

*Original Research***Association among Feeding After Milking, Animal Factors and Post-milking Standing Period and Effect of Post-milking Standing Period on Intra-Mammary Infection in Crossbred Cows**Pranay Bharti^{1*} and Champak Bhakat²¹Krishi Vigyan Kendra, Dindori, Madhya Pradesh, INDIA²LPM Section, ICAR- NDRI, Kalyani, West Bengal, INDIA*Corresponding author: dr12pranay@gmail.com

Rec. Date:	Oct 27, 2018 06:43
Accept Date:	Mar 24, 2019 04:14
DOI	10.5455/ijlr.20181027064304

Abstract

The present investigation was undertaken to study the association of time of feeding after milking and animal factors with post-milking standing period (PMSP) and effect of PMSP on the milk somatic cell count (SCC) in crossbred cows. 24 lactating cows were selected and divided into 2 groups, each of 12 (G1: feeding within 15 min after milking and G2: feeding after 90 min of milking). PMSP was recorded for individual animal and categorized into < 90 min and > 90 min and milk sampling was done and subjected to microscopic method of somatic cell count. All procedure was performed at monthly interval for 4 month of duration. The estimated overall mean (\pm SE) of SCC (logarithmic) was 5.377 ± 0.039 . Time of feeding after milking was significantly ($P < 0.05$) associated with PMSP as the higher percentage (72.92%) of animals were found under the PMSP of > 90 minutes in group G1 as compared to G2. The PMSP was significantly ($P < 0.01$) affected the SCC level and the mean SCC (\pm SE) was 5.965 ± 0.056 in the animals that lie down before 90 minutes after milking while in the animals that lie down after 90 min, mean SCC (\pm SE) was 5.037 ± 0.037 . The association of parity and production level with the PMSP was also significant ($P < 0.01$) and primiparous and medium producer cows showed longer duration of PMSP. Observations revealed that PMSP can be managed by managing feeding time and can be utilized for maintaining better udder health.

Key words: Animal Factors, Crossbred Cow, Feeding after Milking, Intra-Mammary Infection, Post-Milking Standing Period

How to cite: Bharti, P., & Bhakat, C. (2019). Association Among Feeding After Milking, Animal Factors and Postmilking Standing Period and Effect of Post-milking Standing Period on Intra-Mammary Infection in Crossbred Cows. International Journal of Livestock Research, 9(5), 136-143. doi: 10.5455/ijlr.20181027064304

Introduction

India ranks number one in milk production in the world with the milk production of 165.4 million tonnes at the end of the year 2016-17 (NAS, 2017) and dairy industry playing a crucial role in livelihood activity



for the farmers by contributing to the health, nutrition and earnings of the household (Bharti *et al.*, 2017). However, in spite of large quantity of milk production, productivity of animals is still very low and the quality aspects of milk have not received sufficient attention which has been the major hindrance in realising the large export potential of milk and milk products. To achieve the demand the emphasis are being given to crossbred animals but crossbred animals are also more prone to intra-mammary infection. Intra-mammary infection is an imperative threat affecting the dairy sector (Bharti *et al.*, 2015). According to NAAS report (2013) mastitis is one of major reason for low yield and poor quality and ranks first among the diseases that cause substantial loss to owners. Two decade ago the incidence of clinical and subclinical mastitis in India was ranged from 1-10% and 1-50% respectively in cows (Sharma *et al.*, 2012) while recent studies have been reported the incidence of SCM ranged from 19.20 to 83% in cows. Among the several barriers in achieving the milk production targets high somatic cell counts (SCC) continues to remains as a most challenging impediment, since the udder quarters with high SCC (>500,000 cell/ml) show 4-18% less production (Nielsen *et al.*, 2009) and somatic cell count (SCC) in bovine milk and can be used to monitor the udder health status and level or occurrence of subclinical mastitis (SCM) in herds or individual cows (Sharma *et al.*, 2011).

