



Incidence of Lactation Disorders and Their Economic Impact in Dairy Animals in Relation to Non-genetic Factors

Deepak Kumar Verma¹, Rajbir Singh¹, Akhilesh Kumar Singh², Aman Rathaur³,
Ashwani Kumar Singh³, Sandeep Kushwaha⁴, Sonam Jahan⁴

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ABSTRACT

Background: Lactation disorders adversely affect reproductive performance, milk production and economic efficiency in dairy animals. Their occurrence is influenced by non-genetic factors such as parity, period and season of calving and understanding their incidence and economic losses is essential for improving herd health and productivity.

Methods: The study was conducted at IIMT University, Meerut, for duration of two years using records from the State Livestock-cum-Agriculture Farm, Hastinapur (Meerut), Uttar Pradesh. A total of 983 calving records from 258 Haryana cows covering 30 years (1992-2021) were analyzed to assess the incidence of major lactation disorders in relation to parity, period and season of calving. Economic losses were estimated based on treatment costs and the effects of non-genetic factors were evaluated using analysis of variance.

Result: The incidence of lactation disorders varied across different lactation, periods and seasons of calving. Higher occurrence of several reproductive disorders was observed in early lactations, while udder-related disorders showed an increasing trend with advancing lactation. Period-wise and seasonal variations indicated the influence of management and climatic conditions on the incidence of lactation disorders. Non-genetic factors had significant effects on several disorders. Lactation disorders resulted in considerable economic losses, mainly due to increased treatment costs. The study concluded that the lactation disorders are influenced by non-genetic factors such as parity, calving period and season, with higher incidence in early lactations and adverse seasons. These disorders lead to notable economic losses, highlighting the importance of improved management for better productivity.

Key words: Economic losses, Lactation disorders, Non-genetic factors, Parity, Season of calving.

INTRODUCTION

The livestock sector plays a significant role in the agricultural economy and contributes substantially to the livelihood of rural populations. The livestock sector contributes about 25.6 percent to the total agricultural output and about 4.11 per cent to the national Gross Domestic Product (GDP) of India (Anonymous, 2018). Among the various livestock products, milk plays a vital role in the Indian agricultural economy. The nation sustained its position as a global leader by achieving an all-time high milk output of 247.87 million tonnes during 2024-25 (Agri Dots, 2025).

Lactation disorders are among the important health problems that adversely affect the productivity and profitability of dairy farming. These disorders can lead to reduced milk yield, impaired reproductive performance and increased veterinary expenses in dairy animals (Sinha *et al.*, 2014). The occurrence of lactation disorders also results in increased labor requirements and higher management costs, ultimately causing economic losses to dairy farmers (Rathod *et al.*, 2017). The incidence of such disorders is often influenced by various non-genetic factors such as parity, season of calving, stage of lactation, feeding management and housing conditions (Verma and Gupta, 2019; Minamino *et al.*, 2020).

Understanding the incidence of lactation disorders and the role of non-genetic factors affecting their occurrence is essential for improving dairy herd management. Moreover,

¹School of Agricultural Sciences, IIMT University, Meerut-250 001, Uttar Pradesh.

²Department of Animal Husbandry and Dairying, Faculty of Agriculture, Prof. Rajendra Singh (Rajju Bhaiya) University, Prayagraj-211 010, Uttar Pradesh, India.

³School of Advanced Agriculture Science and Technology, Chhatrapati Shahu Ji Maharaj University, Kanpur-208 024, Uttar Pradesh, India.

⁴Zoological Survey of India, Kolkata-700 053, West Bengal, India.

Corresponding Author: Akhilesh Kumar Singh, Faculty of Agriculture, Department of Animal Husbandry and Dairying, Prof. Rajendra Singh (Rajju Bhaiya) University, Prayagraj-211 010, Uttar Pradesh, India. Email: akhileshbhu88@gmail.com

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estimation of the economic losses associated with these disorders is important for evaluating their impact on dairy production systems. Such information can help in developing appropriate management strategies to minimize losses and enhance the overall productivity of dairy animals (Hogeveen *et al.*, 2011).

