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Postpartum Anestrous and Risk Factors in Crossbreed Dairy Cows in Northern Central Highland of Ethiopia

Tewodros Eshete [a*], Tilaye Demisse [b], Tefera Yilma [b], Berhan Tamir [c]

[a] Department of Animal Science, College of Agriculture and Natural Resource Science,
Debre Berhan University, Debre Berhan, Ethiopia
[b] Department of Veterinary Obstetrics and Gynecology, College of Veterinary Medicine and Agriculture,
Addis Ababa University, Bishoftu, Ethiopia
[c] Department of Animal Production Studies, College of Veterinary Medicine and Agriculture,
Addis Ababa University, Bishoftu, Ethiopia

ABSTRACT

The study was carried out to determine the prevalence and incidence of postpartum anestrous problems and its associated risk factors in crossbred dairy cows in northern central highland of Ethiopia. Retrospective and longitudinal study was used to gather data on the occurrence of postpartum anestrus and the associated risk factors in crossbred cows. The prevalence and incidence of postpartum anestrous were 39.7% and 40.95%, respectively. Risk factors such as age, parity, body condition, milk yield, management condition, herd size, heat detection practices and predisposing reproductive problems had significant influence on the prevalence and incidence of postpartum anestrous in crossbred dairy cows. Postpartum anestrous was significantly aggravated as the age, parity and milk yield of dairy cows increased. The highest occurrences of postpartum anestrous was identified in crossbred dairy cows with poor body condition score, large herd size, poor management condition, inaccurate heat detection practice and in crossbred dairy cows that had a history of reproductive problems during the previous calving. Maintaining optimal body condition score of cows, farmers' awareness creation on management condition, i.e., how to improve their farm hygiene, feed and feeding dairy cow, and health care and handling animals during and after parturition would increase the number of cows ready for breeding by 60 days postpartum

Keywords: Crossbred, Dairy cows, Incidence, Risk factors, Postpartum anestrous, Prevalence.

INTRODUCTION

Ethiopia has a large cattle population of 65.4 million cattle, of which 7.15 million are dairy cows and 12.57 million milking cows (CSA, 2020). Despite the large number of dairy cattle, their production and reproductive performance are poor, and dairy production is also a subsistence smallholder-based industry (Gebreyohanes et al, 2021). Reproductive inefficiency resulted in inconsiderable economic losses of smallholder dairy farm and dairy industry due to prolonged calving interval, early culling of potentially used cows, reduced milk yield and overall lifetime performances and increased cost due to veterinary services (Talukedem et al., 2005). The duration of postpartum anestrous has an important influence on reproductive performance (Lucy, 2007). In high yielding dairy herds, there is increased incidence of anestrous, perhaps due to increased partitioning of energy to milk production can result in postpartum anestrous by delaying resumption of follicular activity (Opsomer et al., 2004). Postpartum anestrous is a state of complete sexual inactivity with no manifestation of estrous for more than two months (Opsomer et al., 2004).

The anestrous condition is associated with the presence of inactive ovaries, and even if there is follicular development, none of the growing follicles becomes mature enough to ovulate (Montiel & Ahuja, 2005). There are many factors that influence postpartum anestrous problems, including age, parity, management system, herd size, body condition score, peripartum disease, milk yield, inadequate feed and some other predisposing reproductive problem (Butler, 2003; Dulo et al., 2017). Due to rising urbanization, increasing human population, the demand for milk, and the fact that the dairy industry provides employment opportunity for the unemployed once in the study area, smallholder and commercial dairy farms and dairy production occasionally risen quickly. However, the performance of the dairy cows in terms of productivity and reproduction as well as the profitability in the study area is

*Corresponding author: tedyshet@gmail.com

incredibly low. Most of dairy farmers are complaining dairy cows kept in their farm did not provide one calf annually; it may take two and above years even if the management conditions practiced are relatively good. This might be due to occurrences of reproductive problems, lack of reproductive management (poor heat detection, lack of close inspection of reproductive system of dairy cow pre- and post-delivery), which might be the main economic problems of the sector. Moreover, there is no well documented study on the occurrences of postpartum anestrous and associated risk factors in study area. Therefore, based on the above justification and background, the current study was carried out to determine the prevalence and incidence of postpartum anestrous in crossbred dairy cows and to identify associated risk factors of postpartum anestrous in selected areas of north central highlands of Ethiopia.

