POSTPARTUM FOLLICULAR DEVELOPMENT AND ITS INFLUENCE ON SUBSEQUENT REPRODUCTION IN BUFFALOES

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ABSTRACT

Early postpartum ovarian follicular activity was studied to test the hypothesis that the presence of a large follicle 10 mm in diameter in the ovary ipsilateral to the previously gravid uterine horn between Days 14 and 28 postpartum improves subsequent reproductive performance in water buffaloes. Freshly calved, suckled Mehsana buffaloes (n = 20) were subjected to daily ovarian ultrasound imaging between Day 14 and 28 postpartum. The direction of first postpartum large follicle (10 mm) in relation to past gravid uterine horn was determined. Animals were divided into two groups based on location of a large follicle on the ovary ipsi- (Group A) and contralateral (Group B) to past gravid uterine horn. First postpartum ovulation, first postpartum estrus, calving to conception interval and number of services per conception were recorded. The interval from calving to the detection of first large follicle was significantly higher ($P < 0.01$) in the animals of Group B (17.5 ± 1.2 days, n=12) than Group A (22.4 ± 1.7 days, n=8) up to Day 28 postpartum. First postpartum ovulation occurred significantly earlier ($P < 0.05$) in animals of Group B (18.3 ± 1.5 days, n=7) than in animals of Group A (23.3 ± 1.2 days, n=7) up to Day 28 postpartum. The location of a large follicle on either the ovary ipsi- or contralateral to the uterine horn carrying the previous conceptus did not significantly affect the occurrence of the first postpartum estrus (57.9 ± 5.8 versus 56.6 ± 10.5 days), the calving to conception interval (68.4 ± 15.0 versus 91.8 ± 12.9 days) or the number of services per conception (1.4 ± 0.3 versus 1.7 ± 0.2). It was concluded that the data did not support the hypothesis that the presence of a large follicle in the ovary ipsilateral to the previously gravid uterine horn during the early postpartum period improved the subsequent reproductive performance of water buffaloes.

Key words: Follicular growth, Reproductive performance, Water buffalo

The characterization of follicular growth during early postpartum period demonstrated that greater follicular activity occurred in the ovary contralateral to previously gravid uterine horn in dairy cattle (Savio *et al.*, 1990; Kamimura *et al.*, 1993; Sheldon *et al.*, 2002) and water buffaloes (Usmani, 1992). The occurrence of a large follicle as determined by palpation per rectum, in the ovary ipsilateral to previously gravid uterine horn on Day 26 postpartum, increased the likelihood of shorter caving to conception intervals (Bonnet *et al.*, 1993). However, the accuracy of manual palpation in identifying and measuring such structures is open to criticism due to high level of subjectivity. Compared to manual palpation

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ultrasonography permits a more precise estimation of the numbers as well as the size of follicles (Hanzen *et al*., 2000). The relationship between postpartum ovarian activity and subsequent reproductive performance of water buffaloes has been investigated (Singh *et al*., 1979; Baruselli, 1991); however, little attention has been paid to the local relationship between previously gravid uterine horn and follicular growth, and its influence on subsequent reproductive performance in water buffaloes. The objective of present study was to test the hypothesis that the presence of a large follicle (10 mm in diameter) in the ovary ipsilateral to previously gravid uterine horn between Days 14 and 28 postpartum improves subsequent reproductive performance in suckled water buffaloes.

Experimental animals : Freshly calved multiparous Mehsana buffaloes (n=20), 5 to 7 years of age and weighing 510-660 Kg with normal parturition were selected at Livestock Research Station, S D Agricultural University, Sardar Krushinagar. These animals were stall-fed and provided with balanced ration and seasonal green fodder. The animals were suckled followed by hand milking twice per day. The experiment was conducted during breeding season from September to February.

Ultrasound examination: The ultrasound examinations were performed using a real-time B-mode ultrasound scanner equipped with a 6.5 MHz convex linear array transducer designed for intra-rectal placement. Ultrasound scanning of ovaries was difficult before Day 14 postpartum owing to the greater size of involuting uterus. The previously gravid uterine horn was determined transrectally by palpation as that was longer and of greater diameter than the contralateral horn on Day 14 postpartum. The transducer was placed over ovary through rectal wall and scanning was accomplished in several planes to identify all the follicles >4 mm in diameter. Both the ovaries were scanned daily from Day 14 onwards until a large follicle (10 mm in diameter) was detected up to Day 28 postpartum. When detected earlier than Day 28 the large follicle was scanned daily till it ovulated up to Day 28 postpartum. The location of first postpartum large follicle with respect to side of previously gravid uterine horn was recorded. The diameter of follicle was estimated by averaging two measurements taken perpendicular to each other. The ovulation was defined as disappearance of previously identified follicle (10 mm) from one ultrasound examination to the next (Nasser *et al*., 1993).

Postpartum reproductive status of experimental animals : Each experimental animal was closely monitored for expression of behavioural estrus through heat detection with teaser buffalo bull twice daily; each session lasting for one hour in the morning and the evening and buffaloes were considered in estrus only when they accepted bull mounting. Animal in estrus was naturally served with known fertile buffalo bull. The pregnancy was detected on Day 30 by ultra sonography and later confirmed by palpation per rectum between Days 50 and 60 post-breeding. The occurrence of first postpartum ovulation, first postpartum estrus, calving to conception interval and number of services per conception of each animal were recorded. The reproductive performance was compared between two groups of animals. The statistical significance of differences between the two groups of animals for each variable was calculated using Student's *t*-test (Snedecor and Cochran, 1986).