Previous studies have reported that lactation disorders significantly reduce milk production, reproductive efficiency

and profitability in dairy animals, with their incidence being strongly influenced by non-genetic factors such as parity, season and stage of lactation (Bhattachariya and Buchoo, 2008). These disorders also impose considerable economic losses due to increased treatment costs and prolonged recovery (Rathod *et al.*, 2017). However, limited information is available on the combined effect of non-genetic factors on lactation disorders and their economic impact under organized farm conditions.

Therefore, the present study was undertaken to evaluate the incidence of major lactation disorders in relation to non-genetic factors and to assess their economic impact in dairy animals.

MATERIALS AND METHODS

The study was conducted at IIMT University, Meerut, on Haryana cows. The study was carried out for duration of two years using records from the State Livestock-cum-Agriculture Farm, Hastinapur (Meerut), Uttar Pradesh.

Data collection

Data on lactation disorders and related economic losses were obtained from official farm records, including history-cum-pedigree sheets. In total, 983 calving records from 258 adult cows over a 30-year period (1992-2021) were analyzed, considering only cows that had completed at least one lactation.

Location and climatic conditions

The region receives an average annual rainfall of 750-950 mm, with most precipitation occurring during the monsoon season (July-September), along with occasional winter showers. The climate is tropical, characterized by maximum temperatures of about 42°C during summer (April-June), followed by the monsoon period. Winters extend from December to March, during which temperatures range between 4°C and 30°C.

Management and feeding practices

Animals were maintained under a balanced feeding system comprising dry roughage, green fodder and concentrate mixture. Dry roughage in the form of wheat straw and green fodder based on seasonal availability, including green maize, green jowar and berseem, was provided to the animals. Mineral mixture supplementation was provided in accordance with the age and physiological status of the animals. Standard farm management practices related to feeding, milking, sanitation and animal care were strictly followed throughout the study period.

Animal health care and preventive management

Animal health care practices were rigorously implemented to assess their association with lactation disorders. Sick animals were promptly identified and treated under the supervision of a qualified veterinarian. Preventive health care measures, including routine vaccination against major

infectious diseases as per recommended schedules, were consistently followed.

Breeding practices

The breeding policy followed at the farm involved selective breeding using Haryana bulls obtained from high-yielding dams. These practices were followed to maintain herd productivity while evaluating the role of non-genetic factors influencing lactation disorders and their economic impact.

Factors of study

A. Incidence of lactation disorders

The present study considered major lactation disorders of economic importance to assess their incidence in dairy animals. The disorders included abnormal calving, utero-vaginal prolapse, retention of placenta, metritis, anoestrus, repeat breeding, mastitis and blood in milk.

Parameters of study

The 30-year data were categorized by parity, period and season of calving to assess the incidence of lactation disorders and their statistical significance under different non-genetic factors.

1. Parity of lactation

The parities of lactation were examined up to the last parity available in the history sheet of the cow.

2. Period of calving

Since the data covered a 30-year period (1992-2021), the entire duration was divided into five equal periods to study the changes in incidence of disorders over time.

3. Season of calving

Months with similar climatic conditions were grouped into four seasons: winter (December-March), summer (April-June), rainy (July-September) and post-monsoon (October-November).

B. Estimation of economic losses

Economic losses due to lactation disorders were estimated only on the basis of treatment costs. For this purpose, abnormal calving, metritis and mastitis were considered and costs were calculated based on medicines used, excluding indirect losses such as reduced milk yield.

Statistical analysis

The incidence of various lactation disorders was calculated for different levels of parity, period and season of calving and expressed as the percentage of cows affected by a particular disorder.

Effect of non-genetic factors

The significance of the effect of various non-genetic factors such as parity, period and season of calving on lactation disorders was estimated using analysis of variance (ANOVA) with the F-test.

