



DETERMINATION OF MASTITIS PREVALENCE USING CALIFORNIA MASTITIS TEST (CMT) PADDLE ON TWO BREEDS OF DAIRY CATTLE

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ABSTRACT

The study was conducted to evaluate mastitis prevalence using California Mastitis Test (CMT) in Bunaji and Wadara breeds at the ATBU Dairy Research Center and two other farms. Milk samples were collected from 110 cows after the animals were restraint and the udder was cleaned disinfected let out little milk before the sample was collected. Two mills (2ml) was collected from each cow using the CMT paddle and 3mls of the reagent was added to each of the sample, stirred for 5 minutes before examination. These 110 samples were collected from three locations (Alhaji Jauro Jaki (42) Alhaji Maikudi farm (40) and ATBU Dairy Research and development Centre (28). The results of the evaluation of Mastitis using CMT in Bunaji and Wadara cows based on location indicated that Alhaji Jauro Jaki (AJJ) had the highest number of positive teats recorded at 31 (73.8%), followed by Dairy Research and Development Centre (DRDC) which had 17 (60.7%) positive teats. The number of positives for Alhaji Maikudi (AM) were 14 (35%). The result of the evaluation based on Age indicated that for AJJ, cows below 6 years recorded 50% prevalence, while those above 6 years had the highest rate of 85.71%. The result based on breed showed that, out of the total of 110 samples screened only 13 cows were Wadara breed, the others were Bunaji and all the Wadara breed were found in DRDC only. The results indicated that AJJ recorded 73.81% prevalence rate and all of them were Bunaji. AM had lower value of 35.00% rate. In the Dairy Research and Development Centre (DRDC), a total of 15 samples were from Bunaji cows while the remaining 13 from Wadara cows. The two breeds (Bunaji and Wadara) recorded 93.33 and 23.08% prevalence rates respectively. This means that Wadara breed recorded more than four times lower prevalence compared to Bunaji breed. The result based on parity indicated that, AJJ had the highest number of positive teats (73.8%) followed by DRDC which had 60.7% positive teats. The positive teats for Alhaji Maikudi was 35%. The study revealed that 60.7% of the DRDC cattle tested positive, 73.8% of AJJ and 35% of AM farm tested positive for mastitis using the paddle test. This indicated a significant prevalence rate of Mastitis at the DRDC compared to the other two farms. This can lead to decreased milk quality and economic losses. This study highlights the need for improved mastitis control, measure and regular screening in dairy farm to enhance animal welfare and dairy productivity.

Keywords: Bunaji, Wadara, Mastitis, CMT

INTRODUCTION

Mastitis means inflammation of the udder and is a common disease among dairy cows worldwide (Celestine, 2014). It is often associated with bacterial intra - mammary infections (IMI) and is subdivided into clinical mastitis (CMT) that is (inflammation with visual signs of inflammation in the udder or milk; and subclinical mastitis (SCM) that iso (inflammation without visual signs. Both CM and SCM influence milk quality and yield negatively, and mastitis is therefore, of major economic concern for the farmer. Clinical mastitis of potential concern in an animal welfare perspective (Ariffin *et al.*, 2019). Mastitis is categorized as acute or chronic on the basis of duration and, as mentioned above, it is also divided into CM and SCM on the basis of symptoms. Clinical mastitis is classified by the types of symptoms: mild (clotting of milk), moderate (changes in milk and visible signs of inflammation of the udder), or severe (changes in milk and udder, and systemic signs). The milk somatic cell count (SCC) measures concentration of somatic cells, predominantly inflammatory ones, and is an important diagnostic tool for SCM. The SCC from a healthy udder is about 70,000 cells/ml (Dasohari and Kandula, 2017) depending on age, breed, stage of lactation, and



milk yield of the cow (Norberg 2005). A threshold of 200 000 cells/ml has been proposed and is often used to distinguish SCM from healthy udders (Delesse 2010) but lower (Mekonnen and Tesfaye 2010) or higher thresholds are used in some studies (Passantino 2007).

