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Research Article

Prevalence of Mastitis Pathogens in Subclinically Healthy Dairy Cattle in Danbatta Local Government Area, Kano State

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Abstract

Subclinical mastitis remains one of the most economically important diseases affecting dairy cattle worldwide due to its negative impact on milk production, milk quality, and animal health. This study investigated the prevalence of mastitis pathogens among subclinically healthy dairy cattle in Danbatta Local Government Area of Kano State, Nigeria. A total of 120 lactating dairy cows managed under pastoral and semi-intensive systems were sampled from six wards within the study area. Milk samples were collected aseptically and screened using the California Mastitis Test (CMT), followed by bacteriological isolation and identification of pathogens using standard microbiological procedures. The overall prevalence of subclinical mastitis was 38.3%. The predominant bacterial isolates identified were Staphylococcus aureus (41.3%), Streptococcus agalactiae (21.7%), Escherichia coli (18.5%), Corynebacterium spp. (10.9%), and Pseudomonas aeruginosa (7.6%). Higher prevalence was recorded among older cows, cows in late lactation stage, and animals managed under poor hygienic conditions. Statistical analysis revealed significant association ($p < 0.05$) between management system and occurrence of subclinical mastitis. The study concludes that subclinical mastitis is prevalent among dairy cattle in Danbatta LGA and poses a serious threat to dairy productivity and public health. Improved hygiene, routine screening, and proper mastitis control programs are recommended to reduce disease burden.

Keywords: *Subclinical mastitis, dairy cattle, prevalence, pathogens, Danbatta, Kano State.*

Introduction

Mastitis is an inflammatory condition of the mammary gland characterized by physical, chemical, and bacteriological changes in milk as well as pathological alterations in glandular tissues. It remains one of the most economically important diseases affecting dairy cattle worldwide due to its adverse effects on milk production, milk quality, animal welfare, and farm profitability (Ruegg, 2022). The disease occurs in two major forms, namely clinical and subclinical mastitis. Clinical mastitis is characterized by visible abnormalities in milk and udder tissues, whereas subclinical mastitis occurs without obvious clinical signs and is usually detected through indirect diagnostic tests such as the California Mastitis Test (CMT) and somatic cell count analysis (National Mastitis Council, 2021).

Subclinical mastitis is considered more economically devastating than the clinical form because infected animals often remain undetected for prolonged periods while continuously shedding pathogenic microorganisms into milk (Halasa *et al*., 2022). The disease leads to significant reduction in milk yield, deterioration of milk composition, increased treatment expenses, reproductive inefficiency, and premature culling of affected animals (Bradley, 2023). In addition, contaminated milk from infected cows may serve as a potential source of zoonotic pathogens capable of causing public health concerns, especially in communities where raw milk consumption is common (Zadoks *et al*., 2022).

Several bacterial pathogens have been implicated in bovine mastitis, among which Staphylococcus aureus, Streptococcus agalactiae, Escherichia coli, Corynebacterium species, and Pseudomonas aeruginosa are the most frequently isolated organisms (Ali *et al*., 2021). These pathogens may be classified as contagious or environmental depending on their sources and transmission patterns. Contagious pathogens are primarily transmitted during milking through contaminated hands, towels, and milking equipment, whereas environmental pathogens originate from contaminated bedding materials, manure, soil, water, and unhygienic housing conditions (Quinn *et al*., 2022).

In developing countries such as Nigeria, dairy cattle are commonly managed under extensive and semi-intensive production systems where inadequate hygiene, poor housing conditions, lack of regular veterinary care, and improper milking practices predispose animals to mastitis infections (Moru *et al*., 2023). The burden of subclinical mastitis is particularly high in tropical regions due to favorable environmental conditions that enhance bacterial proliferation and transmission (Tyasi *et al*., 2025). Previous studies conducted in various parts of Nigeria and Africa have reported prevalence rates ranging from 24% to over 60%, indicating that mastitis remains a major challenge to sustainable dairy production (Abebe *et al*., 2016; Nurye *et al*., 2023).

The economic implications of mastitis are substantial and include decreased milk production, reduced market value of milk, increased veterinary costs, labor expenses, and losses associated with discarded milk during treatment periods (Halasa *et al*., 2022). Furthermore, persistent intramammary infections caused by organisms such as Staphylococcus aureus are often difficult to eliminate due to antimicrobial resistance and the ability of pathogens to evade host immune responses (Barkema *et al*., 2022).