MATERIALS AND METHODS

Description of study area:

The study was conducted in milkshed areas of nort h central highlands of Ethiopia (Debre Berhan, Chacha, Basonawerena and Sheno). Debre Berhan, Basonaworena and Chacha are located in north Shoa zone, Amhara National Regional State. Sheno is located in north Shoa zone, Oromiya National Regional State.

Study animals:

A total of 504 dairy cows from 240 smallholder farms were taken for retrospective study. The cows were 1 to 5 parity and 2 to 10 years old, hand milked twice a day and managed in different production systems. For the longitudinal study, 185 pregnant crossbred dairy cows and heifers from 11 purposively selected dairy farms located in Debre Berhan and Chacha towns were taken. They were calved during the study period from December 2019 to May 2021. These cows were 1 to 5 in parity, 2 to 10 years old, hand milked twice a day and were kept under a similar production system (intensive type of farming).

For the study, four districts, and two *kebeles* (smallest administrative unit) from each district with a total of 8 *kebeles* were purposively selected based on the availability of crossbred dairy cows.

Sample size of dairy farms:
Arsham (2005) sample size determination formula was used to determine the number of dairy farms involved in this study. This formula was employed with estimation of 3% of standard error (SE), 5% desired absolute precision (d), $n = (SE)^2/d^2$ therefore sample size of dairy farms was calculated as follows: $(0.5)^2/ (0.03)^2$, a total of 277 dairy farms were determined, However, only 240 dairy farms were considered for this study and the rest

(37) were rejected due to inappropriateness and lack of proper data about their dairy cows.

Sample size of dairy cow:

The sample size required for this study was calculated using Thrusfield (2007) formula, which took into account the estimated prevalence of postpartum anestrous as well as the desired absolute precision. Using a 95 percent confidence interval, a 5% precision, and since there is no any similar report in the study area 50% expected prevalence was taken, so the sample size was calculated as follow.

$$n = \frac{1.96^2 \, P_{exp} \, (1-P_{exp})}{d^2}$$

P_{exp}= Expected prevalence 50%, d = Desired level of precision (5%) and n= Sample size
$[1.96^2 \times 0.5 \, (1-0.5)]/(0.05)^2 = 384$ dairy cows

However, to increase the precision of the study, 120 dairy cows were added to the 384, therefore 504 dairy cows were taken to illustrate the prevalence of postpartum anestrous in the northern central highland of Ethiopia. Individual dairy cows from the 240 selected dairy farms were sampled using simple random sampling based on the composition of the dairy cows. From 504 dairy cows, 185 individual dairy cows were sampled using simple random sampling for a longitudinal study in order to examine the incidence of postpartum anestrus. From a total of 240 dairy farms, 11 dairy farms with at least 10 pregnant cows and heifers were purposively selected for the longitudinal study.

Study design and data collection:

From December 2019 to May 2021, a retrospective study using cross sectional study design and longitudinal study through regular follow up was carried out to ascertain the prevalence and incidence of postpartum anestrous, respectively, and associated risk factors in the study area.

Retrospective study:
Retrospective study was conducted to study prevalence and analysis of major risk factors of postpartum anestrous in crossbred dairy cow. To examine the prevalence of postpartum anestrous in the selected farms, data from the record books and casebooks of individual dairy cows kept by the farms were collected to identify postpartum anestrous, predisposing reproductive disorders, and risk factors. Interviews with dairy farm owners, custodians, and managers were also used to acquire missing data from record books and casebooks about the occurrences of postpartum anestrous and risk variables. Data on the following parameters were carefully recorded on a cow basis (age, parity,

milk yield and body conditions score) and herd basis (herd size, management, production system and heat detection practices).

