



Research Article

Factors Affecting the Postpartum Onset of Estrus in Local Ewes

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ABSTRACT

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The delayed onset of estrus following lambing reduces the productivity of sheep. The present study was carried out to determine the key factors affecting the early onset of postpartum estrus in local ewes of Bangladesh. The effects of body weight, breed, season, presence of male following delivery and suckling on the postpartum onset of estrus were observed. Seventeen ewes (12 Indigenous and 7 Garole) were used in this study. The pregnancy and delivery were monitored. The indigenous ewes with higher body weight (14.87 ± 0.27 kg) showed earlier postpartum onset of estrus (28.8 ± 5.48 vs. 46 ± 8.96 days) compared to lower body weight (12.89 ± 0.48 kg). Similarly, the earlier postpartum onset of estrus (28.5 ± 8.5 vs. 37 ± 9.0 days) was observed in Garole ewes of higher body weight compared to lower body weight (28.3 ± 2.65 kg vs. 24.42 ± 0.22 kg). No significant difference was observed on Days of postpartum estrus onset between the breed, although Garole breed having higher body weight exhibited estrus earlier. The postpartum onset of estrus was earlier (27 ± 7.56 vs. 44.57 ± 7.47 days) during breeding season compared to non-breeding season in indigenous ewes. Indigenous ewes showed significantly ($P < 0.05$) earlier onset of estrus (21.5 ± 0.5 vs. 41.88 ± 6.6 days) in the presence of ram compared to the absence. Similarly, an earlier onset of estrus was observed in Garole ewes, however the difference was insignificant. The postpartum onset of estrus was significantly ($P < 0.01$) delayed (49.85 ± 5.18 vs. 17.75 ± 2.3 days) in the indigenous ewes of suckling group compared to the non-suckling group. A similar trend was observed in Garole ewes (37 ± 9.0 vs. 28.5 ± 8.5 days); however, the difference was not significant. Therefore, the economic losses due to delayed postpartum estrus could be prevented through the management of above-mentioned factors.

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Introduction

Sheep production can contribute a lot to the economy of Bangladesh for meat, wool, skin and milk. Reproduction plays a vital role in the productivity of sheep (Ferreira-Silva et al., 2016). Postpartum anestrus or delay in onset of estrus is an important cause of lower reproductive performance and economic losses for the farmers (Ronquillo et al., 2008). The time it takes to resume ovarian cyclicity after parturition has important economic consequences for sheep production. To raise sheep production, it is important to reduce the time of onset of estrus after delivery (Fraire-Cordero et al., 2018). Different factors like body weight, male presence and suckling may affect the periodic cycling (Arroyo et al., 2000). The main cause of postpartum anestrus is a suppression of the pulsatile release of luteinizing hormone (LH) which may occur due to some factors including suckling and the associated metabolic demands of lactation, immaturity,

poor body condition and absence of inductive seasonal signals (Mitchell et al., 1998). Nutrition plays a significant role in the production and reproduction of sheep from the early embryonic stages to the whole life. Prolonged restriction of dietary energy reduces body weight and lengthen the postpartum anestrus period in domestic ruminants by suppressing LH pulse frequency that is necessary for the growth of ovarian follicles to the pre ovulatory stage as under nutrition apparently inhibits the pulsatile secretion of LH by reducing GnRH secretion by the hypothalamus (Shevah et al., 1975, Schillo, 1992). After parturition, it is essential to implement the nutritional strategies to improve the metabolic imbalance which helps in the reestablishment of ovarian activity. Muzaffarnagari cross ewes had significantly longer postpartum onset of estrus interval (PPI) than Jamuna basin Indigenous ewes (Asaduzzaman et al., 2020). The breeding season has an effect on the shorter postpartum interval (Asaduzzaman et al., 2022). The placement of male with

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anestrus ewes has a marked effect in accelerating the frequency of GnRH/LH secretion which induces ovulation (Ungerfeld et al., 2020) and reduces the interval of time from birth to first ovulation (Martin et al., 1986, Morales-Terán et al., 2011, Castillo-Maldonado et al., 2013). Suckling is often described as the major factor delaying the resumption of normal ovarian cycles (Williams, 1990, Ronquillo et al., 2008). It could delay the return to estrus in ewes by inducing prolactinoma oxytocin which may inhibit ovarian or pituitary function (Kann and Martinet, 1975, Edgerton, 1980, Mandiki et al., 1990). Interval between parturition and first estrus may be reduced either by weaning the lambs soon after birth (Fletcher, 1971) or by restricting suckling to two 30-min session per day (Morales et al., 2004, Ronquillo et al., 2008). Management approaches following birth for determined factors affecting the early onset of postpartum estrus in sheep play vital role in early or due time onset of postpartum estrus. This will encourage the sheep farmers to develop the sheep industry in Bangladesh. The objective of the study was to elucidate the factors affecting the early onset of postpartum estrus in local ewes.

