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Factors affecting calving to service interval in crossbred Friesian cows in a large dairy farm

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Abstract

To determine the calving to service interval and its associated factors, 125 crossbred Friesian cows were studied. The farm records were randomly examined, and related data were collected on genotype, age, body weight, body condition score (BCS), parity, milk yield, suckling status and season of first postpartum service. The overall calving to service interval in Friesian crossbred cows was 98.9 ± 42.6 days. Calving to service intervals in cows with 50.0%, 62.5 - 68.8% and 75.0 - 87.5% exotic blood were 98.7 ± 41.6, 102.9 ± 58.3 and 94.7 ± 33.6 days, respectively. The calving to service interval in cows aged 42 - 60, 61 - 78 and 79 - 173 months was 74.0 ± 14.4, 108.5 ± 48.9 and 100.8 ± 43.0 days, respectively. The calving to service interval in cows with body weight 140 - 180, 181 - 220 and 221 - 250 Kg was 94.3 ± 38.4, 99.3 ± 41.4 and 134.2 ± 74.9 days, respectively. The calving to service interval in cows with BCS 2.5 - 3.0 and 3.5 - 4.0 was 98.8 ± 42.3 and 99.1 ± 44.3 days, respectively. The calving to service interval in cows with parity 1, 2 - 3 and 4 - 10 was 117.5 ± 76.4, 99.6 ± 40.0 and 96.4 ± 41.2 days, respectively. The calving to service interval in cows with milk yield 0 (dry), 1 - 5, 6 - 10 and 11 - 16 litres was 118.4 ± 51.2, 99.6 ± 45.6, 102.5 ± 45.8 and 84.0 ± 22.1 days, respectively. The calving to service interval in suckling and non-suckling cows was 100.5 ± 44.3 and 88.8 ± 28.8 days, respectively. The calving to service interval in cows in summer, rainy and winter season was 98.8 ± 41.4, 104.5 ± 46.9 and 95.3 ± 41.9 days, respectively. The difference in calving to service interval among cows of different ages was significant (P<0.05). It is suggested that calving to service interval was not influenced by breed, body weight, BCS, parity, milk yield, suckling status or season of service. (*Bangl. vet*. 2021. Vol. 38, No. 1 - 2, 33 – 41)

Introduction

In dairy herds, calving interval is widely used as the major parameter to assess bovine reproductive efficiency. Calving interval of about one year is considered economically optimal (Inchaisri *et al*., 2010). In order to achieve this, the calving to service interval should not exceed 65 days (Opsomer *et al*., 2000). Increased interval between calving and service due to delayed onset of post-partum oestrus is one of the main constraints in dairy cows leading to extended calving interval (Kamal *et al*., 2012).

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In Bangladesh, commercial farmers prefer rearing crossbred Friesian cows for their increased milk production. But prolonged calving interval causes economic loss in these commercial farms. Without the clear understanding of the factors affecting calving to service interval, it is difficult to take remedial measures. The objective of this study was to determine the factors affecting the interval between calving and first post-partum service in crossbred Friesian cows in a large dairy farm in Bangladesh.

Materials and Methods

Data collection

The study was conducted in a large farm in Dhaka from January 2018 to June 2019: 125 crossbred Friesian cows were randomly selected, and data were collected on genotype, age, body weight, body condition score (BCS), parity, milk yield, suckling status and season of service.

Management of cows

The cows were reared by intensive system, but some cows had zero grazing with occasional semi-zero grazing and tethering. Most cows were fed on straw (5 Kg/cow/day) and cut grass (30 Kg/cow/day). Common supplements were rice polish (1.5 Kg/day/cow), wheat bran (2.5 Kg/day/cow) and oil cake (1.0 Kg/day/cow). All cows were hand-milked twice daily eight hours apart. In most cases, calves were allowed to suck during milking for half an hour each time. All cows were routinely dewormed and vaccinated against common infectious diseases.

Determination of exotic genotype % of cows

The exotic genotype % of crossbred Friesian cows were taken from the farm register, and divided into three groups: 50, 62.5 - 68.8 and 75 - 87.5%.

Determination of age of cows

The age of cows was determined from the register, and divided into 42-60, 61-78 and 79-173 months.

Determination of body weight of cows

The body weight of the cows was obtained from the register, and divided into three groups: 140 - 180, 181 – 220 and 221 – 250 Kgs.