RESULTS AND DISCUSSION

Incidence of lactation disorders

Effect of lactation on incidence of calving

Data presented in the Table 1 regarding the incidence of abnormal calving varied from 3.1 per cent in third lactation to 6.6 per cent in first lactation animals. Almost similar incidences of abnormal births varying from 4.4 to 4.9 per cent have been reported by Kumari *et al.* (2015). The incidence of utero-vaginal prolapse ranged from 2.97 to 3.88 per cent among different lactations. Almost similar incidence of prolapse (3.2 to 3.6%) was reported by Bhattachariya and Buchoo (2008). It was found that the incidence of prolapse was little higher in first and fifth calvers, though statistically the differences were not found (Sarder *et al.*, 2015). Retention of placenta was observed to be high among first lactation (6.59 per cent) and fifth lactation cows (6.47 per cent) than in third and fourth calvers. Similar findings were reported by Bhattachariya and Buchoo (2008) and Rahman *et al.* (2020) also observed the occurrence of retention of placenta in Gir cattle under organized herd conditions. Dutta *et al.* (2020) also reported retention of placenta incidence of 6.25 per cent in crossbred dairy cows maintained under field conditions, indicating the importance of non-genetic factors in reproductive disorders. The incidence of metritis was higher in second lactation animals (11.88 per cent). The overall incidence was comparable to reports Khan *et al.* (2016). Significant effect of parity of lactation on metritis incidence was reported by Hadush *et al.* (2013). Studies conducted in Holstein cattle reported metritis as one of the most common reproductive disorders affecting dairy cattle populations. The incidence of anoestrus was highest among first lactation animals (33.72 per cent) and showed a decreasing trend with increase in parity order. Similar estimates have been reported by Hadush *et al.* (2013) also reported higher incidence of anoestrus in younger

animals. Das *et al.* (2023) also reported that anoestrus was the most prevalent reproductive disorder in Jersey crossbred cattle with an incidence of 35.77 per cent. Repeat breeding was found high in first calvers (15.89 per cent). Similar incidence had been reported by Bhattachariya and Buchoo (2008) and Das *et al.* (2023) reported repeat breeding incidence of 8.54 per cent in Jersey crossbred cattle and Dutta *et al.* (2020) observed repeat breeding incidence of 14.16 per cent in crossbred dairy cows under field conditions. Mastitis incidence ranged from 13.57 to 19.75 per cent across different lactations. The highest incidence was observed in third lactation cows (19.75 per cent), while the lowest incidence was recorded in first lactation animals (13.57 per cent). Similar findings were reported by Fareed *et al.* (2017), who observed mastitis prevalence of 18.33 per cent and reported substantial economic losses associated with mastitis and reproductive disorders in dairy animals. Blood in milk incidence varied from 2.33 to 4.74 per cent across different lactation orders. The lowest incidence was found in first lactation cows, whereas the highest incidence was observed in fifth lactation animals. The increasing trend with advancement of lactation may be attributed to greater susceptibility of older cows to udder injuries and mammary gland disorders. Similar observations were also reported by Tomar (1984), who found that parity and management period had significant influence on blood in milk incidence.

Effect of period on incidence of calving

Data presented in the Table 2 regarding the incidence of abnormal calving varied from 2.5 per cent in second period to 8.3 per cent in fourth period. Significant effect of period of calving was reported by Sarder *et al.* (2015). The incidence of prolapse ranged from 2.76 to 4.65 per cent among different periods. Similar observations were reported by Sangeeta *et al.* (2002). Retention of placenta varied from

Table 1: Effect of lactation on incidence of calving.

Lactation	Abnormal birth	Sex ratio	Prolapse	Retention of placenta	Metritis	Anoestrus	Repeat breeding	Mastitis	Blood in milk
1	6.6	45.6	3.88	6.59	7.75	33.72	15.89	13.57	2.33
2	4.5	50.8	2.97	5.94	11.88	25.25	13.86	16.34	3.47
3	3.1	45.9	3.09	4.94	6.79	25.31	14.20	19.75	4.32
4	5.4	43.4	3.10	3.88	5.43	16.28	8.53	17.83	3.88
5	3.5	48.7	3.45	6.47	3.88	13.79	7.33	17.67	4.74

Table 2: Effect of period on incidence of calving.