Materials and Methods

Study area

The research was conducted at Sheep Research Farm and Reproduction Laboratory under the Department of Surgery and Obstetrics, Faculty of Veterinary Science in Bangladesh Agricultural University, Mymensingh during the period of October 2021 to September 2022.



Fig. 1. Diagnosis of pregnancy by USG

Season effect on postpartum onset of estrus

The experiment was performed during two seasonal period, breeding season (September - February) and non-breeding season (March- August). The number of pregnant ewes during breeding season and non-breeding season were 8 and 11 respectively.

Selection of pregnant ewes and monitoring pregnancy until delivery

Nineteen pregnant ewes were selected from the ewe flock in the Department for the research. Among them, twelve were Indigenous and five were Muzaffarnagari cross ewes (commonly known as Garole). Pregnancy was confirmed at 50 days following natural service with the aid of a trans-abdominal ultrasonography (Fig. 1), using B-mode diagnostic ultrasound scanner (DRAMINIŃSKI, Poland). The pregnancy was monitored throughout the whole gestation length and the delivery was monitored. The age of the selected ewes were between 2 to 2.5 years.

Postpartum onset of estrus

Postpartum onset of estrus was determined by the interval (Days) following parturition to first observed estrus signs, specific for ewes (swollen and hyperaemic vulva, mucus secretion and stand to be mounted by the vasectomized ram (Akter et al., 2022). When each ewe was observed to accept a mount (Fig. 6), she was considered to be in estrus (Romano et al., 2000).

Effect of breed and body weight

Two available local breeds (Indigenous and Galore) and two groups of body weight within each breed on Days postpartum onset of estrus were observed. The body weight was measured by using a weighing balance scale (Fig. 2) immediately after parturition and on the day of onset of estrus.



Fig. 2. Measurement of body weight

Male effect (Introduction of ram to ewes)

A ram was kept with the 5 ewes on the 10th day of parturition in the same room separated by fencing to avoid physical contact between them (Fig. 3) in order to observe the male effect on postpartum onset of estrus in comparison to the absence of males. The ewes were

kept with the ram for about 15 hours daily until the onset of estrus. Fourteen post-partum ewes were observed for Days onset of estrus in the absence of a male.

Suckling effect (Isolation of lamb from the ewes)

For determination of suckling and non-suckling effects on the postpartum onset of estrus, the ewes were

divided into two groups. One group of 12 ewes were suckled by the lambs (Fig. 5) and one group of 7 ewes were non-suckling ewes whose lambs were fully separated from their mother after 3 days of parturition for two months (Fig. 4). The ewes and the lambs were then maintained in separate pens and fed according to their respective nutritional requirements.



Fig. 3. Introduction of ram to ewes



Fig. 4. Isolation of lambs from ewes



Fig. 5. Suckling by lambs





Swollen and hyperemic vulva of different ewes



Stand to be mounted

Fig. 6. Detection of postpartum estrus onset

Statistical Analysis

All data were entered in the spreadsheet of the Microsoft Excel 2010 program. All values related to the postpartum onset of estrus were expressed as Mean \pm Standard Error of Mean. A t-test was performed with a 95% confidence interval to find out the significant differences between the parameters. A P value less than 0.05 ($p < 0.05$) was regarded as statistically significant.

Results

Effect of breed and body weight on Days postpartum onset of estrus

The effect of breed and body weight on postpartum onset of estrus is presented in Table 1. In Indigenous ewes, the higher body weight group 14.87 ± 0.27 kg showed earlier post-partum onset of estrus (28.8 ± 5.48 days) compared to the lower body weight group 12.89 ± 0.48 kg (46 ± 8.96 days). However, there were no

significant differences between the two groups on days post-partum onset of estrus ($p > 0.05$). Similarly, no significant differences were observed in the Garole breed between the two body weight groups, although the days postpartum onset of oestrus of higher body weight (28.3 ± 2.65 kg) was earlier (28.5 ± 8.5 days) than lower body weight of 24.4 ± 0.22 kg (37 ± 9.0 days).