Determination of BCS of cows

The body condition was determined on the basis of visibility of bony prominence and deposition of sub-cutaneous fat using 1-5 scale (Nicholson and Butterworth, 1986). The cows were divided into two groups: 2.5 – 3.0 and 3.5 - 4.0.

Determination of parity of cows

The parity was determined from the register, and divided into 1, 2 - 3, and 4 – 10 parity.

Determination of milk yield of cows

The daily milk yield of the cows was determined from the milk register, and divided into four groups: 0 (dry), 1 – 5, 6 - 10 and 11 to 16 litres.

Determination of suckling status of cows

The cows were divided into two groups: suckling and non-suckling.

Determination of season of giving service to cows

The season of service was determined from the register, and cows were divided into three groups: Summer (March - June), Rainy (July -October) and Winter (November - February).

Determination of calving to service interval

The interval between calving date and service date was the time in days between calving and service, from the register.

Analysis of data

The data were entered in Microsoft Excel Worksheet, for analysis. The data were analysed by Turkey Pairwise Comparisons using Minitab 17 software. The variation in calving to service interval (days) among/between groups was considered significant when the P value was less than 0.05.

Results and Discussion

Of the 125 crossbred Friesian cows examined, the mean calving to service interval was 98.9 ± 42.6 days. In contrast, higher calving to service interval (182 days) in crossbred Friesian cows was reported in Ethiopia by Mekonnen *et al*. (2010). Cilek (2009) and Tadesse *et al*. (2010) reported that calving to first service interval was 111 and 115 days in Holstein-Friesian breed in Turkey and Central Highland Ethiopia, respectively. Lower interval (80 days) between calving and onset of post-partum oestrus has been reported in crossbred cows in Bangladesh (Saha *et al*., 2015). The variations might be due to differences in climate and the management. In the present study, the problem can be classified as mild. This means emphasis should be given to reduce the interval between calving and service in crossbred Friesian cows resulting in reduced inter-calving interval and making the dairy farming economically sustainable.

Effects of exotic genotype % on calving to service interval in crossbred Friesian cows are shown in Table 1. The calving to service interval in 50%, 62.5-68.8% and 75.0-87.5% crossbred Friesian cows was 98.7 ± 41.6, 102.9 ± 58.3 and 94.7 ± 33.6 days, respectively, but the differences were not significant. Contrasting to the present study, higher interval was demonstrated in 75% Friesian crossbred cows than in 50% crossbred cows in Bangladesh (118 vs. 113 days) (Rahman *et al*., 2016). The variations between those studies might be due to size of farm (large vs. small holding farms).

Table 1: Effects of exotic genotype % on calving to service interval in crossbred Friesian cows

Exotic genotype %	No. of cows examined	Calving to service interval (days)
50.0	108	98.7 ± 41.6
62.5-68.8	11	102.9 ± 58.3
75.0-87.5	6	94.7 ± 33.6

Calving to service interval (days) are mean ± SD.
Days within same column did not vary significantly (P>0.05).

Effects of age on calving to service interval cows are shown in Table 2. The calving to service interval in cows aged 42 - 60 months, 61 - 78 months and 79 - 173 months was 74.0 ± 14.4, 108.5 ± 48.9 and 100.8 ± 43.0 days, respectively. The differences were significant (P<0.05). Contrasting to the present study, Eduvie (1985) showed that the occurrence of first postpartum oestrous followed by service was earlier in cows over 60 months old than those 36-60 months old. Moreover, Fonseca *et al*. (1983) reported that interval from calving to first service decreased as age at calving increased up to about 40 months of age.

Table 2: Effects of age on calving to service interval in crossbred Friesian cows

Age (Months)	No. of cows examined	Calving to service interval (days)
42 to 60	15	74.0 ± 14.4 [b]
61 to 78	21	108.5 ± 48.9 [a]
79 to 173	89	100.8 ± 43.0 [ab]

Calving to service interval (days) are mean ± SD.
[a,b]Days with superscripts within same column varied significantly P<0.05).

Table 3: Effects of body weight on calving to service interval in crossbred Friesian cows

Body weight (Kg)	No. of cows examined	Calving to service interval (days)
140 to 180	52	94.3 ± 38.4
181 to 220	67	99.3 ± 41.4
221 to 250	6	134.2 ± 74.9

Calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly (P>0.05).