Period	Abnormal birth	Sex ratio	Prolapse	Retention of placenta	Metritis	Anoestrus	Repeat breeding	Mastitis	Blood in milk
1	7.0	42.5	4.65	5.81	9.30	27.91	13.95	16.82	3.49
2	2.5	47.9	3.55	5.08	7.61	25.38	11.68	15.73	3.55
3	3.3	47.8	3.63	5.61	6.60	21.12	10.56	16.17	3.30
4	8.3	47.2	2.76	6.91	6.91	23.50	11.98	16.13	4.15
5	3.9	47.4	2.78	5.56	7.22	23.89	15.00	19.44	3.89

5.08 to 6.91 per cent across periods. Bhattachariya and Buchoo (2008) have also reported significant effect of period of calving on retention of placenta. Metritis incidence ranged from 6.60 to 9.30 per cent among periods. Murugeppa and Dubey (1997) reported that period of calving did not influence metritis significantly. Anoestrus varied between 21.12 and 27.91 per cent in different periods. Tomar and Tripathi (1985) reported that period of calving had no effect on anoestrus incidence. Repeat breeding ranged from 10.56 to 15.00 per cent among periods. Bhattachariya and Buchoo (2008) observed significant effect of period. Mastitis incidence ranged from 15.73 to 19.44 per cent also similar Fareed *et al.* (2017) reported mastitis prevalence of 18.33 per cent and observed substantial economic losses associated with mastitis and reproductive disorders in dairy animals. Rahman *et al.* (2020) observed an overall mastitis incidence of 4.45 per cent in Gir cattle under organized herd management. Blood in milk varied from 3.30 to 4.15 per cent across periods. Tomar (1984) reported that period had significant influence on blood in milk.

Effect of season on incidence of calving

Data presented in the Table 3 regarding the incidence of abnormal calving was highest during summer (8.3 per cent) and lowest during autumn (2.7 per cent). Higher incidence during summer was also reported by Arun *et al.* (1995). The incidence of prolapse was low during winter (2.40 per cent) and high during summer (4.41 per cent). Similar findings were reported by Bhattachariya and Buchoo (2008). Retention of placenta varied from 4.73 per cent in autumn to 7.35 per cent in summer. Dutta *et al.* (2020) also reported that environmental and managemental conditions significantly influenced the occurrence of reproductive disorders in dairy cattle. Metritis incidence was highest

during rainy season (9.35 per cent). Tomar and Tripathi (1994) also reported significant seasonal influence on metritis. Anoestrus was highest during summer (32.84 per cent) and lowest during autumn (16.89 per cent). Hadush *et al.* (2013) also reported higher incidence of anoestrus during summer months. Das *et al.* (2023) also observed higher overall occurrence of anoestrus among reproductive disorders in Jersey crossbred cattle. Repeat breeding was highest during summer (14.71 per cent) and lowest during rainy season (7.48 per cent). Arun (1999) reported significant seasonal influence on repeat breeding in Haryana cows. The incidence of mastitis was highest during rainy season (27.57 per cent) and lowest during autumn (12.84 per cent). Sinha *et al.* (2014) also reported higher mastitis incidence during rainy season. Rahman *et al.* (2020) reported significant seasonal influence on mastitis incidence in Gir cattle. Blood in milk was lowest during summer (2.45 per cent) and highest during rainy season (5.14 per cent). Mukharjee *et al.* (1993) also reported that season influenced the incidence of blood in milk.

Effect of non-genetic factors on reproductive traits

Data presented in the Table 4 regarding the analysis of variance revealed that non-genetic factors significantly influenced several reproductive and udder traits. Period of calving had a highly significant ($P<0.01$) effect on abnormal birth, whereas season showed significant ($P<0.05$) influence. Parity did not significantly affect abnormal birth. Similar observations have been reported by Sangeeta *et al.* (2002). Sex ratio was significantly influenced by season, while lactation and period had no significant effect. Parity did not significantly affect prolapse or retention of placenta. Likewise, seasonal variation was not significant for these disorders. However, earlier researcher such and Bhattachariya and Buchoo (2008) have reported period effect on these traits. Metritis was significantly influenced

Table 3: Effect of season on incidence of calving.

Season	Abnormal birth	Sex ratio	Prolapse	Retention of placenta	Metritis	Anoestrus	Repeat breeding	Mastitis	Blood in milk
Winter	4.3	49.9	2.40	5.28	7.19	23.74	13.91	13.91	3.36
Summer	8.3	42.8	4.41	7.35	5.39	32.84	14.71	13.73	2.45
Rainy	3.3	46.4	4.21	6.07	9.35	19.16	7.48	27.57	5.14
Autumn	2.7	46.5	3.38	4.73	6.76	16.89	10.81	12.84	

Table 4: Effect of non-genetic factors on reproductive traits (ANOVA Summary).

