



A study on the factors influencing resumption of postpartum ovarian activity in crossbred cows*

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Abstract

The aim of the study was to identify the factors influencing postpartum resumption of ovarian activity in crossbred cows. Sixty crossbred cows on day 30 postpartum were selected and the details of age, parity, milk yield, peripartum and postpartum complications were recorded. Animals were examined per rectally from 30 to 90 days postpartum at 12 days interval for the presence of corpus luteum (CL) of any stage during the period of study. Serum progesterone concentrations were estimated and cows which resumed ovarian activity (progesterone concentration >1 ng/mL) at early and late postpartum periods were identified. Association of age, parity, BCS, milk yield and reproductive complications with postpartum resumption of ovarian activity (ROA) at varying periods was analysed. No significant association between ROA and variables such as age, parity, milk yield and reproductive complications were observed. BCS was significantly ($P < 0.01$) associated with ROA. The higher number of animals with postpartum complications belonged to not resumed period than that of early and late resumed periods. The odds ratio for BCS indicated 6.46 times risk for ROA for every unit increase of BCS.

Key words: Animal factors, postpartum dairy cows, resumption of ovarian activity

The reproductive performance of dairy cows is dependent on the period at which the animal resumed its ovarian activity postpartum. Severe negative energy balance during postpartum period might increase the chance for the development of many metabolic disorders and reproductive complications. Major limiting factors which influence the postpartum ROA of dairy cattle are age, parity, BCS and milk yield. During the postpartum period timely uterine involution plays an important role in evoking ROA postpartum fertility. Uterine function is usually compromised in cattle

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by bacterial contamination of the uterine lumen after parturition, and pathogenic bacteria often persist, causing uterine disease, a key cause of infertility in cattle.

Uterine infections can delay the onset of postpartum ovarian cyclicity by delaying the initiation of folliculogenesis and suppressing the rate of follicular growth in dairy cows during the early puerperium by inhibiting LH release (Jainudeen and Hafez, 2000). Zraly *et al.* (1989) assumed that the delayed and asynchronous growth of follicles in cows with pathological puerperium was a consequence of disturbed repairing processes of endometrium and endocrine dysfunctions. Altered follicular responsiveness to gonadotrophic support through changes in metabolic hormones such as insulin-like growth factor I (IGF-I) and insulin may contribute to impaired function of dominant follicles at early postpartum. Mateus *et al.* (2002) reported that abnormal ovarian activity (prolonged anestrus, prolonged luteal phases, and ovarian cysts) in cows with severe endometritis.

Materials and Methods

The study was conducted at Instructional Livestock Farm Complex (ILFC), Pookode and Livestock Research Station (LRS), Thiruvazhamkunnu. Sixty crossbred cows aged between 3 to 10 years of age; 2 to 5 parity were selected for the study. Data regarding the milk yield, peripartum and postpartum complications of the selected animals were recorded. Observations on postpartum complications such as postpartum metritis, endometritis, cervicitis, vaginal prolapse and vaginitis were recorded.

The BCS of the cows was ascertained based on the fat deposition over certain areas of the body as per Smijisha (2012). Cows were subjected to clinico-gynaecological examination at 12 days interval from 30 to 90 days postpartum for the assessment of uterine involution, inflammatory changes and the presence of abnormal vaginal discharges to assess the reproductive health and ovarian functional status by detecting the presence of CL. Blood samples (5 mL) were collected by jugular venipuncture in clot activator blood

collection vacutainers at 12 days intervals starting from day 30 till day 90 postpartum. Serum was separated by centrifugation at 1500 G for 10 minutes and stored in storage vials at -20°C until assayed for progesterone concentration. Progesterone estimation was carried out by using sandwich ELISA kit. The influence of age, parity, BCS, milk yield and reproductive complications for the ROA postpartum were analysed statistically. The ROA was assessed by the first rise in serum progesterone concentration above 1 ng/mL from days 30 to 90 postpartum. ROA was further divided into early resumption (before 42 days postpartum), late resumption (resumed between days 42 to 90 postpartum). The samples were subdivided into resumed or not resumed before 42 days postpartum to study the influence of different variables on early ROA by logistic regression analysis.