Effects of body weight on calving to service interval in crossbred Friesian cows are shown in Table 3. The calving to service interval in cows weighing 140 - 180, 181 - 220 and 221 - 250 Kg was 94.3 ± 38.4, 99.3 ± 41.4 and 134.2 ± 74.9 days, respectively, but the differences were not significant. This result is in agreement with Narasimha Rao and Venkatramaiah (1993) who stated that body weight in the later stage of postpartum period has no significant effect on the onset of post-partum ovarian cyclicity. Balanced diet and body weight are important factors for interval to first post-partum ovulation in cows (Senatora *et al*., 1996). Although heavier cows are served sooner, they require more services and have a longer interval from first service to conception (Dhaliwal *et al*, 1996).

Effects of BCS on calving to service interval in crossbred Friesian cows are shown in Table 4. The calving to service interval in cows with BCS 2.5 - 3 and 3.5 - 4.0 was 98.8 ± 42.3 and 99.1 ± 44.3 days, respectively, but the differences were not significant. This result is in agreement with Ciccioli *et al.* (2003) who reported that calving to service interval was not influenced by BCS. In contrast, regardless of yield, cows with low BCS exhibited poor fertility (Berry *et al*., 2003). Damarany (2020) showed that the interval between calving and first service in crossbred cows with BCS <3 was significantly longer (P<0.05) than cows with higher BCS. Low BCS as a consequence of selection for high yield may alter the level of circulating gonadotrophins influencing calving to service interval and subsequent fertility (Royal *et al*., 2002).

Table 4: Effects of BCS on calving to service interval in crossbred Friesian cows

BCS	No. of cows examined	Calving to service interval (days)
2.5-3.0	95	98.8 ± 42.3
3.5-4.0	30	99.1 ± 44.3

Calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly other (P>0.05).

Effects of parity on calving to service interval in crossbred Friesian cows are shown in Table 5. The calving to service interval with parity 1, 2 - 3 and 4 - 10 was 117.5 ± 76.4, 99.6 ± 40.0 and 96.4 ± 41.2 days, respectively, but the differences were not significant (P>0.05). Contrasting to this study Motlagh *et al*. (2013) reported that the effect of parity on calving to service interval was significant (P<0.05). Cattle in first and sixth lactation had a longer interval (135 and 136 days, respectively) than the others. First calvers had the longest intervals (184 days), while those in fourth parity or more had the shortest intervals (171 days) (Asimwe *et al*., 2007). Physiological stress in early first lactation could partly explain the longer interval. The second explanation is that first parity animals continue to grow, which requires dietary energy (Asimwe *et al*., 2007). As there were only six animals in 1st parity in the present study further study with more cows is required.

Table 5. Effects of Parity on calving to service interval in crossbred Friesian cows

Parity	No. of cows examined	Calving to service interval (days)
1	6	117.5 ± 76.4
2 - 3	56	99.6 ± 40.0
4 - 10	63	96.4 ± 41.2

Calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly (P>0.05).

Effects of milk yield on calving to service interval in crossbred Friesian cows are shown in Table 6. The calving to service interval in cows with daily milk yield 0 (dry), 1 - 5, 6 - 10 and 11 - 16 litres was 118.4 ± 51.2, 99.6 ± 45.6, 102.5 ± 45.8 and 84.0 ± 22.1 days, respectively, but the differences were not significant. No difference was observed in interval between calving and onset of cyclicity in Bangladesh among different milk yield groups (Saha *et al*., 2015). However, calving to service interval in Friesian cows with a mean daily milk yield of 32 kg was less than in cows yielding 39 to 50 kg (Santos *et al*., 2009). The period of negative energy balance and peak lactation might influence onset of oestrus and fertility of dairy cows (Dhaliwal *et al*., 1996).

Table 6: Effects of milk yield on calving to service interval in crossbred Friesian cows

Milk yield (Litre)	No. of cows examined	Calving to service interval (days)
0 (dry)	5	118.4 ± 51.2
1 - 5	25	99.6 ± 45.6
6 - 10	70	102.5 ± 45.8
11 - 16	25	84.0 ± 22.1

Calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly (P>0.05).

