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Original Research

Effective Postpartum Follow-up Management Strategy Improves Reproductive Performance in Dairy Cows

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Abstract

The present study was conducted on Karan Fries cows (n=100) to see the effect of postpartum health monitoring strategy on reproductive performance. Sixty freshly calved cows were monitored for any abnormal health, rectal temperature was recorded daily for 7 days, and febrile cows (> 103 ℉) were treated with systemic antibiotics and then re-examined at 10-15 days postpartum and again on the 30th day postpartum, i.e., "postpartum follow-up management strategy". While 40 cows were kept as controls, the cows with clinically abnormal health were treated only as per farm standards. Rectal temperature of febrile cows reduced significantly on day 1 and day 2 following antibiotic treatment (104.04±0.20 vs. 102.43±0.25 and 102.06±0.33 ℉, p<0.001). In the 'follow-up' group, mean days to first insemination and days open reduced by 28.6 and 38.7 days, respectively, compared to the control group (p<0.05). However, the first service (55.0 vs. 47.5%) and overall service (68.34 vs. 70%) conception rates were similar between the 'follow-up' and control group (p>0.05). It may be concluded that the "postpartum follow-up" management strategy improved the reproduction efficiency, particularly days to first insemination and days open in crossbred cows.

Keywords: Cows, Postpartum Follow-up, Rectal Temperature, Reproductive Performance.

Introduction

Two to three weeks following parturition is considered as the most critical phase of the production cycle in dairy cows. The cows are more prone to puerperal diseases, particularly uterine and udder infections (Patbandha *et al*., 2020), due to compromised immunity (Drackley *et al*., 2005). Puerperal disorders further negatively affect dairy cows' productive and reproductive performance (Kristula *et al*., 2001; Kumari *et al*., 2016). Postparturient health monitoring could be helpful to identify the cows that are more prone to puerperal diseases as early as possible. The implementation of managemental interventions, and preventive and therapeutic measures at suitable times could minimize the duration of illness and subsequently the economic losses (Smith and Risco, 2005). Previous studies in dairy cows reported that daily recording of rectal temperature for at least 7 days could be used as a non-invasive tool for routine monitoring of the health status of postparturient cows (Kristula *et al*., 2001; Smith and Risco, 2005). Systemic antibiotic treatment of cows with a rectal temperature above the normal range (>103^{o}F) had a positive effect on their health status (Kristula *et al.*, 2001). Thus, daily monitoring of rectal temperature for 7 days following calving and subsequent re-examination of the same cows at 10-15th and 30th day postpartum and therapeutic management could improve their health status. The objective of the present study was to see the effect of the implementation of postpartum health monitoring protocol and management strategy on reproductive performance in dairy cows.

Materials and Methods

The present study was conducted at National Dairy Research Institute (NDRI), Karnal, on total 100 crossbred Karan Fries cows for 7 months (July to January). The different meteorological variables at Karnal during the study period are presented in Table 1. The mean ambient temperature, relative humidity, Temperature Humidity Index (THI), rainfall, wind speed, and sunshine during the study period varied from 12.7^{o}C (January) to 29.3^{o}C (July), 67.5% (November) to 83.2% (August), 0.0 mm (December-January) to 7.9 mm (July), 1.8 km/hr (November) to 6.7 km/hr (July) and 3.2 hrs (January) to 5.9 hrs (July-August), respectively. The experimental cows were selected based on their body condition score (3.5-4.5 on a 1-6 point scale), body weight (430-540 kg), and previous standard lactation milk yield (3600-4000 kg). Moreover, the dams' standard lactation yield was considered for selection of primiparous cows. All the experimental procedures were approved by the Institutional Animal Ethics Committee (IAEC) of NDRI (1705/Go/ac/CPCSEA).

