Uterine Involution and Ovarian Follicular Growth during Early Postpartum Period of Murrah Buffaloes (*Bubalus bubalis*)

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ABSTRACT : Ultrasonographic studies were conducted on eight Murrah buffaloes daily from day 6 postpartum (pp) onwards till day 77 pp to monitor changes in the cervix, uterine horn and ovarian follicular growth and development. The mean size of horn and cervix on day six (9.07±0.74 and 8.58±0.00 cm) decreased significantly to 4.09±0.09 and 3.56±0.08 cm by day 27 pp, respectively. Follicles in 50% of the buffaloes ovulated within 24 to 54 days pp and the size of the largest follicle on different days increased to more than 5 mm. The remaining 50 percent of animals ovulated after 65 days postpartum. Large size follicles (>8.5 mm) appeared in six out of eight buffaloes between 10 to 30 days pp and five animals had ovulated during early postpartum period. Waves pattern of follicular growth was observed during early postpartum period. Ovulatory follicles growth rate was more than the anovulatory follicles and increase in size was more as compared to the subordinate follicle. Anovulatory follicles persisted for longer period. Mean size of large follicle was more from day 6 to 41 pp and again from 50 to 65 pp in cyclic animals. Second large follicle were large during early postpartum (18 days), thereafter, its size was more in acyclic animals. Small follicles population was less in cyclic animals upto day 50 postpartum. Mean medium size follicle growth pattern did not differ in cyclic and acyclic groups. Large size follicle number was more in cyclic group (5/8) during 14 to 20 days postpartum. Presence of large follicles (>8.5 mm) showed initiation of ovarian activity. ***(Asian-Aust. J. Anim. Sci. 2004. Vol 17, No. 3 : 313-316)***

Key Words : Buffalo, Uterine Involution, Follicular Growth, Postpartum

INTRODUCTION

Absence of estrus is the most common single cause of infertility observed in rural buffaloes (Iyer, 1978). Anestrus and inactive ovaries lead to longer postpartum interval in buffaloes (Cockrill, 1980). Physiology of basic reproductive pattern is of great importance for improving the reproductive efficiency of buffaloes, and thereby helping the economy of the owner. During the last decade different hormonal treatments have been tried to induce early cyclicity in pubertal heifers and buffaloes after calving (Baruselli et al., 1997; Lohan et al., 2001) but with variable success. Ovarian ultrasonography studies have brought out clear pattern of follicular dynamics in cattle (Sirois and Fortune, 1988; Savio et al., 1998) thereby providing a basis for improving fertility, synchronizing estrous cycle with more precision and enhancing superovulatory responses (Lucy et al., 1992). Accuracy of per- rectal palpation of ovarian structures in cattle and buffaloes is very poor (Ribadu and Dobson, 1994 and Wishy and Ghoneim, 1995). This study was undertaken to monitor the uterine and follicular growth changes during early postpartum period of Murrah buffaloes in order to understand postpartum ovarian physiology.

MATERIALS AND METHODS

Eight Murrah buffaloes (2nd and 3rd lactation) during last quarter of gestation, were purchased in the month of Oct. 2000, under National Agriculture Technology Project (NATP) in operation. Buffaloes were purchased from Arid Zone, 10-30 km, away from Hisar city. Animals were fed as per NRC recommendation and reared under semi open loose housing system. All animals calved normally during Nov. and Dec. 2000.

Involution of uterus and follicular development on both ovaries of all buffaloes were recorded daily from day six postpartum onwards till day 77 postpartum (pp), using ultrasound machine (Pie Medical Vet 200, Holland) attached with Transrectal Linear Array probe of 7.5 MHz frequency. Observations on the involution of uterus were carried out daily till the size of cervix and uterus reduced to normal size. Ovaries were scanned daily for 17 to 18 days with intermittent gap of seven days, by drawing position of different categories of follicles (small, 2-4.5 mm; medium, >4.5-8.5 mm; large, >8.5 mm) on both the ovaries. Sudden disappearance of large follicle present at previous examination and appearance of corpus luteum was considered as ovulation of that follicle (Murphy et al., 1990). The diameter of cervix, horn and follicles were measured with inbuilt scale by the same person throughout the study for precision by ultrasonographic monitoring. Teaser bull was paraded daily during early hours of evening and morning, to detect heat. Analysis of variance and linear regression was carried out to determine the significance of changes in cyclic and acyclic postpartum buffaloes.

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Table 1. Postpartum interval from calving to first ovulation, first heat and second heat in buffaloes

Parameters	1.	2.	3.	4.	5.	6.	7.	8.
First ovulation from calving (days)	65	38	54	35	24 (e)	-	-	-
First heat from calving (days)	74	47 (d)	-	55 (e)	47 (e)	-	-	73 (dx)
Second heat	86 (ax)	72 (ax)	-	-	-	-	-	-

ax=Mated with bull, d=Artificial Insemination not done, e=Corpora lutea not observed later on, dx =Mucus discharge observed.