For all of the cows, body condition was scored in order to assess the nutritional status. Therefore, animals were grouped into 0, 1, 2, 3, 4 and 5 body condition scores (BCS) according to Richard (1993). Based on BCS, cows were classified as poor (≤ 2.5), medium (≥ 2.75 to ≤ 3.5) and good (≥ 3.75) to evaluate their effect on the prevalence of postpartum anestrus in crossbred dairy cattle (Esheti and Moges, 2014). According to Nishi et al. (2018) and Dulo et al. (2017) the age and parity of cows were categorized into 3 groups such as age (≤ 4, 5 to 6 and ≥ 7 years); parity $\leq 2^{nd}$, 3rd to 4th and $\geq 5^{th}$ parity), respectively, and their effects on prevalence of postpartum anestrous were evaluated. Milk yield of cows also categorized into three groups such as ≤ 10 litters, 10 to 20 and ≥ 20 litters daily based on milk yield data recorded during the study period and yield effects on postpartum anestrous were evaluated. Classification of management systems was done based on the criteria adopted by Richard (1993). Accordingly, extensive, semi-intensive and intensive systems are identified and their effects on prevalence of postpartum anestrus in crossbred dairy cattle were evaluated. Management condition of the dairy farms was also categorized into 3 groups as follows. Poor: Cows were provided with traditional feed such grazing and limited straw feeding; they were housed on a conventional floor without any facilities, and there were no measures taken to prevent disease or deworm the cows. Medium: the cows were supplied some concentrate and straw, they were housed in farm with little facilities of concrete floor and manger but not scientifically made and poor drainage system, deworming irregularly and have taken disease preventive measures occasionally. Good: Cows were supplied balanced feed (concentrate, vitamin and mineral mixture before calving) diet including brewery by product and straw), the cows were housed in farm with concrete floor, relatively scientifically made and good drainage system, dewormed and have taken diseases preventive measures regularly every 2 month interval. Similarly, their effects on the occurrences of postpartum anestrous were evaluated.

Longitudinal study:

A longitudinal study design with regular follow-up dairy cows was used to examine the incidence of postpartum anestrous and associated risk factors in crossbred dairy cattle. 185 pregnant cows in the 11 dairy farms were identified by their tag number/ID, and parity, and their gestation period regularly followed until delivery and 60 days after delivery by referring their individual case book. Data on the above considered risk factors were also carefully recorded and used same methods of categories. Cows were closely observed during gestation, at and after calving, data were recorded. If a cow has not been shown estrus by 60 days postpartum period record as anestrus, if the cow has not been conceived from three or more regularly spaced service recorded as repeat breeder, if the fetal membrane of the cow has not been removed or expelled within 24 hours of postpartum period recorded as retained fetal membrane (RFM), if the cow had parturition problem recorded as dystocia, if the cow had delivered fetus before full gestation period recorded as abortion, if the cow has vaginal discharge after parturition (21 to 42 days in milk) was recorded as endo-metritis (Ayisheshim, 2017).

Data management and analysis:

The data were analyzed using Statistical Package for Social Sciences Version 25. Chi square was used to determine the associations between risk factors with prevalence and incidence of postpartum anestrous. Logistic regression was also employed to check the influence of the risk factors on the occurrences of postpartum anestrous. In all the analysis, $p < 0.05$ was considered to have a significant effect.

RESULTS

The retrospective study revealed that, from 504 animals examined, 39.7% prevalence of postpartum anestrous at 60 days postpartum was obtained (Table 1). Postpartum anestrous was also found as the highest incidence i.e., 40.9%.