The experimental cows were maintained under a loose housing system. The freshly calved animals were kept in maternity pens, continuously for 5 days, and then shifted to the milking herd. The maternity pen had both covered and open areas with a feeder and waterer. The maternity pen had a concrete floor, whereas the milking animals' paddock had a brick on edge flooring. The cows in the maternity pen were milked twice daily (morning and afternoon) for colostrum by hand milking. In contrast, the cows in the milking herd were milked thrice daily by machine milking in an automatic Herringbone milking parlour (morning, noon, and evening). The cows were fed concentrate and green fodder uniformly throughout the experimental period on routine farm standards. The health management and other routine farm practices were similar throughout the experimental period.

Table 1: Meteorological variables during the study period (July-January)

Months	AT (^{o}C)	RH (%)	THI	Rainfall (mm)	Wind speed (km/hr)	Sunshine (hrs)
July	29.3±0.37	76.6±1.70	81.3±0.52	7.9±3.33	6.7±0.65	5.9±0.74
August	28.9±0.21	83.1±1.01	81.6±0.32	2.3±0.95	3.7±0.34	5.9±0.69
September	28.2±0.26	75.4±0.75	79.3±0.43	1.6±1.09	3.6±0.27	8.2±0.42
October	24.8±0.41	69.0±1.13	73.5±0.63	0.2±0.18	2.3±0.25	7.5±0.29
November	19.9±0.31	67.5±1.55	66.0±0.45	0.3±0.27	1.8±0.22	5.2±0.61
December	14.0±0.42	72.7±1.47	57.4±0.63	0.0±0.00	2.2±0.22	4.7±0.58
January	12.7±0.54	80.5±1.52	55.1±0.92	0.0±0.00	2.2±0.19	3.2±0.53
AT - Air temperature; RH - Relative humidity; THI - Temperature humidity index						

Health Monitoring Protocol

The cows were monitored by two health monitoring protocols. In the first (control) group (n=40), the health monitoring procedure was practiced as per the Animal Health Complex, NDRI. Briefly, cows were checked for retained fetal membranes (RFM) and then manual removal of fetal membranes and administration of I/U antibiotic bolus, parenteral oxytetracycline LA, ecbolic, and antihistamine. The animals were followed twice per week till their recovery. If there was a normal delivery, the cow was left without any health monitoring protocol. In the second, i.e., 'follow up' group (n=60), cows were examined for RFM, followed by daily temperature recording up to 7 days postpartum. Out of 60 cows, 20 had a fever (>103^{o}F rectal temperature at least for 2 days during morning time) and were treated with systemic Ceftiofur antibiotic (intramuscular route) for 3 consecutive days. The remaining 40 non-febrile cows in the 'follow-up' group received no antibiotics. Previous studies on the same breed reported an upper threshold limit of rectal temperature in healthy cows as 102.9^{o}F (Patbandha *et al*., 2020). Hence cows with a rectal temperature above 103.0^{o}F were considered febrile. Further, Kristula *et al*. (2001) reported a positive effect on the health status of febrile cows (>103^{o}F rectal temperature) that were treated with systemic antibiotics. Both febrile and non-febrile cows in the 'follow up' group were re-examined at 10-15 days postpartum and again 30 days postpartum for any uterine infections. In both groups, after a voluntary waiting period of 50 days, the cyclic cows were inseminated, and non-cyclic animals were induced for estrus followed by fixed-time insemination as per the farm protocol.

Statistical Analysis

Information about the first and successful insemination data was collected from the A.I. register. Then reproductive performance, such as days to first insemination, days open, and conception rate, were calculated. The effect of postpartum health monitoring protocol on days to first insemination and days open were compared by independent '*t*'-test, and on conception rate was compared by '*chi-square*' test. The median days to first insemination and median days open between the groups were compared by 'Mann-Whitney U' non-parametric test. The effect was considered significant when 'p'≤0.05.