Several environmental factors and host risk factors are associated with elevated SCC and most control measures are directing at reducing their impact (Bhutto *et al.*, 2010). Udder health is also impacted by lying behaviour and Keeping cows on their feet for a certain period of time after milking will increase the likelihood that the teat canals have closed prior to the udder contacting the stall surface when the cow lies down, thus decreasing the odds of bacterial penetration of the teat (Tyler *et al.*, 1997; Johansson *et al.*, 1999). According to previous investigations, the presence of feed, particularly fresh feed, has been shown to encourage longer post-milking standing times (DeVries and von Keyserlingk, 2005; DeVries *et al.*, 2010). Keeping all these information in view the present study was planned to study the association of time of feeding after milking and animal factors with post milking standing period (PMSP) and effect of PMSP on the milk somatic cell count (SCC) in crossbred cows.

Materials and Methods

Location and Experimental Design

The present study was carried out at Eastern Regional Station, National Dairy Research Institute (ERS-NDRI), cattle yard located in Kalyani city of West Bengal, latitude and longitude position being 22°56'30"N and 88°32'04"E, respectively. Twenty four lactating Jersey crossbred animals of 1st to 7th parity were randomly selected from the lactating herd of the institute farm for present investigation and then the animals were randomly divided into 2 groups G1 & G2, each having 12 animals. In group one (G1) the feed was offered within the 15 minutes after milking and to the second group (G2) the feed was offered after the 90



minutes of milking. The experimental animals were housed under loose housing system and housing space of the animals was specified as per the BIS standards. All the feeding management practices and the feed ingredients were same as of the whole lactating herd. Concentrate and ad libitum green fodder was provided to complete the nutrient requirement of the lactating cows. Machine milking was done twice a day during morning from 6.00 to 8.30 AM and evening from 2.30 to 4.30 PM.

Observation of Post-Milking Standing Period

In this study, group one the feed was offered within the 15 minutes after milking and to the second group the feed was offered after the 90 minutes of milking. The post-milking standing period (PMSP) was calculated by calculating the time interval between time of lying down of animal first time after milking and the time of end of milking. Post-milking standing period was recorded manually by physical observation of the animals after milking & recorded for continuous five days after morning and evening milking for the period of 90 minutes after milking for individual animals in each group. The data of 5 days were averaged for each animal for post-milking standing period and the following parameters were recorded: time of end of milking, time of lying down up to 90 minutes after milking and time of feeding after milking for each group.

Classification of Animal Factors

Parity

All animals were classified under the different categories of parities according to suitability of factors to see the effects. To see the effect of animal factor on PMSP, animals were divided into primiparous and pluriparous animals.

Level of Milk Production

Level of milk production for all the animals were divided into three milk production categories considering the herd average milk production in a lactation period- (1) low yielders (<1800kg), (2) medium yielders (1800-2200kg) and (2) high yielders (>2200kg).

Collection of Milk Samples and Analysis

After the recording of post-milking standing period for continuous five days, milk sampling was performed on 6th day for individual animal in each group. Representative morning milk samples were collected from all the four quarters of all experimental lactating cows. For this purpose, quarters were named as Left Fore (LF), Left Hind (LH), Right Fore (RF) and Right Hind (RH). Approximately 30 ml of milk was collected aseptically in the clean & sterilized sampling bottles. The collected samples were brought to the laboratory immediately for further analysis and somatic cell count (SCC) was performed within one hour of collection.

The procedure for somatic cell counting (SCC) in milk was adapted according to the method described by Schalm *et al.* (1971).

Statistical Methods

The association of time of feeding after milking and animal factors with the post-milking standing period were analyzed by chi-square test with the help of SAS software package, version 9.3. Before analysis, the SCC was transformed into log scale to minimize the heterogeneity of variance. The effect of post-milking standing period on SCC was analysed by ANOVA procedure with help of SAS (Statistical Analysis System) software and means were compared by Duncan's multiple range test and Tukey's studentized test.