Result and discussion

Out of 60 animals selected 22 cows resumed cyclicity before day 42 postpartum and 38 animals not resumed cyclicity within 90 days postpartum (table 1).

Out of 22 animals which resumed cyclicity 8 (36.4%) cows were belonged to the age group < 4.5 years while 14 (63.6%) cows were ≥ 4.5 years of age. Out of 38 cows which did not resumed activity 15 (39.5%) were aged < 4.5 years and 23 (60.5%) were aged ≥ 4.5 years. Nonsignificantly ($P > 0.05$) higher number of animals which did not resume cyclicity were aged ≥ 4.5 years (table 1)

Out of 22 animals resumed cyclicity 13 (59.1%) cows were belonged to the parity group ≤ 2 while 8 (40.9%) cows were > 2 parity. Out of 38 cows which did not resumed activity 18 (47.0%) were belonged to parity ≤ 2 and 20 (52.6%) were within the parity > 2 . Nonsignificantly ($P > 0.05$) higher number of animals which did not resume cyclicity within the parity range > 2 .

Out of 22 animals resumed cyclicity 10 (45.5%) cows were belonged to the BCS group ≤ 3 while 12 (54.5%) cows were > 3 BCS. Out of 38 cows which did not resumed activity 18 (47.0%) were belonged to BCS ≤ 3 and 20

(52.6%) were within the BCS > 3. Regression analysis of the data revealed a significant ($P < 0.01$) association of BCS with ROA postpartum was observed. It was found that higher the BCS range > 3, the number of animals which did not resumed cyclicity also increased. The odds ratio (6.46) for ROA was higher for BCS which indicated that there existed 6.46 times risk for every unit increase of BCS. However, the influence of age and parity were non significantly associated for development of postpartum ROA as its odds ratios were 0.704 and 0.290, respectively.

In the present study, age and parity of the selected animals were not significantly ($P > 0.05$) influenced the postpartum ROA. Similar observations made in several earlier studies that postpartum ovarian activity was not influenced by age and parity and a prolonged quiescence of ovaries were observed in primiparous than in multiparous cows (Morrow *et al.*, 1969; Bulman and Lamming, 1978). However, Opsomer *et al.* (2000) found parity as a clear risk factor for prolonged luteal phases in postpartum cows. They observed that cows that had calved 4 or more times were 2.5 times

Table 1. Significant factors affecting resumption of ovarian activity at different periods (< 42 days and > 42 days) postpartum (n=60)

Factors	Classification	Resumed before 42 days	Not resumed before 42 days	P value	Odds ratio	95% CI
Age	<4.5	8 (36.4%)	15(39.5%)	0.656 ^{ns}	0.704	0.151-3.288
	≥ 4.5	14 (63.6%)	23 (60.5%)			
Parity	≤2	13 (59.1%)	18 (47.0%)	0.107 ^{ns}	0.290	0.064-1.307
	>2	8 (40.9%)	20 (52.6%)			
BCS	≤ 3.0	10 (45.5%)	18 (47.4%)	0.003 ^{**}	6.467	1.923-21.742
	>3.0	12 (54.5%)	20 (52.6%)			
Total no. of cows (n=60)		22 (36.67 %)	38 (63.33%)			

ns – Non significant, ** indicate significant ($P < 0.01$), CI- confidence interval

Table 2. Influence of milk yield and reproductive complications for the early resumption (before 42 days) of ovarian activity postpartum (n=60).