Results and Discussion

The rectal temperature has been used as a non-invasive tool to monitor the health status of postparturient cows owing to ease of implementation and low cost. Fever or pyrexia is a vital clinical sign of postparturient infectious diseases, and systemic antibiotic treatment of animals with pyrexia and supportive therapy improves normal health status (Kristula *et al*., 2001; Smith and Risco, 2005). In this study, the rectal temperature was recorded daily for seven days in crossbred cows, and the febrile cows (>103^{o}F) were treated with systemic antibiotics. Following treatment, the rectal temperature reduced significantly in febrile cows on day 1 and day 2 after antibiotic treatment (104.04±0.20 vs. 102.43±0.25 and 102.06±0.33 ^{o}F, p<0.001). The results follow previous studies (Kristula *et al*., 2001; McLaughlin *et al*., 2013); who reported more than 1^{o}F reduction of rectal temperature in febrile cows treated with systemic antibiotics on day 1 succeeding treatment. Most of the cows that had rectal temperatures higher than the upper normal value (>103^{o}F) were later observed to be affected with uterine or udder infection and were treated with Ceftiofur antibiotic along with other supportive therapies. Wenz *et al*. (2011) reported higher rectal temperature in cows affected with infectious diseases like metritis, mastitis, and pneumonia during 10 days postpartum, which is supported by our result. Higher body temperature during infection is an adaptive mechanism that helps to fight infectious agents (Hart, 1988).

Table 2: Effect of postpartum follow-up on days to first insemination and days open in crossbred cows

Groups	Days to 1st AI		Days open	
	Mean±SE	Median (25%-75%)	Mean±SE	Median (25%-75%)
Control (n=40)	141.1^{a}±12.4	121.5^{a} (84.5-198.5)	164.2^{a}±13.7	143.0^{a} (99-233)
Follow-up (n=60)	112.5^{b}±5.9	103.0^{a} (74.5-149)	123.5^{b}±9.9	111.5^{b} (88-145)

Means or median values with different superscripts (a, b) differ statistically (p≤0.05)

In the 'follow-up' group, the mean days to first insemination significantly (p≤0.05) reduced by 28.6 days compared to the control group (Table 2). On the other hand, though the median days to first insemination were reduced by 18.5 days in the follow-up group compared to the control group, the difference was statistically insignificant

(p>0.05). Further, in the postpartum 'follow-up' group, both mean and median days open significantly (p≤0.05) reduced by 38.7 and 31.5 days, respectively, compared to the control group. In the 'follow-up' group, all the experimental cows were closely monitored, but only the cows with clinically abnormal health status were treated in the control groups. Some cows in the control groups may have had a fever or were sub-clinically affected. Still, such events were less in the follow-up group as the cows were monitored for 7 days closely and again re-examined at the 10-15th day and again on the 30th day postpartum. There was no significant (p>0.05) difference in mean and median days to 1st insemination in febrile cows treated with antibiotics and cows without fever (Table 3). Similarly, mean and median days open did not differ statistically (p>0.05) between the febrile cows treated with antibiotics and cows without fever (Table 3). The results followed Sheldon *et al*. (2004), who observed similar days to first insemination and days open in Holstein Friesian cows with and without fever. Treatment of febrile cows with antibiotics along with supportive therapy depending on clinical conditions may have improved their state of normal health and reproductive performance. This might be attributed to similar reproductive performance between the non-febrile group cows and the febrile cows treated with antibiotics and supportive therapy.

Table 3: Days to first insemination and days open in febrile crossbred cows treated with antibiotics and non-febrile cows

Groups	Days to 1st AI		Days open	
	Mean±SE	Median (25%-75%)	Mean±SE	Median (25%-75%)
Antibiotic treated (n=20)	115.4±8.3	115.4 (83-151.5)	119.5±8.1	125.5 (97-141)
Non- febrile (n=40)	111.2±7.9	103.0 (71-139)	125.4±14.3	110.0 (78-154)