Prevalence and risk factors:

The effect of considered risk factor on the postpartum anestrous is shown in Table 2. Age and parity had significant ($P < 0.05$) effect on prevalence of postpartum anestrous. The prevalence of the postpartum anestrous was 63.8 and 8.4 times higher in relatively older cows ≥ 8 and 6 7 years of age, respectively than other age groups. The body conditions of dairy cows had significant effect ($P < 0.05$) on the prevalence of postpartum anestrous. The prevalence of postpartum anestrous was 9.1 and 1.9 times higher ($P < 0.05$) in dairy cows at poor and fat body condition, respectively compared to dairy cows at medium body condition. This study revealed a significant association of the prevalence of postpartum anestrous ($P < 0.05$) with increasing milk yield, in cows which provide greater than 20 litters of milk had the highest prevalence (67.5%). With respect to herd size there was a significant difference ($P < 0.05$) with the prevalence of postpartum anestrous. The prevalence of postpartum anestrous was 2.9 times higher ($P < 0.05$) in dairy cows with relatively large herd size

(> 20 heads per herd) compared to dairy cows with relatively small herd (< 10 heads per herd).

Effects of management condition on the prevalence of postpartum anestrous in dairy cows are shown in Table 3. It was observed that, the prevalence of

Table 1: Prevalence and incidence of postpartum anestrous in crossbred dairy cows.

Methods	Total No of cow examined	No of cow affected	Percentage affected
Retrospective Study	504	200	39.7
Longitudinal Study	185	76	40.9

Table 2: Associated risk factors with the prevalence of postpartum anestrous in crossbred dairy cows

Risk factors	Retrospective Study					
	Category	No. of animals examined	Prevalence of RB No. (%)	X^2 (p-value)	Odds ratio (95% CI)	P-value
Age of cow	≤3 years	92	10 (10.9)	191.2	1 Reference	0.000
	4-5 years	189	31 (16.4)	(0.000)	1.6 (0.74-3.78)	0.239
	6-7 years	97	49 (50.5)		8.4 (3.88-18.04)	0.000
	≥8 years	123	95 (77.2)		63.8 (27.0-150.9)	0.000
Parity	≤2 parity	252	35 (13.9)	109	1 Reference	0.000
	3-4 parity	135	61 (45.2)	(0.000)	5.1 (3.12-8.36)	0.000
	≥5	117	90 (76.9)		45.6 (23.5-88.5)	0.000
BCS	Thin	156	113 (72.4)	105.9	9.1 (5.8-14.3)	0.000
	Medium	269	59 (21.9)	(0.000)	1 Reference	0.000
	Fat	79	28 (35.4)		1.9 (1.13-3.37)	0.016
Milk Yield	<10 litters	156	38 (24.4)	58.2	1 Reference	0.000
	1020 litters	222	77 (34.7)	(0.000)	1.6 (0.09-0.26)	0.040
	>20 litters	126	85 (67.5)		6.4 ((0.38-0.96))	0.000
Herd size	< 10	247	130 (37.5)	9.5	Reference	0.011
	10-20	119	46 (38.7)	(0.009)	1.1 (0.69-1.63)	0.774
	> 20	38	24 (63.2)		2.9 (1.45-5.80)	0.000

Table 3: Associated herd related risk factors with the prevalence of postpartum anestrous in crossbred dairy cows.

Risk factors	Retrospective Study					
	Category	No. of animal examined	Prevalence of RB No. (%)	X^2(p-value)	Odds ratio (95% CI)	P-value
Production system	Extensive	181	46 (63.9)	28.3	4.1 (2.3-7.4)	0.000
	Semi-intensive	241	100 (41.5)	(0.000)	2.4 (1.4-4.1)	0.031
	Intensive	72	54 (28.3)		1 Reference	0.000
Management Condition	Poor	112	70 (62.5)	36.5	4.4 (2.7-7.2)	0.000
	Medium	184	72 (39.1)	(0.000)	1.7 (1.1-2.6)	0.014
	Good	208	58 (27.9)		1 References	0.000
Heat detection	Daily ≤ 20min	94	61 (64.9)	30.7	3.6 (2.3-5.8)	0.000
	Daily ≥ 20 min	410	139 (33.9)	(0.000)	1 References	0.000
Predisposing reproductive disorders						
Abortion	Yes	74	31 (58.1)		2.4 (1.48-4.02)	0.001
	No	430	156 (36.3)	0.000	1 References	
Dystocia	Yes	66	31 (53.0)		1.9 (1.12-3.18)	0.017
	No	438	164 (37.4)	0.016	Reference	
RFM	Yes	162	85 (47.5)		1.6 (1.09-2.34)	0.015
	No	342	122 (35.7)	0.011	Reference	
Metritis/endometritis	Yes	101	46 (54.5)		2.0 (1.28-3.12)	0.002
	No	403	144 (35.7)	0.001	1 References	
Vaginal/uterine Prolapses	Yes	48	13 (72.9)		4.8 (2.48-9.32)	0.000
	No	456	164 (36.0)	0.000	1 References	

