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PREVALENCE OF BOVINE MASTITIS IN DAIRY HERDS AND IMPACTS ON MILK QUALITY

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ABSTRACT

The present study reports the prevalence and impacts of bovine mastitis in dairy herds in the state of Minas Gerais.Mastitis, an infectious inflammation of the mammary gland, is predominantly triggered by pathogenic microorganisms of the genera Staphylococcus spp. and Streptococcus spp., with the subclinical form being the most prevalent. This asymptomatic manifestation, responsible for approximately 42.82% of the cases analyzed, constitutes a significant risk factor, since it causes an increase in the Somatic Cell Count (SCC) and compromises the quality and productivity of the milk. The epidemiological analysis showed seasonal variations in the incidence of the condition and a correlation between increases in SCC levels and inadequate management practices, such as reduced milking frequency and poor hygiene. The improvement of milking techniques and the continuous monitoring of herd health biomarkers are crucial to reduce the occurrence of mastitis, since the findings reinforce the relevance of adopting prophylactic measures and early interventions to ensure the economic sustainability of dairy farms, animal health and milk quality.

Keywords: Sanitary management. Zootechnical practices. Breast inflammation. Epidemiology of mastitis.

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INTRODUCTION

Bovine mastitis is one of the diseases with the greatest impact on dairy farming, causing substantial economic losses and compromising the quality of dairy production (Schvarz & Santos, 2018). According to Lopes et al. (2012), the multifactorial nature of this pathology requires a deeper understanding of its pathogenic mechanisms and its pathophysiological repercussions, allowing the implementation of more effective prevention and control protocols. Recognized as one of the main causes of losses in the milk production chain, mastitis not only reduces productivity, but also imposes additional costs with therapies and premature disposal of infected animals. In this context, the adoption of prophylactic measures becomes essential to ensure the health of the herd and the economic viability of dairy units (Rodrigues et al., 2018).

The etiopathogenesis of mastitis is mostly associated with the invasion of the mammary gland by opportunistic microorganisms, with bacteria being the main etiological agents, although fungi and viruses can also play a relevant role in the infection (Santos, 2016). The condition can be classified as clinical, when there is an evident manifestation of clinical signs, and subclinical, whose detection requires laboratory tests, highlighting the diagnostic complexity of this disease (Ribeiro, 2023). According to Lopes et al. (2011), the severity of mastitis can be categorized into different clinical forms: the hyperacute form, characterized by rapid progression and severe systemic manifestations, including intense pyrexia and prostration; the acute form, associated with severe mammary inflammation and impairment of the animal's general condition; the subacute form, which exhibits moderate abnormalities in milk secretion; the subclinical form, which, although asymptomatic, causes an increase in SCC and a reduction in milk production; and the chronic form, which can persist over multiple lactations, being identified by the persistent increase in SCC.

Epidemiological studies conducted in the northern region of Minas Gerais indicate high prevalence of subclinical mastitis. Research carried out in herds by the Agricultural Research Company of Minas Gerais (EPAMIG) revealed an average incidence of 42.82% of this form of the disease, with Staphylococcus spp. (57.17%) and Streptococcus spp. (18.75%) being the predominant pathogens (Morais et al., 2011). The disease causes substantial economic losses, including a reduction in milk production, whose severity is directly proportional to the degree of infection, as measured by the CMT (California Mastitis Test) (Brant & Figueiredo, 1994).

The diagnosis of subclinical mastitis can be made through microbiological tests, which identify the etiology of the infection and evaluate the resistance profile of pathogens to antimicrobials, helping in the most assertive therapeutic choice. The Somatic Cell Count

(SCC) is an essential diagnostic tool, widely used for epidemiological monitoring and sanitary control of the disease in herds (Rodrigues et al., 2018). The adoption of preventive measures and effective control strategies is imperative for maintaining breast health and milk quality (Brazil, 2023). In addition to direct losses, mastitis has implications for public health, as residues of antibiotics used in the treatment of the disease can remain in the milk and cause adverse reactions in consumers, in addition to favoring the development of antimicrobial-resistant microorganisms. Thus, it is imperative to improve management and milking practices, combined with diagnostic and therapeutic strategies based on scientific evidence (Brasil, 2023).

Strict biosecurity protocols, appropriate milking techniques, careful animal management, and early therapeutic interventions are key to reducing the incidence of the disease and mitigating its impacts on dairy production (Margatho, Freires Júnior & Brasil, 2019).

In the therapeutic context, bovine mastitis requires a careful clinical approach, considering the complexity of its clinical presentations (Moura, 2021).

The present study aims to analyze the prevalence of clinical and subclinical mastitis in six dairy farms located in the municipality of Montes Claros, northern region of Minas Gerais.

METHODOLOGY

The present study was conducted in six dairy farms located in the state of Minas Gerais, throughout 2023. The properties involved in the study are located in the municipalities of Francisco Sá, São Francisco, Itacarambi, Pedras de Maria da Cruz, Verdelândia and Capitão Enéas. The selection of these farms was based on criteria of representativeness of the dairy production systems in the region, covering herds with numbers of lactating cows ranging from 72 to 183 animals. The research had a cross-sectional observational design, with data collection carried out in the months of January, March, July, and August 2024. The choice of these periods aimed to contemplate possible seasonal variations in the occurrence of bovine mastitis. The data were obtained through technical visits to the properties, structured interviews with farm managers and review of zootechnical and veterinary records.