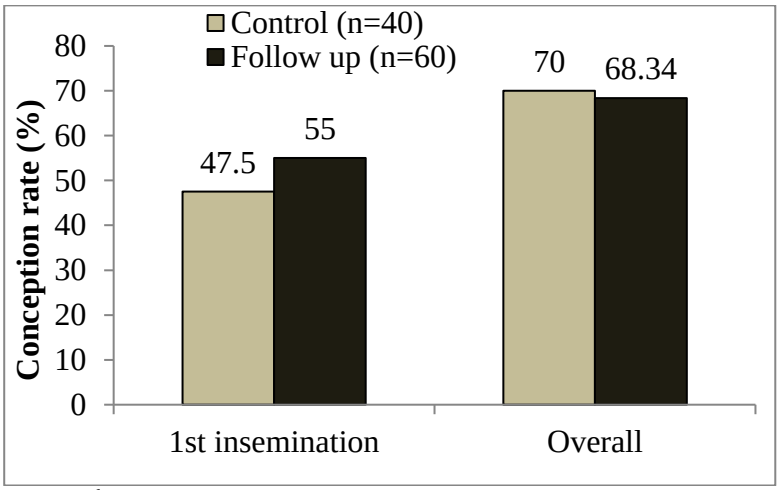

Figure 1A: First and up to 3rd insemination conception rate (%) of cows in control (n=40) and follow-up group (n=60).

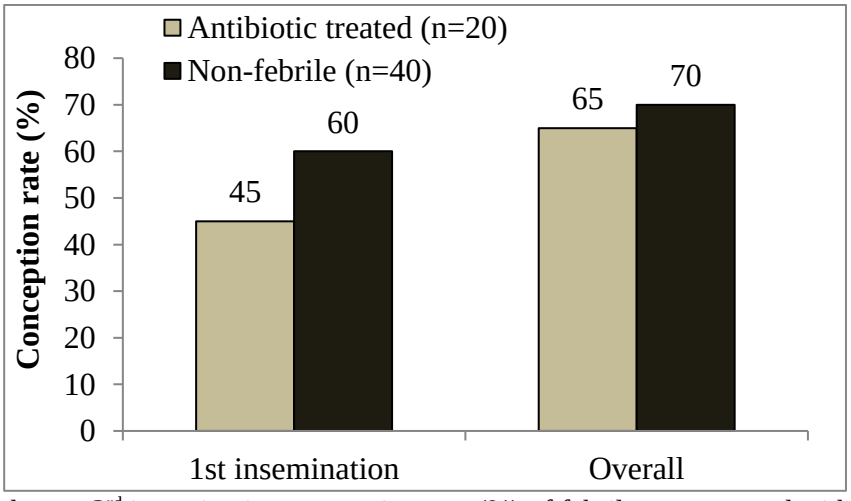

Figure 1B: First and up to 3rd insemination conception rate (%) of febrile cows treated with antibiotics (n=20) and non-febrile cows (n=40).

The first service conception rate and overall conception rate of crossbred cows are depicted in Figures 1A and 1B. However, the first service conception rate was observed to be higher in the 'follow-up' group as compared to the control group (55.0 vs. 47.5%); it did not differ statistically (p>0.05). Similarly, the overall conception rate did not vary statistically between follow-up and control groups (70.0 vs. 68.34%, p>0.05). Further, the cows without fever had a 60% first service conception rate, though it was comparatively higher than the antibiotic treatment group (i.e., 45%), but did not differ statistically (p>0.05). Similarly, the overall conception rate remained statistically similar (70% and 65% conception in non-febrile and antibiotic treatment groups, respectively). Previous studies reported a positive effect of early diagnosis followed by treatment of cows affected with uterine infections on pregnancy in dairy cows (Benzaquen *et al*., 2007; Giuliodori *et al*., 2013). Treatment of febrile cows in this study may lead to their better recovery and readiness for insemination. This might be attributed to the similar conception rate between febrile and non-febrile cows.

Taken together, it may be concluded that post-partum health monitoring (or follow-up) improved reproductive performance in reducing days to first insemination and days open in crossbred cows. However, the postpartum follow-up management strategy did not affect the conception rate.

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Contribution by Authors

All the authors contributed equally to writing the manuscript. The final manuscript was read by all authors and consented to publication.

Conflict of Interests

There is no conflict of interest.

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