Table 4: Associated risk factors with incidence of postpartum anestrous in crossbred dairy cows.

Risk factors	Regular Follow up (Longitudinal Study)					
	Category	No. of animals examined	Incidence RB No. (%)	X^2 (p-value)	Odds ratio (95% CI)	P-value
Age of cow	< 4 years	64	10 (15.6)	55.5 (0.000)	1 reference	
	5-6 years	55	15 (27.3)		2.0 (0.82-4.97)	0.124
	> 7 years	67	51 (76.1)		17.2 (7.15-41.41)	0.000
Parity	<2 parity	75	13 (17.3)	54.2 (0.000)	1 reference	0.000
	3-4 parity	76	31 (40.8)		3.3 (1.55-6.98)	0.002
	>5	35	35 (91.4)		50.9 (13.51-191.56)	0.000
BCS	Poor	64	50 (78.1)	56.2 (0.000)	15.5 (5.23-44.99)	0.000
	Medium	90	20 (22.2)		1.24 (0.45-3.42)	0.681
	Good	32	6 (18.8)		1 reference	0.000
Milk Yield	< 10 litters	57	11 (19.3)	44.35 (0.000)	1 reference	0.000
	10-20 litters	73	22 (30.1)		1.8 (0.79-4.12)	0.162
	>20 litters	56	13 (76.8)		13.8 (5.60-34.16)	0.000
Management	Poor	56	16 (71.4)	34.6 (0.000)	11.3 (1.1-5.5)	0.000
	Medium	75	26 (34.7)		2.4 (4.6-27.6)	0.041
	Good	55	10 (18.2)		1 reference	0.000

Table 5. Associated risk factors with incidence of postpartum anestrous in crossbred dairy cows.

Risk factors	Regular Follow up (Longitudinal Study)					
	Category	No. of animal examined	Prevalence of RB No. (%)	X^2 (p-value)	Odds ratio (95% CI)	P-value
Herd size	<20	71	22 (31.0)	4.6 (0.099)	1 reference	
	20-30	32	15 (46.9)		1.9 (0.83-4.6)	0.122
	>30	83	39 (47.0)		2 (1.0-3.83)	0.044
Heat detection	≤ 20 min	104	20 (19.3)	45.7 (0.000)	1 reference	
	> 20 min	82	56 (68.3)		9.0 (4.6-17.7)	0.000
Predisposing reproductive disorders						
Abortion	Yes	56	36 (65.5)	19.5 (0.000)	4.3 (2.21-8.41)	0.000
	No	131	40 (30.5)		1 reference	
Destocia	Yes	44	27 (61.4)	10.0 (0.002)	3.0 (1.5-6.1)	0.002
	No	142	49 (34.5)		1 reference	
RFM	Yes	55	31 (56.4)	7.8 (0.005)	2.5 (1.3-4.7)	0.006
	No	131	45 (34.4)		reference	
Metritis/endometritis	Yes	139	53 (62.2)	8.7 (0.003)	2.9 (1.4-6.3)	0.004
	No	37	23 (35.6)		reference	
Vaginal/uterine prolapse	Yes	38	255 (65.8)	12.3 (0.000)	3.6 (1.7-7.8)	0.001
	No	148	51 (34.5)		reference	