Results and Discussion

Association of Time of Feeding After Milking, Parity and Production Level with Post-Milking Standing Period

To determine the association among time of feeding after milking and post-milking standing period, Chi-square test was performed and the percent distribution of observation of PMSP at different feeding time has been shown in Table 1. The result showed a significant ($P < 0.05$) association between time of feeding and PMSP with the Pearson chi-square value of 4.444 (Table 4). The result of present study indicated that when feed was delivered within 15 minutes after milking, post-milking standing period of were tended to increase and percentage of observation was higher under the post-milking standing period of > 90 min. Similar to the results obtained in present study Watters *et al.* (2013), DeVries *et al.* (2011) and DeVries *et al.* (2010) found that the delay between milking and feed delivery was a significant predictor of post-milking standing time whereas, in a study of AMS herds, no correlation was found between PMSD and feeding management by Deming *et al.* (2013).

Table 1: Percent distribution of observation of PMSP at different time of feeding after milking

Post-Milking Standing Period	% Distribution of Observation under Different Time of Feeding after Milking		Total
	Within 15 min	After 90 min	
< 90 min	27.08 (13)	47.92 (23)	37.5 (36)
> 90 min	72.92 (35)	52.08 (25)	62.5 (60)
Total	100 (48)	100 (48)	100 (96)

Values in parenthesis indicate number of observations in respective category

To find out the association among parity and post-milking standing period, data on animals were classified as primiparous and pluriparous animals and then observations on PMSP were classified accordingly. The percent distribution of PMSP observation under different parity has been given in Table 2.

Table 2: Percent distribution of observation of PMSP under different parity of animals

Post-Milking Standing Period	% Distribution of Observation under Different Parity Animals		Total
	Primiparous	Pluriparous	
< 90 min	15 (6)	53.57 (30)	37.5 (36)
> 90 min	85 (34)	46.43 (26)	62.5 (60)
Total	100 (40)	100 (56)	100 (96)

Values in parenthesis indicate number of observations in respective category

The percentage of primiparous animals was higher under the class of PMSP of > 90 min. The result of chi-square test showed a significant ($P < 0.01$) association between parity and PMSP with the Pearson chi-square value of 14.811 (Table 4). Similar to present study, Deming *et al.* (2013) found a significant association of parity with the standing time after milking. Watters *et al.* (2013) observed that the cows of parity ≥ 3 spent more time standing after milking than lesser parity cows whereas, DeVries *et al.* (2010) found non-significant association ($P > 0.05$) of parity with PMSP. The data on PMSP were also classified according to production level of animals and were tested for association between production level and post-milking standing period. The percent distribution of PMSP observation under different production level has been given in Table 3.

Table 3: Percent distribution of observation of PMSP under different level of production

Post-Milking Standing Period	% Distribution of Observation under Different Production Level			Total
	Low	Medium	High	
< 90 min	54.28 (19)	9.37 (3)	48.27 (14)	37.5 (36)
> 90 min	45.72 (16)	90.63 (29)	51.29 (15)	62.5 (60)
Total	100 (35)	100 (32)	100 (29)	100 (96)

Values in parenthesis indicate number of observations in respective category

Table 4: Pearson chi-square value for association of time of feeding, parity and production level with PMSP

Factor for Association with PMSP	Pearson Chi-Square Value	df	Significance Level
Time of feeding	4.444	1	0.05
Parity	14.811	1	0.01
Production level	16.444	2	0.01

The result of chi-square test showed a significant ($P < 0.01$) association among level of production and PMSP with the Pearson chi-square value of 16.444 (Table 4). The percentage under PMSP of < 90 min was higher for low and high producing animals and minimum for medium production level animals. In contrast to present study, DeVries *et al.* (2010) found that there was no significant association ($P > 0.05$) of parity, DIM, or cow's milk production with post-milking standing time.

The reason behind the higher percentage of animals under PMSP of >90 min when feed was delivered within 15 min in the present study may be that, when feed was delivered within 15 min after milking, most of the animals were engaged in feeding and hence they stood for longer periods. Pluriparous animals lied down early (higher percentage under PMSP of < 90 min), might be due to they needed more rest as they were high production animals and also older ones.