Effect of season on postpartum onset of estrus in ewes

The effect season on postpartum onset of estrus is shown in Table 2. In Indigenous ewes, the postpartum onset of estrus was earlier (27 ± 7.56 days) in the breeding season than non-breeding season (44.57 ± 7.47 days). While in Garole breed, the postpartum onset of estrus was delayed (37 ± 9 days) in breeding season compared to non-breeding season (28.5 ± 8.5 days). However, there were no significant differences within each breed between the seasons ($P > 0.05$).

Table 1. Effect of breed and body weight on Days postpartum onset of estrus (mean±SEM)

Breed (data pooled over breed in respect of body weight)		Postpartum onset of estrus (Days)
Indigenous (n=12)		38.18±5.89 (12-68)
Garole (n=5)		32.75±5.61 (20-46)
Body weight during estrus (kg)		
Indigenous	12.89±0.48 (10-14) (n=6)	46±8.96 (16-68)
	14.87±0.27 (>14-20) (n=6)	28.8±5.48 (12-41)
Garole	24.42±0.22 (20-25) (n=3)	37±9 (28-46)
	28.3±2.65 (>25-31) (n=4)	28.5±8.5 (20-37)

Table 2. Effects of season on Days postpartum onset of estrus (mean±SEM)

Parameter	Postpartum onset of estrus (Days)	
	Indigenous	Garole
Breeding season	27±7.56 (12-41) (n=4)	37±9 (28-46) (n=4)
Non-breeding season	44.57±7.47 (21-68) (n=8)	28.5±8.5 (20-37) (n=3)

Presence of male effect on Days postpartum onset of estrus

The presence of male effect on Days postpartum onset of estrus is presented in Table 3. In Indigenous, the ewes in the presence of male showed significantly (P<0.05) earlier onset of postpartum estrus (21.5±0.5 days) compared to ewes in the absence of the male group (41.88±6.6 days). Similarly, earlier onset of estrus was observed in Garole ewes (28.5±8.5 vs 37±9.0 days); however, the difference was not significant (P>0.05).

Effect of Suckling and non-suckling on Days postpartum onset of estrus

The effect of Suckling and non-suckling on Days postpartum onset of estrus is presented in Table 4. The suckling significantly (P<.01) delayed the postpartum onset of estrus in the Indigenous ewes group compared with ewes in the non-suckling group (49.85±5.18 vs 17.75±2.3 days). A similar trend was observed in Garole ewes; however, the difference was not significant (37±9.0 vs 28.5±8.5 days).

Table 3. Effect of male on Days postpartum onset of estrus (mean±SEM)

Parameter	Postpartum onset of estrus (Days)	
	Indigenous	Garole
Presence of male	21.5±0.5 ^a (21-22) (n=2)	28.5±8.5 (20-37) (n=3)
Absence of male	41.88±6.6 ^b (12-68) (n=10)	37±9 (28-46) (n=4)

^{a,b}The mean value with the different superscript in the same column is statistically significant (P< 0.05)

Table 4. Effect of Suckling and non-suckling on Days postpartum onset of estrus (mean±SEM)

Parameter	Postpartum onset of estrus (Days)	
	Indigenous	Garole
Suckling	49.85±5.18 ^a (31-68) (n=8)	37±9 (28-46) (n=4)
Non-suckling	17.75±2.3 ^b (12-22) (n=4)	28.5±8.5 (20-37) (n=3)

^{a,b}The mean value with the different superscript in the same column is statistically significant (P< 0.05)

Discussion

Body weight is one of the main factors affecting postpartum interval. In the present study, breed and body weight differ the postpartum interval. The postpartum onset of estrus was longer (38.18±5.89 days) in Indigenous ewes compared to Garole ewes (32.75±5.61 days). While, Muzaffarnagari cross ewes had a longer postpartum interval (PPI) than those of Jamuna basin

Indigenous ewes (Asaduzzaman et al., 2022). This discrepancy may be due to the small number of ewes used for garole breed. The ewes of higher body weight showed earlier postpartum onset of estrus compared to the lower body weight group for both Indigenous and Garole breed. This result is relevant to other studies (Nottle et al., 1997, Boland et al., 2001). They stated that poor nutrition is responsible for loss of body

weight that increases postpartum onset of estrus interval. In coarse wool breeds, malnutrition during lactation lengthens the postpartum period (Dunn and Kaltenbach, 1980), although he did not observe any effect in mature Merino ewes. The higher body weight stimulates the hypothalamic-pituitary responsiveness to synthesis and secretion of pituitary gonadotrophins and sensitivity of ovary and uterus to induce estrus early during postpartum period.

