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Effects of clinical mastitis on reproductive performance in crossbred cows during transitional period

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Abstract

The effect of clinical mastitis on reproductive performance in crossbred cows (Jersey +Holstein Friesian) under hilly condition was studied during the month of August, 2016 to May, 2018 in and around Aizawl district of Mizoram. The reproductive records of cows with clinical mastitis (n = 10) during transition period were compared with the records of cows without mastitis (n = 10). Clinical cases of mastitis were identified at every milking by the herd personnel based on abnormal milk or swelling of the mammary gland. Haematology showed significant ($P<0.05$) increase in leukocyte (12.47 ± 0.28) in mastitic cows. Higher granulocytes level and lymphopenia was observed in mastitis affected cows. Biochemical estimation revealed significantly ($P<0.05$) higher level of Calcium and lower level of Phosphorus in mastitis affected cows compared to healthy one. Mastitic cows showed more duration of calving to first service (215 ± 44.90 days) and calving to conception (297 ± 34.80 days) than non-mastitic cows (78.88 ± 3.86 and 133.32 ± 12.90 days).

Keywords: Mastitis, reproductive performance, transition period, haematological, blood biochemical

1. Introduction

Mastitis in cattle is considered the most important disease affecting milk production worldwide ^[1] and the second reason for poor reproductive efficiency as a result of discarded cows ^[2]. Mastitis negatively affect the reproductive performance of dairy cows in terms of increase in days to first service, increase of services per conception and the days to conception, alterations in inter-estrus interval, and an increase in abortions ^[3]. In mastitis, there is a break in the blood-milk-barrier, along with impaired synthesis and secretory activity of udder epithelial cells, which alters the level of most components and quantity. The cows with clinical mastitis prior to first AI (artificial insemination) or between first AI and pregnancy confirmation had a greater days not pregnant and increased culling rate compared with uninfected cows ^[4]. Conception rate to first postpartum AI and pregnancy rate at the end of the study were both decreased in cattle affected with clinical mastitis. Therefore mastitis, either prior to or after first postpartum AI, affect not only milk yield, but also impairs the reproductive performance of dairy cows. The objective of the present study was to evaluate the effect of clinical mastitis on reproductive performance in crossbred cows (Jersey + Holstein Friesian) during the transitional period under hilly condition.

2. Materials and method

2.1 Selection of animals: A total of twenty (20) numbers of animal (1st to 4th parity) during the transitional period were selected, and were grouped into two groups (group A & group B), containing ten (10) animals in each group. Group A contains cows without mastitis and Group B contains cows with mastitis. Clinical cases of mastitis were identified at every milking by the herd personnel based on abnormal milk or swelling of the mammary gland.

2.2 Collection of blood sample: A total of twenty (20) numbers (10 healthy & 10 affected with mastitis) of blood samples were collected. Eight (8) ml of blood samples were collected from the jugular vein of each cows (4ml in EDTA vial and 4ml in clot activator vial). Blood from EDTA vial was analysed for TLC (total leukocytic count), Lymphocyte and Granulocyte in the auto hemoanalyser (MS4e) and blood from clot activator vial were centrifuge at 3000 rpm for 10 minutes and serum were separately kept in -20 °C until pending analysis.

Serum samples were analysed for Calcium (Ca), Phosphorus (P) and Magnesium (Mg) in Fujifilm spectrophotometer.

2.3 Reproductive examination: All the animals in both the group were examined on the basis of behavioural signs of estrus and by rectal palpation method. Pregnancy diagnosis were done by rectal palpation after 60 days of artificial insemination.

3. Results and discussion

3.1 Haematological analysis: In the present study the mean value of leukocyte (TLC) in mastitis affected animal is 12.47 ± 0.28 which is significantly ($P < 0.05$) higher than the healthy animal (7.014 ± 0.032). Similarly granulocyte count was recorded significantly ($P < 0.05$) higher (71.70 ± 0.05) in mastitis affected cow compared to healthy cow (30.28 ± 0.09). However lymphocyte count was observed to be significantly lower in mastitic cases compared to healthy cow (25.58 ± 0.01 vs 52.82 ± 0.03). Zaki and his co-workers⁽⁵⁾ in the year 2008 reported similar findings in which there was an increase in TLC in affected animals along with a higher granulocyte count and lymphocytopenia which might be due to persistent infection. All the findings of the present study were depicted in the table 1.