postpartum anestrous was highest in poor management condition (67.8%) and the lowest in good management condition (28.6%). The prevalence was significantly (P < 0.05) associated with the management condition. Odds ratio estimate for the prevalence of postpartum anestrous was 4.4 times higher (P < 0.05) in cows which was managed in poor management condition compared to in dairy cows which managed under good management condition. The prevalence was higher in faulty heat detected dairy cows (64.9%) and lower in correctly heat detected dairy cows (33.9%). The prevalence was significantly (P < 0.05) influenced by the heat detection practice of dairy cows. The effect of predisposing reproductive problems (abortion, dystocia, RFM, metritis/endometritis and vaginal/uterine prolapse)

were significantly associated (P < 0.05) with the prevalence of postpartum anestrous in crossbred dairy cows. Estimates were 2.4, 1.9, 1.6, 2.0 and 4.8 times higher which were predisposed by abortion, dystocia, RFM, metritis/endometritis and vaginal/uterine prolapses, respectively compared to dairy cows which were free of the aforementioned reproductive problems.

Incidence and risk factors:
All risk factors of the farms were considered to assess their influence and association with the incidence of postpartum anestrous (Table 4). Age, parity, body condition, milk yield and management condition of the farm had highly significant influence and were significantly associated with the incidence of postpartum anestrous (P < 0.05). Estimate was 17.2 times higher (P < 0.05) in

relatively older cows (≥ 7 years), respectively, compared to those with younger age (≤ 4 years). Cows that have ≥ 5 and 3 4 parity had 50.9 and 3.3 times higher, respectively in comparison to those that have ≤ 2 parity (P < 0.05). Estimate was furthermore 15.5 times higher in dairy cows with poor body condition compared to in cows with good body condition (P = 0.000). OR estimates were 13.8 times higher (P = 0.000) in cows which had relatively high milk yield (> 20 liters/day) than in those which had low milk yield (< 10 liters/day) (P = 0.001).

Cows in poor and medium management condition had 11.3 and 2.4 times higher (P< 0.05), respectively than those in good management condition. All the risk factors; heat detection and predisposing reproductive problems had highly significant influence (P < 0.05) on incidence of postpartum anestrous (Table 5). However, herd size had no significant association (P > 0.05) with it. Postpartum anestrous was 9 times higher in cows detected estrus for ≤ 20 min than cows detected for > 20 min (P = 0.000). Cows in large farms (≥ 30 cows) had 3 times higher (P = 0.044) than those in small farms (≤ 20 cows). The incidence was (4.3, 3, 2.5, 2.9 and 3.6) times higher (P < 0.05) in dairy cows which had history of predisposing reproductive problems (abortion, dystocia, RFM, metritis/endometritis and vaginal/uterine prolepses), respectively compared to those had no history of predisposing reproductive problems during the previous calving.

DISCUSSION

Postpartum anestrous is the most important cause of poor reproductive performance and it is also a big reproductive problem in modern dairy cow production worldwide (Nishi et al., 2018). A prevalence and incidence of 39.7% and 40.9% were recorded, respectively. The finding is agreement with previous studies (Shiferaw et al., 2005; Kumar et al., 2014; Nishi et al., 2018) in which about 40%, 40.4% and 40.2% in cows were diagnosed as having postpartum anestrous, respectively. Opsomer, et al. (2000) reported higher prevalence of postpartum anestrous 49% which is little bit higher than this study. The variability in occurrence of anestrous might be resulted from different managerial, environmental, nutritional conditions existing in various herds and season data collection.

