murrah cross	30	22	73.33	25.00
4	Jafrabadi	3	2	66.67	2.27
5	Nagpuri	4	0	0.00	0.00
6	Pandharpuri	3	0	0.00	0.00
D. Age group					
1	3-5 years	193	46	23.83	52.27
2	6-8 years	319	39	12.23	44.32
3	9-11 years	24	3	12.50	3.41
4	> 11 years	3	0	0.00	0.00
E. Lactation number					
1	1st lactation	97	37	38.14	42.05
2	2nd lactation	93	12	12.90	13.64
3	3rd lactation	105	21	20.00	23.86
4	4th lactation	78	13	16.67	14.77
5	5th lactation	17	2	11.76	2.27

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6	6th lactation	6	1	16.67	1.14
7	8th lactation	1	0	0.00	0.00
8	Dry animals	142	2	1.41	2.27
F. Stage of lactation					
1	Early (0-4 months)	340	82	24.12	93.18
2	Mid (4-8 months)	42	2	4.76	2.27
3	Late (> 8 months)	15	2	13.33	2.27
4	Dry animals	142	2	1.41	2.27
G. Quarter-wise (n = 88 animals, 352 quarters)					
1	Right fore	88	31	35.22	19.50
2	Right hind	88	45	51.14	28.30
3	Left fore	88	40	45.45	25.16
4	Left hind	88	43	48.86	27.04

QUARTER-WISE DISTRIBUTION

Of the 352 quarters examined across 88 mastitic buffaloes, 159 exhibited involvement (45.17% overall quarter involvement rate). Hind quarters were collectively more affected (50.00%) than fore quarters (40.34%). Right hind quarters showed the highest individual prevalence (51.14%), followed by left hind (48.86%), left fore (45.45%), and right fore (35.22%). These findings are broadly comparable to those of Tariq *et al.* (2014) and Baloch *et al.* (2018). The greater vulnerability of hind quarters has been attributed to their anatomical proximity to faecal soiling, a higher milk secretory load, and potentially less effective evacuation during milking. Single-quarter involvement was the most common presentation (55.68%), followed by two quarters (22.72%), all four quarters (14.77%), and three quarters (6.81%), as presented in Table 2. The non-simultaneous pattern of quarter involvement has been attributed to variability in teat sphincter integrity, exposure of individual quarters to pathogens, and the immune status of each glandular compartment (Srinivasan et al., 2013; Braun et al., 2021).

Table 2: Quarter-wise number of quarters affected by clinical mastitis in buffaloes (n = 88).

Sr. No.	Quarters Affected	No. of Positive Cases	Percent Cases (%)
1	One quarter	49	55.68
2	Two quarters	20	22.72
3	Three quarters	6	6.81
4	Four quarters	13	14.77
Total		**88**	**100.00**

AETIOLOGICAL PROFILE

Microbiological findings from 83 quarters with available culture results are summarised in Table 3. Bacterial agents were identified in 78 cases (93.98%). Gram-negative short rods consistent with *E. coli* constituted the predominant isolate (44.58%), followed by *Staphylococcus* spp. (36.14%), mixed infections (7.23%), and *Streptococcus* spp. (6.02%). Yeast was detected in three of five samples that were negative on BHI Agar (3.61%), and two samples yielded no growth (2.41%). The predominance of *E. coli* is consistent with findings from the same geographical region reported by Awandkar *et al.* (2009), who identified *E. coli* as the leading causative organism. Being an environmental pathogen, *E. coli* is frequently introduced during milking or through contaminated housing, whereas *Staphylococcus* and *Streptococcus* species are primarily

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contagious, with the infected udder serving as their principal reservoir (Bhanot et al., 2012). The yeast prevalence of 3.61% accords with the 5.51% reported by Awandkar *et al.* (2021b), suggesting that fungal mastitis, though less common, is a recognised feature of the local aetiological landscape.

Table 3: Broad aetiological classification of clinical mastitis cases in buffaloes (n = 83).

Sr. No.	Aetiological Agent	No. of Cases	Cases (%)
1	*E. coli*	37	44.58
2	*Staphylococcus spp.*	30	36.14
3	Mixed infection	6	7.23
4	*Streptococcus spp.*	5	6.02
5	Yeast	3	3.61
6	No growth	2	2.41
Total		**83**	**100.00**

CONCLUSION

Clinical mastitis in buffaloes is a condition of significant economic and clinical relevance, adversely affecting milk yield, milk quality, and the market value of affected animals. In the present hospital-based study, an overall prevalence of 16.33% was recorded among buffaloes in the Marathwada region. The disease was most prevalent during the winter season, in Murrah cross and Jafrabadi breeds, in animals during their first lactation, and predominantly in the early stage of lactation (93.18%). Hind quarters exhibited greater susceptibility than fore quarters. Bacterial organisms, chiefly *E. coli* and *Staphylococcus* spp., accounted for 93.98% of aetiologically confirmed cases, with yeast detected in a further 3.61%. These findings highlight the multifactorial aetiology of bubaline clinical mastitis and point towards the importance of breed-specific management protocols, targeted surveillance in winter, and improved hygiene during the early lactation period as priority areas for intervention.

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