Post-Milking Standing Period and its Effect on Somatic Cell Count

All the experimental animals during the study period were classified into two major suitable categories (after milking, animals lie down before 90 min. & and after 90 min.) and accordingly the somatic cell count of their quarter milk samples were classified to investigate the effect of PMSP on SCC. The Mean \pm SE of post-milking standing period of the animals that lied down before 90 minutes after milking was 47.62 \pm 2.25 minutes with range of 14.66 min. to 72.5 min. The overall Mean \pm SE of PMSP for all the animals was not available as observation period in this study was only upto 90 min. after milking. The SCC data were analysed to see the effect of PMSP on somatic cell count. The analysis of variance showed that there was a significant ($P < 0.01$) effect of post-milking standing period on the level of somatic cell count. The overall Mean \pm SE of Log₁₀SCC was significantly higher for the group of animals having PMSP of < 90 min (5.965 \pm 0.056) as compared to the group of animals having PMSP of > 90 min. (5.037 \pm 0.037) which is being depicted in Fig. 1).

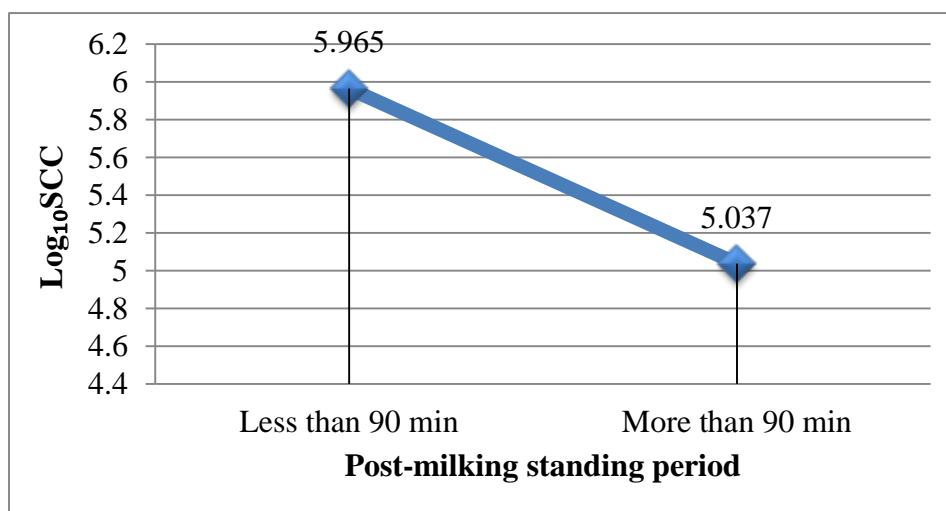


Fig. 1: Mean \pm SE of Log₁₀SCC in different group of Post-milking standing period (PMSP)

Similar to present findings, Watters *et al.* (2013) found a non-linear relationship between post-milking standing time and eSCC incidence. They suggested that, compared to those cows that lie down < 90 min after milking, cows that lie down for the first time > 90 min after milking had a lower risk of acquiring a

new elevated somatic cell count (eSCC) while, DeVries *et al.* (2010) reported that cows that laid down, on average between 40 and 60 min after milking, tended to have a decreased risk of acquiring a new environmental intra-mammary infection (IMI). Higher values of SCC for the group of post-milking standing period of less than 90 minutes in the present study might be due to the fact that the teat canals remains open for some period after the milking and if animals lay down early after milking, teat comes in contact of ground surface and the chances of infection increases.

Conclusion

The results of present study indicated that post-milking standing time of animal was associated with their parity and production level. The animals lied down within 90 min after milking had higher somatic cell count in their milk indicative of poor udder health. The post-milking standing time of animal can be managed by handling time of feeding after milking and provision of fresh feed immediately after milking which can be utilized for maintaining better udder health.

Acknowledgements

The authors are indebted to the Director, ICAR-NDRI, Karnal and Head, ICAR-NDRI (ERS), Kalyani for providing the facilities for conducting the research. The first author is extremely thankful to ICAR-NDRI for providing financial assistance in the form of institutional fellowship during entire study tenure.