The incidence rate of clinical mastitis in Nigeria (CM) is estimated at 26 cases per 100 cow-years, and corresponding numbers for other countries ranged from 23 to 65 (Ojo *et al.*, 2009). The occurrence of CM and SCM increases with increasing parity (Tikofsky and Zadoks 2005). In Sweden, the incidence of VTCM in 2012/2013 increased from 7.1 per 100 cow-years for primiparous cows to 23.1 in sixth and higher parities (Wagner and Erskine 2006). However, in some studies incidence rate of CM in primiparous cows is as high as in considerably older cows (Moges *et al.*, 2011). Nigeria has 18.4 million cattle, with relative numbers of cattle used for beef and milk production amounting to 3.38 million and 2.27 million heads respectively Federal Ministry of Agriculture and Rural Development (FMARD, 2017). However, the majority of this livestock is at risk of mastitis because of the milking procedure and the unhygienic housing conditions. The economic impact of the disease is greatly influenced by direct and indirect losses. Depending on the severity of the disease, mastitis causes significant economic losses to the dairy industry in terms of reduced milk production and quality, an increased risk of culling of infected animals, increased veterinary costs and deaths (Ariffin *et al.*, 2019) Mastitis can be classified as clinical or subclinical. In infected animals, clinical mastitis shows signs of inflammation such as redness, heat, pain, and swollen udder (Sarker and Samad, 2011). Additionally, there are visible deformities in the milk like clots, abnormal color, flakes, and blood (Dasohari and Kandula, 2017). The main objective of the study was to evaluate Mastitis using California Mastitis Test (CMT) in Bunaji and Wadara breeds at the ATBU Dairy Research Center and two other farms and specifically to investigate the genetic variation of *Staphylococcus aureus*, *S. dysgalactiae*, and *Streptococcus. uberis* isolates collected from cases of CM in Bunaji and Wadara breeds and the occurrence of *S. aureus*, *Streptococcus dysgalactiae*, and *S. uberis* IMI at and just after calving in large free-stall in Bunaji and Wadara breeds with mastitis problems in the study area.

MATERIALS AND METHODS

Study area

The experiment was conducted at the ATBU Dairy Research and Development Centre, ATBU Gubi campus, Bauchi. Bauchi (Latitude 10° 17' N and longitude 9° 49' E) with an altitude of about 690.2 meters above sea level. Bauchi is bordered by seven states of Kano and Jigawa to the North, Taraba and Plateau to the south, Gombe and Yobe to the east and Kaduna to the West. It occupies a total area of 49,259.01sq kilometres, representing about 5.3% of the total land mass of Nigeria. The state fall within the Guinea savannah ecological zone with an annual rainfall of between 1000mm and 1300mm per annum, effective rainy season start from mid-May or sometimes early June. In contrast, the Northern tip of the State receiving a rain late June/July. Relative humidity ranges from about 12% in February to about 68% in August. At the beginning of the rainy season, relative humidity is about 37%. Bauchi state has an average temperature of 40.50c (around April) and 6.110c – 7.220c (around December and January) (BASGD, 2006). The climatic conditions of Bauchi exhibit two marked seasons which are rainy season and dry season. During the rainy reason, there are abundance of pastures and green grasses for animals to graze. The dry season lasts for a period of about 7 months (October to April). The months of October to December are the period of harvest and there are a lot of animal feeds in form of crop residues

Sample and Sample Size Determination

A total of 110 lactating cows were examined, (97 Bunaji) and (13 Wadara) dairy cattle on the farm. The samples were further categorized based on location, parity, age, and breed for detailed analysis. (42 cattle's were found in Alhaji Jauro Jaki farm, 40 cattle's where found in Alhaji Maikudi and 28 from Dairy research center and development making a total of 110 dairy cows. Specifically, two breeds (Bunaji and Wadara) were examined, and the samples were divided into age groups (young and adult) and by parity (number of birth), location (Dairy research center, Alhaji Jauro Jaki, and Alhaji Maikudi).



Sample Size Determination

According to William (1977) in Ariffin *et al.* (2019).

Thresh field sample size formula for proportions

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{E^2}$$

Z = Z-score corresponding to the desired confidence level (e.g., 1.96 for 95% confidence)

p = estimated proportion of the population

E = desired margin of error

Data Collection

Upon arrival at the study locations, the animals were restrained and the udder disinfected with formaldehyde, little milk was let out before proper collection of 2ml of milk sample from each udder teat using a sterile plastic paddle containers, then 3ml of bromothymol blue (pH indicator) was added, stir for 5 minutes and examined.