Trait	Lactation (MS)	Period (MS)	Season (MS)
Abnormal birth	0.0638	0.1792**	0.1698*
Sex ratio	0.1228	0.0699	0.5201*
Prolapse	0.0084	0.0052	0.0598
Retention of placenta	0.0098	0.0684	0.0477
Metritis	0.2012*	0.0008	0.2275*
Anoestrus	0.5598*	0.0108	0.5238*
Repeat breeding	0.3189*	0.0212	0.2926*
Mastitis	0.4375**	0.0029	0.6121**
Blood in milk	0.039	0.010	0.062

by parity and season, whereas period had no significant effect. The higher susceptibility in certain lactation groups may be associated with physiological stress and postpartum complications. Das *et al.* (2023) reported that non-genetic factors, particularly period of calving, significantly affected reproductive disorders in Jersey crossbred cattle. Anoestrus was significantly affected by parity and season, but not by period of calving. Higher incidence during summer months suggests possible association with nutritional deficiency and heat stress, as also indicated by Hadush *et al.* (2013). Repeat breeding was significantly influenced by parity and season, while period did not exert significant effect. Similar findings have been reported by Arun (1999). Patel and Ponnusamy (2019) emphasized that scientific reproductive management practices and timely veterinary intervention significantly reduced reproductive disorders and improved reproductive efficiency in dairy animals. Mastitis showed highly significant ($P<0.01$) influence of lactation and season, whereas period had no significant effect. Increased incidence in advanced lactations may be related to cumulative udder exposure and declining immune competence. Comparable observations were made by Patil *et al.* (1995). Blood in milk was not significantly affected by lactation, period or season in the present study, although earlier reports by Mukharjee *et al.* (1993) suggested otherwise.

Estimation of economic losses

Average duration of treatment and treatment cost (rs./case) of major disorders

The findings related to this aspect were analyzed for three major lactation disorders, namely abnormal calving, mastitis and metritis and are presented in Table 5 in terms of average duration of treatment (days) and average drug cost per case across different lactation orders.

Average data presented in Table 5, indicated that duration of treatment of cows of this herd for abnormal calving was 3.16 days. The cows of first lactation took longer time of 3.85 days to recover whereas the cows in older age group could recover in a shorter period of 2.62 days. The results thus showed that older cows (5th and later lactations) recovered quickly. Regarding the expenditure incurred for treatment of cows following abnormal calving, it was found that on an average, Rs. 349.3 was incurred on

drugs. The treatment cost varied from Rs. 290.0 to Rs. 415.5 for the cows of different lactations. The results showed that expenditure incurred for treatment was highest for treating the animals for abnormal calvings in first lactation and lowest in fifth and later lactation. The results of the present investigation on duration of metritis treatment and the cost involved in curing this ailment have been presented in Table 5. On an average, the duration of metritis was observed for 7.1 days. The duration of metritis was found for a longer period (8.0 days) for cows in first lactation and for a shorter period for the cows belonging to fourth parity of lactation (6.5 days). The possible reason for longer duration of metritis among first calvers may be that these cows may not develop immunity or have weak immunity response. The overall expenditure incurred on treatment of a cow suffering from metritis came out to be Rs. 402.7 on cost of medicine only. The highest expenditure on cost of medicine (Rs. 440.4) for treating metritis was found for first calvers and lowest (Rs. 347.5) for the cows of fourth lactation. The relatively higher expenditure on treatment of metritis for first calvers was due to the reason that these cows were found more susceptible to metritis and required treatment for longer time compared to older cows. Thus it could be suggested that first calvers required extra and better care together with preventive measures in case of younger cows during first lactation. This can reduce the extra cost on treatment of younger cows. The data pertaining the duration of treatment and the cost incurred in the treatment of mastitis in Haryana cows at his farm have been presented in Table 5. It was observed that on an average, a cow could recover herself after treatment from mastitis after a period of 5.1 days. The cows of younger age belonging first and second lactation suffered with mastitis for a shorter period than older cows. The present study showed an increasing trend for treatment duration with increase in parity order. The overall expenditure incurred on treatment of a cow suffering from mastitis came out to be Rs. 451.0 on cost of medicine only. There was found an increasing trend in expenditure on drugs for treatment of mastitis with increase in lactation order up to fourth parity. The expenditure increased from Rs. 416.2 for cows of first parity to Rs. 488.6 for the cows belonging to fourth parity and it again decreased to Rs. 468.6 for those cows belonging to fifth and later lactations. Jingar *et al.* (2017)