References

1. Bharti, P., Bhakat, C., Japheth, K., Bhat, S., Chandra, s., & Kumar, A. (2017). Influence of Animal Factors on Milk Somatic Cell Count in Crossbred Cows Reared Under Hot-Humid Climatic Condition. *International Journal of Livestock Research*, 7(4), 228-235.
2. Bharti, P., Bhakat, C., Pankaj, P. K., Bhat, S. A., Prakash, M. A., Thul, M. R. and Japheth, K.P. (2015). Relationship of udder and teat conformation with intra-mammary infection in crossbred cows under hot-humid climate. *Veterinary World.*, 8(7): 898-901.
3. Bhutto, A. L., Murray, R. D. and Woldehiwet, Z. (2010). Udder shape and teat-end lesions as potential risk factors for high somatic cell counts and intra-mammary infections in dairy cows. *The Veterinary Journal.*, 183 (1): 63–67.
4. Deming, J. A., Bergeron, R., Leslie, K. E. and DeVries, T. J. (2013). Associations of housing, management, milking activity, and standing and lying behavior of dairy cows milked in automatic systems. *J. Dairy Sci.*, 96: 344–351.
5. DeVries, T. J. and VonKeyserlingk, M. J. K. (2005). Time of feed delivery affects the feeding and lying patterns of dairy cows. *J. Dairy Sci.*, 88: 625–631.
6. DeVries, T. J., Deming, J. A., Rodenburg, J., Seguin, G., Leslie, K. E. and Barkema, H. W. (2011). Association of standing and lying behaviour patterns and incidence of intra-mammary infection in dairy cows milked with an automatic milking system. *J. Dairy Sci.*, 94: 3845–3855.
7. DeVries, T. J., Dufour, S. and Scholl, D. T. (2010). Relationship between feeding strategy, lying behavior patterns, and incidence of intramammary infection in dairy cows. *J. Dairy Sci.*, 93: 1987–1997.
8. Johansson, B., Redbo, I., Svennersten-Sjaunja, K. (1999). Effect of feeding before, during and after milking on dairy cow behaviour and the hormone cortisol. *Anim. Sci.*, 68: 597–604.



9. NAS. (2017). National Accounts Statistics, Central Statistical Organisation; Ministry of Statistics & Programme Implementation, GOI, New Delhi.
10. National Academy of Agriculture Sciences, Report (2013) retrieved from <https://drive.google.com/file/d/0B2ESp7vQtAoZYzhiUTkydHpmdzg/view>
11. Nielsen, C. H., Emanuelson, U., Berglund, B. and Strandberg, E. (2009). Relationship between somatic cell count and milk yield in different stages of lactation. *Journal of Dairy Science.*, 92(7): 3124-3133
12. Schalm, O. W., Carrol, E. J. and Jain, N. C. (1971). Bovine mastitis. Lea febiger Philadelphia USA.
13. Sharma, N., Gyu, J. R., Hong, Y. H., Kang, T. Y., Lee, H. K., Hur, T. Y. and Jeong, D. K. (2012). Bovine mastitis: An Asian perspective. *Asian Journal of Animal and Veterinary Advances.* 7 (6): 454-476.
14. Sharma, N., Singh, N. K. and Bhadwal, M. S. (2011). Relationship of somatic cell count and mastitis: An overview. *Asian-Aust. J. Anim. Sci.* 24 3: 429 – 438.
15. SAS Institute Inc. (2011). SAS® 9.3 System Options: Reference. 2nd ed. SAS Institute Inc., Cary, NC.
16. Tyler, J. W., Fox, L. K., Parish, S. M., Swain, J., Johnson, D. L., Grasseschi, H. A. and Gant, R. (1997). Effect of feed availability on post-milking standing time in dairy cows. *J. Dairy Res.* 64: 617–620.
17. Watters, M. E. A., Meijer, K. M. A., Barkema, H. W., Leslie K. E., VonKeyserlingk M. A. G. and DeVries, T. J. (2013). Associations of herd- and cow- level factors, cow lying behaviour, and risk of elevated somatic cell count in free-stall housed lactating dairy cows. *Preventive Veterinary Medicine.* 111: 245-255.