Effects of suckling on calving to service interval are shown in Table 7. The calving to service interval in suckling and non-suckling cows was 100.5 ± 44.3 and 88.8 ± 28.8 days, respectively, but the difference was not significant. Similarly, Upadhyay *et al*. (2015) reported no significant effects of suckling on days to first heat after calving in Tharparkar cattle. On the contrary, Margerison *et al*. (2002) reported that cows suckling their own calves had a longer interval from calving to first oestrus than cows suckling other calves. Further, in purebred and crossbred cows, days from calving to ovulation were higher in cows with restricted suckling than in cows not suckling (Mendoza *et al*., 2010). The main cause of longer calving to service interval in suckling cows may be late onset of ovarian cyclicity, due to the absence of appropriate LH pulses (Williams, 1990).

Table 7: Effects of suckling on calving to service interval in crossbred Friesian cows

Suckling status	No. of cows examined	Calving to service interval (days)
Suckling	108	100.5 ± 44.3
No Suckling	17	88.8 ± 28.8

Calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly (P>0.05).

Effects of season on calving to service interval are shown in Table 8. The calving to service interval in in summer, rainy and winter season was 98.8 ± 41.4, 104.5 ± 46.9 and 95.3 ± 41.9 days, respectively, but the differences were not significant. Haile and Yoseph (2018) did not observe any difference in calving to service interval in Friesian cows with respect to season in Ethiopia. On the contrary, Motlagh *et al*. (2013) reported that season had a significant effect on calving to service interval where the longest interval (119 days) was in summer. Moreover, spring-calving dairy cows have been reported to have a longer period between calving and first ovulation than autumn-calving ones (Elmetwally *et al*., 2016). Further, cows calved in the summer had lower calving to service interval than cows calved in the winter and spring (Santos *et al*., 2009). The reason for variations among studies might be due to variations in climate and management.

Table 8: Effects of season on calving to service interval in crossbred Friesian cows

Season	No. of cows examined	Calving to service interval (days)
Summer	55	98.8 ± 41.4
Rainy	28	104.5 ± 46.9
Winter	42	95.3 ± 41.9

Values on calving to service interval (days) are mean ± SD.
Values within same column did not vary significantly (P>0.05).

Conclusions

The study revealed that the overall calving to service interval in crossbred Friesian cows in the large farm was 98.9 ± 42.6 days. The calving to service interval was significantly lower in younger crossbred Friesian cows than older ones. The calving to service interval was not influenced by genotype %, body weight, BCS, parity, milk yield, suckling status or season of service. Further studies are needed with more cows to confirm these findings.

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References

Asimwe L, Kifaro GC 2007: Effect of breed, season, year and parity on reproductive performance of dairy cattle under smallholder production system in Bukoba district, Tanzania. *Livestock Research for Rural Development* **19** Article # 152.

Berry DP, Buckley F, Dillon P, Evans RD, Rath M, Veerkamp RF 2003: Genetic relationships among body condition score, body weight, milk yield, and fertility in dairy cows. *Journal of Dairy Science* **86** 2193-2204.

Ciccioli NH, Wettemann RP, Spicer LJ, Lents CA, White FJ, Keisler DH 2003: Influence of body condition at calving and postpartum nutrition on endocrine function and reproductive performance of primiparous beef cows. *Journal of Animal Science* **81** 3107-3120.

Cilek S 2006: Reproductive traits of Holstein cows raised at Polatli state farm in Turkey. *Journal of Animal and Veterinary Advances* **8** 1-5.

Damarany AI 2020: Effect of body condition score at calving on ovarian activity and subsequent reproductive characteristics during postpartum period in crossbred cows. *Journal of Animal and Poultry Production* **11** 213-221.

Dhaliwal GS, Murray RD, Dobson H 1996: Effects of milk yield, and calving to first service interval, in determining herd fertility in dairy cows. *Animal Reproduction Science* **41** 109-117.

Eduvie LO 1985: Factors affecting postpartum ovarian activity and uterine involution in Zebu cattle indigenous to Nigeria. *Animal Reproduction Science* **8** 123-128.

Elmetwally MA, Montaser A, Elsadany N, Bedir W, Hussein M, Zaabel S 2016: Effects of parity on postpartum fertility parameters in Holstein dairy cows. IOSR *Journal of Agriculture and Veterinary Science* **9** 91-99.

Fonseca FA, Britt JH, McDaniel BT, Wilk JC, Rakes AH 1983: Reproductive traits of Holsteins and Jerseys. Effects of age, milk yield, and clinical abnormalities on involution of cervix and uterus, ovulation, estrous cycles, detection of estrus, conception rate, and days open. *Journal of Dairy Science* **66** 1128-1147.