Table 5: Average duration of treatment and treatment cost (Rs./case) of major disorders.

Lactation	Abnormal calving duration (Days)	Cost (Rs.)	Metritis duration (Days)	Cost (Rs.)	Mastitis duration (Days)	Cost (Rs.)
Overall	3.16 (46)	349.3	7.1 (71)	402.7	5.1 (164)	451.0
Parity 1	3.85 (17)	415.5	8.0 (20)	440.4	4.2 (35)	416.2
2	2.72 (9)	308.6	6.9 (24)	394.2	4.6 (33)	428.8
3	2.92 (5)	318.4	6.6 (11)	398.0	5.5 (32)	462.2
4	2.84 (7)	330.5	6.5 (7)	347.5	5.7 (23)	488.6
5	2.62 (8)	290.0	6.8 (9)	390.5	5.4 (41)	468.6

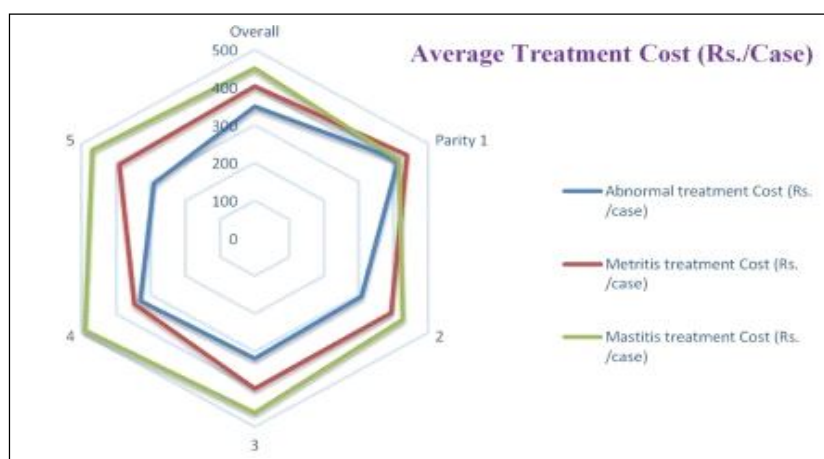


Fig 1: Average treatment cost (Rs./Case).

reported higher treatment cost (Rs. 470.52) for treating mastitis in fourth parity and lowest (Rs. 250.00) in second parity in Karan Fries and Karan Swiss cattle. The present experiment clearly indicate that lactation disorders impose considerable economic burden on dairy farmers due to increased treatment cost, prolonged recovery period and reduced productive efficiency. Similar observations regarding economic losses associated with reproductive disorders were reported by Das *et al.* (2023), who estimated substantial economic losses due to reproductive disorders in dairy cattle populations. Fig 1 shows that the average treatment cost per case varied among different reproductive disorders and parity groups, reflecting differences in disease severity and management expenses.

CONCLUSION

The study had concluded that lactation disorders are prevalent in dairy animals and are significantly influenced by non-genetic factors such as parity of lactation, period of calving and season of calving. Higher incidence of several reproductive and udder disorders was observed in early lactations, during specific periods and under adverse seasonal conditions. Economic analysis revealed that lactation disorders, particularly abnormal calving, metritis and mastitis, resulted in considerable treatment costs and increased duration of recovery, with first-lactation animals incurring higher losses. The findings emphasize that improved management practices, especially during early lactation and stress-prone seasons, can help reduce the incidence of lactation disorders and associated economic losses, thereby improving overall productivity and profitability of dairy herds.

Conflict of interest

All authors declare that they have no conflict of interest.

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