Samples examination

Mastitis detected was examined based on CMT result for clinical and subclinical cases. Degree of coagulation was graded as “-” (negative), “+” (Slightly positive), “++” (Moderately positive), and “+++” (Highly positive).

Clinical examination of the udder

The udders were carefully inspected and palpated to detect possible fibrosis, inflammatory swellings, visible injury, tick infestation, atrophy of the tissue, and swelling of supra - mammary lymph nodes. The size and consistency of mammary quarters was checked for the presence of abnormalities such as disproportional symmetry, swelling, firmness and blindness. Viscosity and appearance of milk secretion from each mammary quarter was examined for the presence of clots, flakes, blood and watery secretions.

Data Analysis

Data collected were analyzed using SPSS to evaluate the number of positive animals. Descriptive statistics were used to summarize the number of positive cases and evaluated using percentages in each group.

RESULTS AND DISCUSSION

Prevalence of Mastitis using California Mastitis Test in Bunaji and Wadara cows Based on Location

The result of the evaluation of mastitis using CMT in Bunaji and Wadara cows based on location is presented in Table 1. The results indicated that Alhaji Jauro Jaki (AJJ) had the highest number of samples (42) recorded, followed by Alhaji Maikudi with 40 samples, while only 28 samples were observed for Dairy Research and Development Centre (DRDC). The number of positive teats recorded for AJJ was 31 representing 73.8%. AM recorded 14 cases representing 35% of positive teats, while DRDC had 17 cases or 60.7% positive teats. Based on location, 62 (56.36%) cases were found to be positive with 48 (43.64%) negative cases. The variation observed in respect to the location indicated that location play a significant role in the prevalence of mastitis. The result of this study is in agreement with report of Shitu *et al.* (2012) reported the mean prevalence of mastitis in different livestock species (cattle, sheep and goat) by zones across Nigeria using Colonial Mastitis Tests.

Table 1: Evaluation of Mastitis Using California Mastitis Test Based on Location

Location	No. of Samples	No. of Positive Teats	No. of Negative Teats	% Positive
AJJ	42	31	11	73.8
AM	40	14	26	35.0
DRDC	28	17	11	60.7
Total	110	62	48	

AJJ-Alhaji Jauro Jaki, AM-Alhaji MaiKudi, DRDC-Dairy Research and Development Centre.



Prevalence of Mastitis using California Mastitis Test in Bunaji and Wadara cows Based on Age

The result of the evaluation of mastitis using CMT in Bunaji and Wadara cows based on Age is presented in Table 2. The results indicated that for AJJ, cows below 6 years recorded 7 positive teats (with 7 negatives); while those above 6 years old had the highest number of 24 (with 4 negatives) recorded for them. For the AM (below 6 years old) no case was observed (with 6 negatives), while for those above 6 years recorded 14 positive teats (with 20 negatives). Dairy Research and Development Centre (DRDC) had 8 positive teats (with 4 negatives) recorded for cows below 6 years old and 10 positive teats (with 6 negatives) for cows above 6 years old. Based on age of cows, 63 cases were found to be positive with 47 negative cases.

The result based on Age indicated that for AJJ, cows below 6 years recorded 50% prevalence rate, while those above 6 years had the higher rate of 85.71%. This value of 85.71% is much higher and similar to the values reported for cows (85.33%) using CMT (Shittu *et al.*, 2012). For AM (below 6 years old) no case was recorded, while for those above 6 years old 14 positives were observed. Dairy Research and Development Centre (DRDC) had 66.67% positive teats recorded for below 6 years old cows and 6.50% positive teats for cows above 6 years old. This is in line with the report of Kinfu (2017) who reported that both the age of cows and the stage of lactation are important factors associated with the occurrence of mastitis. It can be linked to the fact that the teat canal in older animals is wider due to frequent milking over several years, or it may permanently remain partly open. The age of cows may also affect the permeability of the mammary epithelium, which can be linked to damage caused by previous inflammatory states leading to increased permeability even after successful treatment.