The mastitis cases were classified as clinical and subclinical. According to what was described by Morais et al. (2011), clinical mastitis was defined by the presence of evident inflammatory signs in the mammary gland, such as edema, pain, heat, and changes in the color and consistency of the milk. On the other hand, subclinical mastitis was identified in

asymptomatic cows, diagnosed by SCC in individual milk samples. For this analysis, milk samples were collected directly from the mammary quarter of each animal, which were sent to a specialized laboratory for quantification of SCC by flow cytometry. Epidemiological and productive data were organized in electronic spreadsheets for statistical analysis. The prevalence rate of clinical and subclinical mastitis was calculated monthly for each farm using the following formula:

$$\text{Prevalence (\%)} = \frac{\text{Number of mastitis cases}}{\text{Total number of lactating cows}}$$

To evaluate the influence of management and hygiene conditions on the occurrence of mastitis, information was collected on milking frequency, quality of pre- and post-milking hygiene, use of disinfectants, management of animal litter and history of previous mastitis treatments. The impact of mastitis on milk quality was evaluated indirectly through SCC. Values greater than 200,000 cells/mL were considered to indicate the presence of subclinical mastitis, while levels above 1,000,000 cells/mL were indicative of severe clinical mastitis. The chemical composition of the milk was also analyzed, including fat, protein and lactose contents, by means of infrared spectrophotometry.

The data obtained were submitted to descriptive statistical analyses to determine means, standard deviations and confidence intervals. To compare the prevalence of mastitis between different farms and periods of the year, chi-square and ANOVA tests were applied, according to the nature of the variables analyzed. The correlations between SCC, management, and mastitis incidence were evaluated using Pearson's correlation coefficient.

RESULTS AND DISCUSSIONS

The study revealed a high prevalence of bovine mastitis, with a predominance of the subclinical form. The data highlight the need for rigorous monitoring of herd health, since subclinical mastitis, although asymptomatic, can cause significant negative impacts on milk productivity and milk quality, reflected by the increase in SCC. This type of mastitis is associated with substantial production losses, as the inflammatory response of the mammary gland leads to an increase in SCC and a reduction in the microbiological quality of the milk.

Bovine mastitis is characterized as an inflammation of the mammary gland, usually of infectious origin, and is classified into two distinct clinical forms: clinical mastitis and subclinical mastitis. Clinical mastitis presents with visible signs, including edema, erythema, pain, and macroscopic changes in the milk, which may present lumps, blood, or watery consistency (Schvarz & Santos, 2018). The main pathogens involved include Staphylococcus aureus, Streptococcus uberis, and Escherichia coli, each with different pathogenicity mechanisms and host immune responses (Santos et al., 2019).

Table 1 - Subclinical and Clinical Mastitis Index in Six Farms in the North of Minas Gerais

Cidade	Nº de animais	% de animais com mastite clínica	% de animais com mastite subclínica
Francisco Sá	137	30,66	47,45
São Francisco	84	39,28	57,14
Itacarambi	92	59,78	63,05
Pedras de Maria da Cruz	147	24,58	14,96
Verdelândia	72	27,78	26,39
Capitão Enéas	183	24,04	38,80

Source: From the Authors

The analysis of SCC levels revealed a direct correlation between increased SCC and high prevalence of subclinical mastitis, confirming its negative influence on milk quality. Previous studies (Oliveira & Barbosa, 2021; Santos et al., 2019) indicate that farms with failures in hygienic management, low milking frequency, and sanitary deficiencies have a higher incidence of clinical mastitis. The findings reinforce bovine mastitis as one of the main causes of economic loss in dairy farming and highlight the need for control and prevention strategies. The high prevalence of the subclinical form suggests that many cases remain underdiagnosed, aggravating losses in milk production and quality (Schvarz & Santos, 2018).

The impact of subclinical mastitis on SCC highlights the relevance of good management practices, including strict hygiene habits during milking, continuous monitoring of herd health indicators, and adoption of preventive measures, such as the use of antibiograms to select effective antimicrobials in the treatment of infection (Rocha, Carvalho, & Rezende, 2020). Studies by Rodrigues et al. (2018) emphasize that the combination of proper hygiene, effective management, and early diagnosis of mastitis is essential to minimize the prevalence of the disease and ensure the sustainability of dairy activity. Therefore, efficient management of bovine mastitis is crucial to ensure milk quality

and the economic viability of farms. The present study reinforces the importance of implementing preventive measures, early diagnosis and appropriate treatment to reduce the impacts of mastitis on milk production.

The analysis of the data presented demonstrates the influence of local factors, such as management, environmental conditions, and milking practices, on the prevalence of clinical and subclinical mastitis, highlighting the need for personalized interventions based on regional particularities (Oliveira & Barbosa, 2021). The high incidence of clinical mastitis in Itacarambi (59.78%) and São Francisco (39.28%) is associated with management failures and inadequate infrastructure for milking, as reported in previous studies (Lima et al., 2020). On the other hand, Pedras de Maria da Cruz had the lowest prevalence of the disease (24.58%), suggesting a more efficient management and better sanitary conditions.

CONCLUSION

The high prevalence reinforces the need for targeted interventions, such as the adoption of stricter microbiological control measures, improved training of producers, and implementation of effective preventive protocols. Subclinical mastitis proved to be a critical factor for herd health and milk quality, because, even in the absence of evident clinical signs, its presence was associated with an increase in Somatic Cell Count (SCC), which compromises milk composition and reduces its viability for the industry. The economic impact of this form of the disease is often underestimated by producers, as it directly affects the productive longevity of animals and can lead to cumulative losses over time.

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