Age and parity had a significant effect on the occurrences (prevalence and incidence) of postpartum anestrous. Age has been shown to have a negative impact on the occurrences of reproductive problems (Dulo et al. (2017)). This finding is consistent with Tolosa et al. (2021) who found old age and multi-parous cows had a higher risk of postpartum reproductive problems. This is most likely due to repeated exposure of the older and multipara genital tract to environmental factors, resulting in uterine infections, resulting in uterine involution being significantly delayed as parity and age increased, and the time between calving and ovarian resumption being also extended (Esheti & Moges, 2014). Moreover, older cows especially those gave birth too many calves were exposed to repeated traumatic damage of reproductive tract, and hence, have poorly regenerating endometrium (Ball & Peters, 2004; LeBlanc, 2008). The incidence and prevalence were higher in cows with poor and medium body condition than in cows with good body condition.

Poor BCS at calving adversely affects fertility of cow by extending postpartum periods (Shamsuddin et al., 2006). Poor BCS led to high incidence of anestrus than optimal BCS (Opsomer et al., 2004). Poor BCS indicates that cows are undernourished, resulting in a severe negative energy balance (NEB) that can produce enough estrogens to elicit an LH surge and ovulation but not enough to cause heat (Opsomer et al., 2004). This finding revealed that the management system used by the animal owners had a significant effect on the prevalence of postpartum anestrous. According to the current study, the management system had a significant effect on the occurrences of reproductive problems (Bitew & Prasad, 2011).

Postpartum anestrous were influenced by milk yield of cow; higher prevalence and incidence were recorded in relatively high producing cow (> 20 letter/day) than low producers (10 letters per day). Increased milk production, delayed resumption of ovarian function due to increased catabolic state (Butler, 2003), and reduced estrus behavior even with moderate BCS loss (Cutullic et al., 2009). High yielding dairy cows are generally in negative energy balance in early lactation and mobilize body reserves for milk production, aggravating the occurrences of postpartum anestrous (Opsomer et al., 2004).

Postpartum anestrous in dairy cows was higher in poor dairy farm management conditions and significantly lower in good management conditions. A poor management system was associated with a potentially significant and higher prevalence of postpartum reproductive complications, whereas good management practice was associated with minimal complications (Uddin et al., 2015). The prevalence of pre-partum and post-partum complication were highest peak in poor management condition of cow (Uddin et al., 2015). Good management condition (proper feeding, housing and health care throughout pregnancy and early lactation) helped for cows to minimize the occurrences of postpartum anestrous (Nishi et al., 2018).

Similar to Nishi et al. (2018), the occurrences of postpartum anestrous was more common in cows without health preventative measures and was less common in cows who received regular preventive measures. Postpartum anestrous occurred more frequently in cows on large dairy farms and less frequently in cows on small dairy farms. Herd size had a significant impact on the incidence and prevalence of postpartum anestrous.

This result has fairly agreed with Ayisheshim et al. (2017) who reported large farm scale have higher infertility problems than small and medium farm scale. Higher occurrence of postpartum anestrous was observed in dairy cows that are not properly detected their heat signs than the properly detected once. Estrous detection is the most important managerial variable involved in postpartum anestrous cows, maintaining a short calving interval and defining the time interval to insemination (Lyimo et al., 2000). The maintenance of a good level of knowledge of both primary and secondary estrus signs and the observations of cows at the appropriate time of day is critical for farm staff (Van Vliet & Van Eerdenburg, 1996). The incidence of postpartum anestrous was higher in dairy cows which had history of predisposing reproductive problems (abortion, dystocia, RFM, metritis/endometritis and vaginal/uterine prolepses). This was confirmed by Crowe et al. (2014) that reported a delay of resumption of ovarian cycle in cows that showed a dystocia or uterine infection. Dystocia is a risk factor of metritis and clinical endometritis which have been major aggravating causes of infertility in crossbred dairy cow (Dubuc, 2011).

In conclusion, this study revealed high number of occurrence of postpartum anestrus in crossbred dairy cows, a problem that may skew beyond the economically tolerable limit among crossbred dairy cows. Risk factors considered such as age, parity, BCS, milk yield, management conditions, herd size, heat detection practices and predisposing reproductive problems had significant influence on the postpartum.

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COMPETING INTERESTS

The authors have declared that they have no competing interest.

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