Table 2: Prevalence of Mastitis Using California Mastitis Test Based on Age

Location	Age Group	No. of Sample	No. of Positive	No. of Negative	% Positive
AJJ	Below 6	14	7	7	50.0%
	Above 6	28	24	4	85.7%
AM	Below 6	6	0	6	0.00%
	Above 6	34	14	20	41.17%
DRDC	Below 6	12	8	4	66.7%
	Above 6	16	10	6	62.5%
Total		110	63	47	

AJJ-Alhaji Jauro Jaki, AM-Alhaji MaiKudi, DRDC-Dairy Research and Development Centre

Prevalence of Mastitis using California Mastitis Test in Bunaji and Wadara cows Based on Breed

The result of the evaluation of mastitis using CMT in Bunaji and Wadara cows based on breed is presented in Table 3. The result indicated that, out of 110 samples screened only 13 cows were Wadara breed, the others were Bunaji and all the Wadara breed were found in DRDC only. The results further revealed that AJJ recorded 42 samples with 31 positive cases and all of them were Bunaji. AM had 40 Bunaji samples with 14 positive cases, while for Dairy Research and Development Centre (DRDC), a total of 15 samples were from Bunaji cows while the remaining 13 from Wadara cows. The two breeds (Bunaji and Wadara) recorded 14 and 3 positive cases respectively. Based on breed of cows, 62 cases were found to be positive with 48 negative cases. The variation in terms of breed could be due to genetic variability among the two breeds of cow. This corroborate the findings of Kivaria (2006) who reported a significance of breed on prevalence of mastitis. The two breeds (Bunaji and Wadara) recorded 93.33 and 23.08% prevalence rates respectively. This means that Wadara breed recorded more than four times lower prevalence rate compared to the Bunaji breed.



Table 3: Prevalence of Mastitis using California Mastitis Test Based on Breed

Location	Breed	No. of Sample	No. of Positive	No. of Negative	Percentage Positive
AJJ	Bunaji	42	31	11	73.8%
AM	Bunaji	40	14	26	35.0%
DRDC	Bunaji	15	14	1	93.3%
	Wadara	13	3	10	23.1%
Total		110	62	48	

AJJ-Alhaji Jauro Jaki, AM-Alhaji MaiKudi, DRDC-Dairy Research and Development Centre

Prevalence of Mastitis using California Mastitis Test in Bunaji and Wadara cows Based on Parity

The result of the evaluation of mastitis using Colonial Mastitis Test in Bunaji and Wadara cows based on parity is presented in Table 4. The results indicated that AJJ recorded 42 samples with 31 positive cases and all of them were Bunaji. AM had 40 Bunaji samples with 14 positive cases, while for DRDC, a total of 15 samples were from Bunaji cows while the remaining 13 from Wadara cows. The two breeds (Bunaji and Wadara) recorded 14 and 3 positive cases respectively. The number of negative teats were 11, 26 and 1 for Bunaji and 10 for Wadara breed. Based on parity, 62 cases were found to be positive with 48 negative cases. The result further indicated that that AJJ had the higher number of positive teats (73.8%) and all were Bunaji, followed by DRDC with 60.7% positive teats and the least (35%) were recorded at AM. The result of this study lend support to the findings of Delelesse (2010) who reported a similar trend while study Mastitis prevalence in Dairy cattle.

Table 4: Prevalence of Mastitis using California Mastitis Test Based on Parity

Location	Parity	No. of Sample	No. of Positive	No. of Negative	Percentage Positive
AJJ	105	42	31	11	73.8%
AM	111	40	14	26	35.0%
DRDC	78	15	14	1	50.0%
		13	3	10	
Total	294	110	62	48	

AJJ-Alhaji Jauro Jaki, AM-Alhaji MaiKudi, DRDC-Dairy Research and Development Centre

CONCLUSION AND RECOMMENDATION

The study revealed that 60.7% of the DRDC cattle tested positive, 73.8% of Alhaji Jauro Jaki and 35% of Alhaji Mai Kudi farm tested positive for mastitis using the paddle test. This indicated a significant prevalence rate of mastitis at the DRDC compared to the other two farms. This can lead to decreased milk quality and economic losses.

From the study, the following recommendations were made;

- Implementation of proper udder health management practices, such as regular cleaning and disinfection of the udder and milking equipment.
- Regular monitoring of mastitis using the paddle test other diagnostic tools
- Development of mastitis control program include training for farm staff on proper milking techniques.
- Improvement of nutrition and living condition to enhance immune response.
- Implementation of recording system to track mastitis incidence and treatment outcome.

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