Despite the growing importance of dairy production in Kano State, limited information exists regarding the prevalence and distribution of mastitis pathogens among subclinically infected dairy cattle in Danbatta Local Government Area. Understanding the epidemiology of mastitis pathogens within the study area is essential for developing effective control strategies and improving dairy productivity. Therefore, this study was conducted to determine the prevalence of mastitis pathogens among subclinically healthy dairy cattle in Danbatta Local Government Area of Kano State.

Materials and Methods

Study Area

The study was conducted in Danbatta Local Government Area of Kano State, Nigeria. Danbatta lies within the Sudan savannah ecological zone and is characterized by a tropical climate with distinct wet and dry seasons. Livestock farming, particularly cattle rearing, constitutes a major occupation among the inhabitants.

Study Animals

The study involved apparently healthy lactating dairy cows managed under pastoral and semi-intensive systems. Breeds sampled included White Fulani, Red Bororo, and Sokoto Gudali.

Sample Size Determination

The sample size for the study was determined using the formula described by Thrusfield (2018) for prevalence studies:

$$n = Z^2P(1 - P) / d^2$$

Where:

n = required sample size

Z = standard normal deviation at 95% confidence interval (1.96)

P = expected prevalence from previous studies (38.0%)

d = desired absolute precision (0.05)

Substituting the values into the formula:

$$n = (1.96)^2 \times 0.38(1 - 0.38) / (0.05)^2$$

$$n = 362$$

However, due to limitations associated with animal availability, logistics, transportation, and laboratory resources, a total of 120 lactating dairy cows were purposively sampled for the study.

The expected prevalence of 38% used for sample size determination was adopted from previous studies on bovine subclinical mastitis conducted among dairy cattle in Nigeria (Moru *et al*., 2023; Shittu *et al*., 2024).

Sample Collection

Milk samples were collected aseptically from lactating cows after proper cleaning and disinfection of teats using 70% alcohol. Approximately 10 mL of milk was collected into sterile universal bottles and transported in ice-packed containers to the laboratory for analysis.

California Mastitis Test (CMT)

The California Mastitis Test was used to detect subclinical mastitis. Equal quantities of milk and CMT reagent were mixed on a paddle and observed for gel formation. Samples showing positive reaction were considered positive for subclinical mastitis.

Bacteriological Examination

Positive samples were cultured on blood agar and MacConkey agar and incubated aerobically at 37°C for 24–48 hours. Bacterial isolates were identified based on colony morphology, Gram staining, and biochemical tests.

Statistical Analysis

Data obtained were analyzed using descriptive statistics. Chi-square test was used to determine associations between prevalence and risk factors. Statistical significance was considered at $p < 0.05$.

Results and Discussion

Table 1: Overall Prevalence of Subclinical Mastitis

Total Examined	Positive	Negative	Prevalence (%)
120	46	74	38.3

The present study recorded an overall prevalence of 38.3% for subclinical mastitis among apparently healthy dairy cattle in Danbatta Local Government Area of Kano State (table 1). This finding indicates that subclinical mastitis is highly prevalent within the study area despite the absence of visible clinical signs in affected animals. The prevalence obtained in this study is comparable to the findings of Shittu *et al*. (2024), who reported prevalence values ranging from 35% to 48% among indigenous dairy cattle in northern Nigeria. Similarly, Khasapane *et al*. (2023) reported prevalence rates above 40% in dairy herds managed under traditional systems in Africa. The similarity in prevalence could be attributed to comparable environmental conditions, poor milking hygiene, and limited mastitis control programs commonly practiced in traditional dairy production systems.

The occurrence of subclinical mastitis in apparently healthy cattle further confirms the hidden nature of the disease, where infected cows may continue to produce contaminated milk without noticeable udder abnormalities. This condition poses serious economic consequences due to reduced milk yield, altered milk composition, increased treatment costs, and possible zoonotic transmission of pathogenic organisms through raw milk consumption (Ali *et al*., 2021). Environmental factors such as poor sanitation, contaminated bedding materials, and inadequate udder washing before milking may have contributed significantly to the prevalence observed in this study.

The prevalence observed in the present study was however lower than the 57.8% reported by Nurye *et al*. (2023) in Ethiopia and the 62.4% reported by Abebe *et al*. (2016). The lower prevalence in the current study may be due to differences in management systems, climatic conditions, herd size, and diagnostic techniques employed. Seasonal variations and farmer awareness regarding mastitis prevention may also influence prevalence differences across studies.