Haile B, Yoseph M 2018: Reproductive performance of Holstein Friesian dairy cows at a large dairy farm, Ethiopia. *Journal of Dairy and Veterinary Science* **7** 555713.

Inchaisri C, Jorritsma R, Vos PL, Van der Weijden GC, Hogeveen H 2010: Economic consequences of reproductive performance in dairy cattle. *Theriogenology* **74** 835-846.

Kamal MM, Rahman MM, Momont HW, Shamsuddin M 2012: Underlying disorders of postpartum anoestrus and effectiveness of their treatments in crossbred dairy cows. *Asian Journal of Animal Science* **6** 132-139.

Margerison JK, Preston TR, Phillips CJ 2002: Restricted suckling of tropical dairy cows by their own calf or other cows' calves. *Journal of Animal Science* **80** 1663-1670.

Mekonnen T, Bekana M, Abayneh T 2010: Reproductive performance and efficiency of artificial insemination smallholder dairy cows/heifers in and around Arsi-Negelle, Ethiopia. *Livestock Research for Rural Development* **22** Article # 61.

Mendoza A, Cavestany D, Roig G, Ariztia J, Pereira C, La Manna A, Contreras DA, Galina CS 2010: Effect of restricted suckling on milk yield, composition and flow, udder health, and postpartum anoestrus in grazing Holstein cows. *Livestock Science* 127 60-66.

Motlagh MK, Roohani Z, Shahne AZ, Moradi M 2013: Effects of age at calving, parity, year and season on reproductive performance of dairy cattle in Tehran and Qazvin Provinces, Iran. *Research Opinions in Animal and Veterinary Sciences* **3** 337-342.

Narasimha Rao AV, Venkatramaiah P 1993: Effect of body weight changes on the reproductive performance of postpartum Ongole cows. *Livestock Adviser* **18** 10

Nicholson MJ, Butterworth MH 1986: A guide to condition scoring of Zebu cattle. International Livestock Centre for Africa, Addis Ababa 1-29.

Opsomer G, Mijten P, Coryn M, de Kruif A 1996: Post-partum anoestrus in dairy cows: A review. *Veterinary Quarterly* **18** 68-75.

Rahman MM, Gofur MR, Rahman MS, Bari FY, Juyena NS 2016: Effect of genotype on reproductive and productive performances of dairy cows under rural context in Bangladesh. *International Journal of Livestock Research* **6** 9-24.

Royal MD, Flint AP, Woolliams J 2002: Genetic and phenotypic relationships among endocrine and traditional fertility traits and production traits in Holstein-Friesian dairy cows. *Journal of Dairy Science* **85** 958-967.

Royal MD, Pryce JE, Woolliams JA, Flint AP 2002: The genetic relationship between commencement of luteal activity and calving interval, body condition score, production, and linear type traits in Holstein-Friesian dairy cattle. *Journal of Dairy Science* **85** 3071-3080.

Saha SN, Alam MGS, Shamsuddin M, Khatun M 2015: Effects of breed, management system, milk yield and body weight on onset of postpartum ovarian cyclicity in cows. *The Bangladesh Veterinarian* **32** 27-34.

Santos JE, Rutigliano HM, Sá Filho MF 2009: Risk factors for resumption of postpartum estrous cycles and embryonic survival in lactating dairy cows. *Animal Reproduction Science* **110** 207-221.

Senatore EM, Butler WR, Oltenacu PA 1996: Relationships between energy balance and post-partum ovarian activity and fertility in first lactation dairy cows. *Animal Science* **62** 17-23.

Shamsuddin M, Goodger WJ, Hossein MS, Bennett T, Nordlund K 2006: A survey to identify economic opportunities for smallholder dairy farms in Bangladesh. *Tropical Animal Health and Production* **38** 131.

Tadesse M, Thiengtham J, Pinyopummin A, Prasanpanich S 2010: Productive and reproductive performance of Holstein Friesian dairy cows in Ethiopia. *Livestock Research for Rural Development* **22** Article # 34.

Upadhyay VK, Tomar AK, Patel BH, Golher DM, Sahu S, Bharti PK 2015: Effect of early weaning on milking behaviour, production and reproduction of Tharparkar cows. *Indian Journal of Dairy Science* **68** 477-482.

Williams GL 1990: Suckling as a regulator of post-partum rebreeding in cattle: a review. *Journal of Animal Science* **68** 831-852.