Detection of first postpartum large follicle and first postpartum ovulation : The accurate identification and monitoring of small and medium-sized individual follicle was difficult in the early postpartum period before development of the first dominant follicle. The detection of first postpartum large follicle was significantly earlier ($P < 0.01$) in the contralateral ovary (17.5 ± 1.2 days, n=12) than ipsilateral (22.4 ± 1.7 days, n=8) to previously gravid uterine horn. The first postpartum ovulation was equally distributed in the ovary ipsilateral (n=7) and contralateral (n=7) to previously gravid uterine horn between Days 14 and 28 postpartum (Table 1). However, it occurred significantly ($P< 0.05$) earlier in those animals that ovulated on opposite side of previous pregnancy than in those that ovulated on the same side (18.3 ± 1.5 versus 23.3 ± 1.2 Days).

Subsequent reproductive performance of animals : The location of first postpartum large follicle on either ovary ipsilateral or contralateral to previously gravid uterine horn had no significant effect on first postpartum estrus interval (57.9 ± 5.8 versus 56.6 ± 10.5 days, Table 1). Similarly, non-significant differences were observed in calving to conception interval (68.4 ± 15.0 versus 91.8 ± 12.9 days), and in the number of services per conception (1.4 ± 0.3 versus 1.7 ± 0.2) between the animals of two groups.

Several reports suggested that the regressing corpus luteum of pregnancy might have a negative effect on follicular growth during early postpartum period in cattle (Dufour and Roy, 1985; Rajamahendran and Taylor, 1990; Sheldon *et al.*, 2000) and buffaloes (Usmani, 1992). However, later it has been demonstrated that postpartum ovarian function was influenced by previously gravid uterine horn shortly after parturition rather than regressing CL of previous pregnancy in cattle (Sheldon *et al.*, 2002). The growth of small and medium-sized follicles was observed on both ovaries in the present study; however, the interval from calving to detection of first postpartum large follicles was significantly earlier in the ovary contralateral to previously gravid uterine horn up to Day 28 postpartum. This observation suggested that the side of previous pregnancy might have a negative influence on the growth of a large follicle during early postpartum period.

The relationship of ovulating ovary with previously gravid uterine horn had a significant effect on postpartum interval to first ovulation. The interval was longer when ovulation occurred in the ovary ipsilateral to past gravid uterine horn in animals ovulating before Day 28. Similar observation has been reported in cattle (Sheldon *et al.*, 2000) and water buffaloes (Usmani, 1992). Although the detection of the first dominant follicle and occurrence of first postpartum ovulation were significantly earlier in the ovary contralateral to previously gravid uterine horn, equal proportion of first postpartum ovulation occurred on the same and opposite side of previous pregnancy if animals ovulated before Day 28 postpartum in present study. This observation suggested that negative influence of previously gravid uterine horn on occurrence of first postpartum ovulation in the ipsilateral ovary declined with increasing time postpartum (Sheldon *et al.*, 2000).

The presence of a large follicle ipsilateral to previously gravid uterine horn might have some local effect on endometrium and/or myometrium. One hypothesis is that estradiol-17â synthesized by large follicle might have a beneficial local effect in hastening the process of uterine involution (Sheldon *et al.*, 2000). Plasma estradiol-17_{α} concentrations are greater within the utero-ovarian vein draining the ovary containing the large/ovulatory follicle (Ireland *et al.*, 1984). The presence of a large follicle in the ovary ipsilateral to previously gravid uterine horn up to 28 days postpartum has been shown to be associated with shorter calving to conception interval in cattle (Sheldon *et al.*, 2000). Contrary to these reports, however, no difference could be observed in first postpartum estrus interval, calving to conception interval and number of services per conception in the animals with the development of first postpartum large follicle in the ovary either ipsilateral or contralateral to previously gravid uterine horn between Days 14 and 28 postpartum in the present study.

In conclusion, the interval from calving to detection of first large/dominant follicle and occurrence of first postpartum ovulation were significantly earlier in the ovary contralateral to previously gravid uterine horn between Days 14 and 28 postpartum, however, these factors did not have significant influence on subsequent reproductive performance of buffaloes.

Table1: The postpartum follicular activity in relation to the previously gravid uterine horn and its effect on reproductive performance in Mehsana buffaloes

Characteristics	Group A	Group B	Level of significance
Detection of first large follicle (= 10 mm) by Day 28 postpartum (days)	22.4 ± 1.7 (15-28) (n=8)	17.5 ± 1.2 (14-26) (n=12)	P<0.01
First postpartum ovulation (days) by Day 28 postpartum	23.3 ± 1.2 (18-28) (n=7)	18.3 ± 1.5 (15-23) (n=7)	P<0.05
Calving to 1st postpartum estrus interval (days)	57.9 ± 5.8 (33-87)	56.6 ± 10.5 (23-159)	NS
Calving to conception interval (days)	68.4 ± 15.0 (41-165)	91.8 ±12.9 (42-167)	NS
No. of services per conception	1.4 ± 0.3 (1-3)	1.7 ± 0.2 (1-3)	NS

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