Table 2: Frequency Distribution of Mastitis Pathogens

Pathogen	Frequency	Percentage (%)
Staphylococcus aureus	19	41.3
Streptococcus agalactiae	10	21.7
Escherichia coli	8	18.5
Corynebacterium spp.	5	10.9
Pseudomonas aeruginosa	4	7.6
Total	46	100

The bacteriological analysis revealed that Staphylococcus aureus was the predominant pathogen isolated, accounting for 41.3% of all isolates (table 2). This finding agrees with earlier studies conducted by Moru *et al*. (2023) and Ali *et al*. (2021), who identified Staphylococcus aureus as the leading causative agent of bovine mastitis in dairy cattle. The predominance of this organism may be associated with its contagious nature and its ability to colonize teat skin and mammary tissues. The organism can easily spread during milking through contaminated hands, towels, and milking utensils, particularly where hygienic practices are inadequate.

The high prevalence of Staphylococcus aureus may also be linked to its virulence factors, including toxin production and its ability to survive within mammary gland tissues, making treatment difficult and increasing persistence of infection within herds (Tyasi *et al*., 2025). In addition, poor post-milking teat disinfection and lack of dry cow therapy among local dairy farmers may have encouraged continuous transmission of the pathogen among lactating cows.

Streptococcus agalactiae was the second most prevalent isolate with 21.7% (table 2). This organism is considered a contagious mastitis pathogen commonly associated with infected udders and milking equipment. Similar findings were reported by Radostits *et al*. (2022), who stated that Streptococcus species are major contributors to intramammary infections in dairy cattle worldwide. The occurrence of Streptococcus agalactiae in the present study suggests possible deficiencies in milking hygiene and udder sanitation practices among dairy herds in the study area.

The isolation of Escherichia coli (18.5%) further indicates the role of environmental contamination in the epidemiology of mastitis within the study area. Environmental pathogens such as E. coli are usually associated with contaminated floors, dirty bedding materials, stagnant water, and fecal contamination around milking areas (Nurye *et al*., 2023). The relatively high occurrence of E. coli in this study may therefore reflect poor housing conditions and inadequate environmental hygiene.

Corynebacterium spp. and Pseudomonas aeruginosa were isolated at lower frequencies of 10.9% and 7.6%, respectively (table 2). Although these pathogens occurred at lower proportions, they remain important opportunistic organisms capable of causing chronic intramammary infections under poor sanitary conditions. The isolation of Pseudomonas aeruginosa particularly suggests possible contamination of water sources and milking equipment because the organism thrives in moist environments.

Table 3: Age-related Prevalence of Subclinical Mastitis

Age Group (Years)	Number Examined	Positive	Prevalence (%)
2–4	35	9	25.7
5–7	48	20	41.7
>7	37	17	45.9

The present study demonstrated that older cows (>7 years) had the highest prevalence of subclinical mastitis (45.9%), followed by cows aged 5–7 years (41.7%), while younger cows aged 2–4 years recorded the lowest prevalence (25.7%) (table 3). This trend agrees with the reports of Abebe *et al*. (2016) and Khasapane *et al*. (2023), who observed increasing mastitis prevalence with advancing age.

The higher prevalence among older cows may be attributed to repeated exposure to infectious agents over successive lactation periods. As cows age, the teat canal and sphincter muscles gradually lose elasticity, thereby increasing susceptibility to bacterial invasion into the mammary gland. Older cows are also more likely to experience udder injuries and teat lesions that may facilitate pathogen entry (Radostits *et al*., 2022).

In addition, repeated milking and multiple lactations may compromise the integrity of udder tissues, resulting in reduced natural defense mechanisms against invading microorganisms. Younger cows, particularly those in early lactation cycles, tend to possess stronger immune responses and reduced exposure history to mastitis pathogens, which may explain their lower prevalence rates.

Table 4: Prevalence Based on Management System

Management System	Number Examined	Positive	Prevalence (%)
Pastoral	70	31	44.3
Semi-intensive	50	15	30.0

Cows managed under pastoral systems recorded a higher prevalence of subclinical mastitis (44.3%) compared to those managed under semi-intensive systems (30.0%). The significant difference observed between management systems suggests that husbandry practices play a critical role in mastitis occurrence. Similar findings were reported by Ali *et al*. (2021) and Nurye *et al*. (2023), who observed higher mastitis prevalence among cattle managed extensively under traditional production systems.

The higher prevalence among pastoral herds may be due to poor environmental sanitation, inadequate housing, lack of proper milking hygiene, and limited veterinary intervention commonly associated with extensive management systems. In pastoral settings, cows are often exposed to muddy environments, contaminated water sources, and dusty conditions which may facilitate bacterial contamination of the udder and teats.