3.2 Biochemical analysis: Biochemical estimation revealed significantly ($P < 0.05$) higher mean value of Calcium in mastitis affected cows compared to healthy one (13.99 ± 0.28 vs 9.78 ± 0.21), which might be due to the reduced milk production in affected animals which causes decreased Ca excretion in milk. Singh *et al.* in the year 2014⁽⁶⁾ also reported higher plasma levels of Ca in mastitis affected buffaloes which is similar to our findings. However lower mean value of Phosphorus was estimated compared to healthy one (4.95 ± 0.17 vs 6.41 ± 0.12) which might be due to injury to the udder wall resulting in its higher secretion in milk, thus increased loss in milk; which is in accordance with the findings of Dwivedi *et al.* (2004)⁽⁷⁾ and Siddiqe *et al.* (2015)⁽⁸⁾. However, no significant change was observed in case of Magnesium level which is in accordance with the findings of Dwivedi *et al.* (2004)⁽⁷⁾. All the results were depicted in the table 2.

3.3 Reproductive performance: It was evaluated on the basis of duration of calving to first service (open period) and calving to conception. Mastitic cows showed more duration of calving to first service (215 ± 44.90 days) and calving to conception (297 ± 34.80 days) than non-mastitic cows (78.88 ± 3.86 and 133.32 ± 12.90 days). The average values for the duration of calving to first service (open days) and calving to conception were depicted in the table 3. These observations are similar to the findings of Santos *et al.* (2004)⁽⁴⁾ who demonstrated that a smaller proportion of cows with mastitis (before first AI and between AI and pregnancy confirmation) were pregnant compared with uninfected cows. They also reported that the clinical mastitis at any time in lactation resulted in an increased incidence of abortions compared with uninfected cows. Chebel *et al.* (2002),⁽⁹⁾ in their study investigating embryonic mortality between 31 and 45 days after AI (artificial insemination), reported an increase in the incidence of pregnancy loss in cows affected with clinical mastitis. It might be due to increased concentrations of lipopolysaccharide and PGF_{2α} that had deleterious consequences on oocyte function and ultimately on

embryonic development thus increasing the length of open period and the duration of calving to conception⁽¹⁰⁾.

Table 1: Haematological parameters of mastitic and healthy crossbred cows

Parameters	Cows affected with mastitis	Healthy cows
TLC ($10^3/\mu\text{l}$)	$12.46^a \pm 0.27$	$7.01^b \pm 0.31$
Lymphocyte (%)	$25.58^a \pm 0.01$	$52.82^b \pm 0.30$
Granulocyte (%)	$71.70^a \pm 0.05$	$30.28^b \pm 0.09$

Table 2: Biochemical parameters of mastitic and healthy crossbred cows

Parameters (mg/dl)	Cows affected with mastitis	Healthy cows
Calcium (Ca)	$13.99^a \pm 0.28$	$9.78^b \pm 0.21$
Phosphorus (P)	4.95 ± 0.17	6.41 ± 0.12
Magnesium (Mg)	2.40 ± 0.081	2.50 ± 0.085

Table 3: Duration of calving to first service and calving to conception in mastitic and healthy crossbred cows

Parameters	Cows affected with mastitis	Healthy cows
Days from calving to first service	$215^a \pm 44.90$	$78.88^b \pm 3.86$
Days from calving to conception	$297^a \pm 34.80$	$133.32^b \pm 12.90$

4. Conclusion

In conclusion, to our knowledge this study is the first report of the harmful impact of clinical mastitis during transitional period on the reproductive performance in crossbred cows in hilly conditions, mainly increasing the days to first service and period of calving to conception. Thus, mastitis during transitional period have negative impact on reproduction, production and economy of the farmer. Further study is necessary to better understand the mechanism of the effect of mastitis on reproduction during transitional period under hilly conditions.

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