Factors	Classification	n	P value	Odds ratio	95% CI
Milk yield	As per records	60 (100.0 %)	0.938 ^{ns}	1.185	0.938-1.498
Reproductive complications	No complications	37 (61.67%)	0.686 ^{ns}	0.767	0.212-2.775
	With complications	23 (38.33 %)			

ns- nonsignificant

Table 3. Number and per cent of cows resumed and not resumed the ovarian cyclicity at different periods postpartum

	Parameters	Postpartum resumption of ovarian cyclicity			
		Not resumed >90 days	Early resumed (<42 days)	Late resumed (42-90 days)	Total no. and % of animals
without reproductive Complications	No. and % of animals	16 (43.2%)	13 (35.1%)	8 (21.6%)	37 (61.67%)
		11 (47.8%)	9 (39.1%)	3 (13.0%)	23 (38.33%)
Total no. and % of animals		27 (45.0%)	22 (36.7%)	11 (18.3%)	60 (100%)

more at risk than primiparous cows for ROA. Zain *et al.* (1995) remarked that increased parity adversely affected both uterine involution and ROA. They found that cows with a parity ≥ 3 resumed cyclicity later (30.3 ± 3.6 days) than that in primiparous cows (25.5 ± 2.9 days).

Gillund *et al.* (2001) also reported that cows with a BCS of more than 3.5 before calving might have 2.5 times higher risk of developing ketosis which could interfere with ROA postpartum. However, Butler and Smith (1989) indicated that cows which had a decrease in BCS of one unit or more during the first five weeks postpartum had a prolonged interval to the first observed oestrus when compared with their herd mates which had a meagre decline in body condition. Similarly, Opsomer *et al.* (1998) also observed that decrease in body condition was an important risk factor for delayed ovulation and cows losing more BCS during the first and second month after calving were significantly more at risk (odds ratio at 30 and 60 days after calving was 18.7, and 10.9, respectively) of a delay in ovarian function in the immediate postpartum period. Hence, prepartum determination of BCS could provide the status of body reserves of dairy cows which could be utilized during the period of NEB. However, the influence of milk yield and reproductive complications was nonsignificantly associated for development of postpartum ROA as its odds ratios were 1.185 and 0.767, respectively.

Out of 37 animals without reproductive complications 16 (43.2 per cent) cows not resumed cyclicity whereas 13 (35.1 per cent) and 8 (21.6 per cent) cows resumed cyclicity at early and later periods, respectively (table 3). Out of 23 animals with reproductive complications 11 (47.8 per cent) cows not resumed cyclicity whereas, 9 (39.1 per cent) and 3 (13.0 per cent) cows resumed ovarian activity at early and late postpartum periods, respectively. No significant differences ($P > 0.05$) between cows with and without reproductive complications for the postpartum initiation of ovarian activities could be obtained. However, among cows with reproductive complications, nonsignificantly ($P > 0.05$) higher proportion of cows (47.8 per cent) not resumed cyclicity as compared to rest of the population.

Studies showed that higher number of animals without reproductive complications (16 cows; 43.2 per cent) also not resumed before day 42 postpartum as compared to that of early and late periods of resumption. The higher animals with postpartum complications (11 cows; 47.8%) also not resumed ovarian activity than that of early and late resumed periods.

Puerperal diseases have long been implicated in retarding ovarian activity. (Opsomer *et al.*, 2000) observed puerperal disorders also played a significant role in the postpartum ROA. Cows with abnormal calving later affected by puerperal disorders were, 3-3.6 times more at risk of resuming ovarian activity. They also mentioned that cows that retained fetal membranes more than 12 h were not significantly at risk. The occurrence of clinical diseases such as clinical mastitis, severe lameness, or pneumonia during the first month after calving, was a significant risk factor for developing delayed ovarian activity. Cows with these diseases during the first month after calving were 5.4 times more at risk of having a delayed ovarian resumption after calving.

Conclusion

In the present study, no significant association between age, parity, milk yield and reproductive complications with resumption of ovarian activity could be elucidated. However, higher BCS at calving is a risk factor for delayed onset of cyclicity which might be due to rapid mobilization of body fat and subsequent metabolic disorders related to postpartum. More number of animals with reproductive complications failed to resume ovarian activity postpartum. Data from larger population is warranted for associating the variables to reach more conclusive findings.

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