Furthermore, the absence of regular udder washing, teat dipping, and proper milking procedures among pastoralists may increase transmission of contagious mastitis pathogens within herds. Semi-intensive farms, on the other hand, generally provide better housing, improved nutrition, cleaner milking environments, and easier access to veterinary services, all of which contribute to reduced disease prevalence.

Conclusion

The predominance of contagious pathogens over environmental pathogens in this study suggests that transmission during milking remains an important route for mastitis spread within dairy herds in Danbatta Local Government Area. This study also indicated that age is an important risk factor associated with subclinical mastitis occurrence in dairy cattle. Proper monitoring and regular mastitis screening should therefore be emphasized among older lactating cows to reduce disease transmission and production losses. The current study also emphasizes the need for improved dairy management practices and farmer education programs aimed at reducing mastitis occurrence among traditionally managed cattle herds in Kano State.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

Statement of Ethical Approval

This research was conducted in accordance with ethical guidelines governing the use of animals and genetic materials in scientific research as stipulated by the Ethical Committee of Department of Animal Health and Production Technology, School of Science and Technology, Federal University of Science and Technology Kabo, which is in line with Animal health care constitution.

References

1. Abebe, R., Hatiya, H., Abera, M., Megersa, B., & Asmare, K. (2016). Bovine mastitis: Prevalence, risk factors and isolation of Staphylococcus aureus in dairy herds at Hawassa milk shed, South Ethiopia. BMC Veterinary Research, 12(1), 270.
2. Ali, T., Rahman, S. U., Zhang, L., Shahid, M., Zhang, S., Liu, G., Gao, J., Han, B., & Wang, J. (2021). Prevalence of mastitis pathogens and antimicrobial susceptibility of isolates from cattle and buffaloes. Frontiers in Veterinary Science, 8, 746755.
3. Barkema, H. W., Schukken, Y. H., & Zadoks, R. N. (2022). Invited review: The role of cow, pathogen, and treatment regimen in the therapeutic success of bovine Staphylococcus aureus mastitis. Journal of Dairy Science, 105(3), 1875–1891.
4. Bradley, A. J. (2023). Bovine mastitis: An evolving disease. Veterinary Journal, 291, 105927.
5. Halasa, T., Huijps, K., Østerås, O., & Hogeveen, H. (2022). Economic effects of bovine mastitis and mastitis management: A review. Veterinary Quarterly, 42(1), 125–138.
6. Khasapane, N. G., Mokoele, J. M., & Mphaphathi, M. L. (2023). Prevalence of subclinical mastitis and associated bacterial pathogens among dairy cattle. Veterinary Medicine International, 2023, 1–9.
7. Moru, N. H., Bello, M., & Ahmed, A. (2023). Prevalence of bovine mastitis among indigenous dairy cattle breeds in Nigeria. Nigerian Journal of Animal Production, 50(2), 145–154.
8. National Mastitis Council. (2021). Laboratory handbook on bovine mastitis. Madison, WI: National Mastitis Council Inc.
9. Nurye, M., Mohammed, A., & Tadesse, B. (2023). Prevalence of bovine mastitis and associated risk factors in dairy cattle. Cogent Food & Agriculture, 9(1), 2291224.
10. Quinn, P. J., Markey, B. K., Leonard, F. C., FitzPatrick, E. S., Fanning, S., & Hartigan, P. J. (2022). Veterinary microbiology and microbial disease (3rd ed.). Wiley-Blackwell.
11. Radostits, O. M., Done, S. H., Hinchcliff, K. W., & Constable, P. D. (2022). Veterinary medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats (11th ed.). Elsevier.
12. Ruegg, P. L. (2022). A 100-year review: Mastitis detection, management, and prevention. Journal of Dairy Science, 105(12), 10381–10397.
13. Shittu, A., Ibrahim, M., & Yusuf, A. (2024). Prevalence of mastitis among dairy cows in northern Nigeria. Nigerian Journal of Animal Production, 51(1), 77–86.
14. Thrusfield, M. (2018). Veterinary epidemiology (4th ed.). Wiley-Blackwell.

15. Tyasi, T. L., Mokoena, K., & Rashijane, L. T. (2025). Prevalence and risk factors for bovine mastitis in sub-Saharan Africa: A review. Asian Journal of Dairy and Food Research, 44(1), 12–21.
16. Zadoks, R. N., Middleton, J. R., McDougall, S., Katholm, J., & Schukken, Y. H. (2022). Molecular epidemiology of mastitis pathogens of dairy cattle and comparative relevance to humans. Journal of Mammary Gland Biology and Neoplasia, 27(2), 357–372.

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