Season is a major factor that controls the duration of onset of estrus following parturition. The early onset of the following breeding season is correlated with an early lambing date (Haresign, 1992, Mitchell et al., 1997, Asaduzzaman et al., 2022). In the Indigenous ewes, the postpartum onset of estrus was earlier during breeding season than non-breeding season (27 ± 7.56 vs 44.57 ± 7.47 days). Within 30 days postpartum, cyclical ovulatory activity can resume in animals that lambed during the height of the breeding season (Amir and Gacitua, 1987). A study showed that ewes were lambed towards the end of the breeding season had their first ovulation by 25 ± 1.8 days (Santiago-Moreno et al., 2000). In case of Indigenous breeds, the present study differs that postpartum interval was longer after spring (May) lambing than after fall (November) lambing (Dufour, 1975), but this is in line with the result for Garole breed. The resumption of ovarian and estrus activity was much earlier after the November lambing than after the July lambing (Mandiki et al., 1990). The difference in Indigenous breed may be due to the variation of season and environment of our country.

The ewes in the presence of males showed significantly earlier onset of estrus in Indigenous ewes compared with ewes in the group in the absence of males (21.5 ± 0.5 vs 41.88 ± 6.6 days). Similarly, earlier onset of estrus was observed in Garole ewes (28.5 ± 8.5 vs 37 ± 9.0). In the present study, the presence of males hastened the postpartum interval which is in line with the previous studies. The continuous exposure of the ram immediately after sponge removal hastens estrus onset (Romano et al., 2000). The mechanism by which the male hastens estrus in ewes was unknown but it may be the male teasing behaviour. Ram effect is mediated probably by a pheromone which is secreted by the sudoriferous glands in the skin of the ram which seems to inhibit or reverse the effects of photoperiod on the secretion of LH pulses (Knight and Lynch, 1980). Another study stated that the introduction of rams with ewes is able to induce ovulation and estrus in ewes even when lambs continued to suckle the ewes during the period after rams were placed with ewes (Ungerfeld et al., 2020).

Suckling is frequently cited as the main reason delaying the resumption of normal ovarian cycles. In this study, the postpartum interval of suckling and non-suckling group was 49.85 ± 5.18 and 17.75 ± 2.32 days in Indigenous ewe whereas, 37 ± 9 and 28.5 ± 8.5 days in Garole respectively. Non-suckling Indigenous ewes showed estrus 32 days earlier than suckling Indigenous ewes while non-suckling Garole displayed estrus 8 days earlier than suckling Garole. This finding is in agreement with the previous studies (Schirar et al., 1989, Ronquillo et al., 2008). Non-suckling ewes exhibited estrus at an average of 22 days after parturition which was 13 days earlier than the ewes were suckled by lambs (Schirar et al., 1989). Suckling prevents the release of GnRH from the hypothalamus, which causes a significant decrease in pulsatile LH release and prolongs the postpartum anestrus. Another study stated that reduced suckling in ewes can shorten the interval between parturition and the first ovulation which can be achieved by early weaning or by suckling restriction to two 30 minute sessions per day (Mandiki et al., 1989). Some studies found that increasing suckling intensity delayed the start of cyclic reproduction (Fletcher, 1971, Cognie et al., 1976), while other studies found no connection between suckling stimuli and the return to estrus following parturition (Land, 1971, Fletcher, 1973).

Conclusion

In the present study, presence of male and restriction of suckling following parturition significantly influenced the early onset of postpartum estrus in indigenous ewes. There was no significant effect of body weight and breeding season on postpartum onset of estrus in both indigenous and Garole breed. Implementation of such management factors could induce the early onset of postpartum estrus and hence, reduces the productive and economic losses in the sheep farm.

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