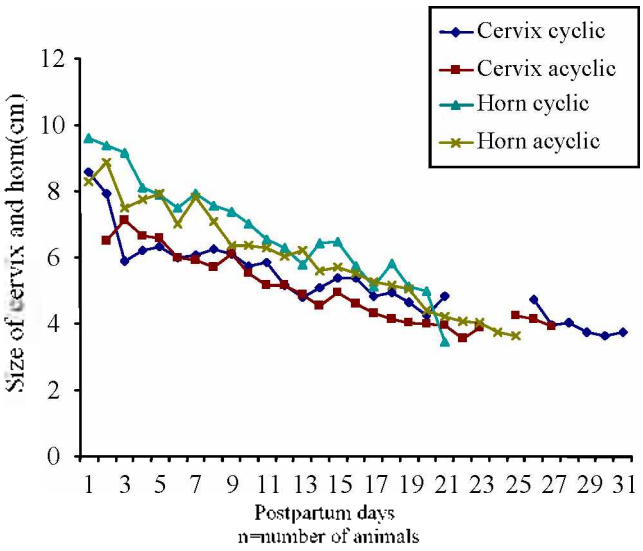

Figure 1. Mean size of cervix and horn in cyclic (n=4) and cyclic (n=4) buffaloes during early postpartum period.

RESULTS AND DISCUSSION

The results of mean values of cervix and horn size recorded daily are presented in Figure 1. On day six pp, the mean size of horn and cervix were 9.07±0.74 and 8.58±0.00 cm, which reduced to 4.09±0.09 and 3.56±0.08 cm by day 27 pp, respectively. Involution of uterus was faster in cyclic animals during the first 10 days pp (Figure 1). There was slight increase in mean diameter of horn and cervix from day 30 onwards which might be due to initiation of ovarian follicular activities (Figure 1) due to steroid production. The coefficient of regression was calculated between days of postpartum with cervix size in cyclic and acyclic and horn size cyclic and acyclic were -0.12±0.01, -0.13±0.01, -0.21±0.02 and -0.20±0.01, respectively. All the regression coefficients were significant ($p<0.01$). Analysis of variance was carried out to test the significance of cyclic and acyclic buffaloes with reference to cervix size and horn size. Cervix size was significantly ($p<0.05$) more in cyclic buffaloes (5.68±0.22 cm) than in acyclic buffaloes (4.97±0.20 cm). However, there was no difference in cyclic and acyclic

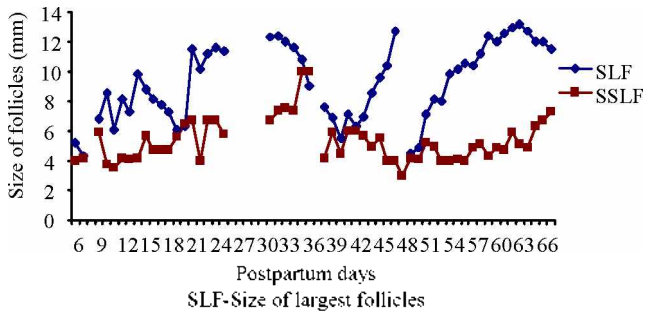

Figure 2. Size of largest and second largest follicles in cyclic buffaloes during advancing postpartum period.

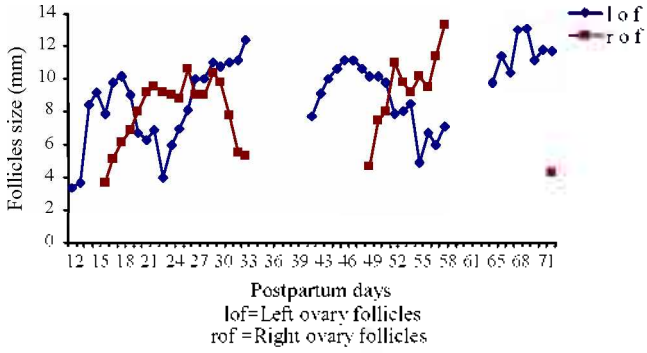

Figure 3. Development of follicles in acyclic buffaloes during advancing postpartum period.

buffaloes with regard to horn size.

On day 6 pp, mean number of small and medium sized follicles were 8.10±5.67 and 1.00±0.00 and mean size of the largest and second largest follicles were 4.37±0.28 and 4.05±0.05 mm respectively, thereafter, number and size of these increased. Large category follicle (>8.5 mm) appeared earlier in cyclic than acyclic animals. Largest follicle size when reached more than 8.5 mm, showed negative effect on the mean population of small size follicles. The mean size of the largest follicle on any day did not grow more than 8 mm upto day 21 pp. Peter and Bosu (1988) also reported that in Holstein cows, size of largest follicle never exceeded 9 mm early after calving. Buffaloes which ovulated (5/8) without behavioral estrus symptoms had follicular growth more than 8mm within 24 to 65 day pp and also came in heat later (Table 1). Savio et al. (1990) and Murphy et al. (1990) also reported that first ovulation was not associated with detection of estrous behaviour in 89 to 94 percent of cows. In cyclic animals, large sized follicle (>8.5 mm) appeared in three animals between 10 to 13 day pp and in one on day 62 postpartum. In acyclic animals (4/8) large follicle appeared between 15 to 47 days postpartum. Follicular growth pattern were observed in waves during early postpartum periods from day eight pp onwards. Evans et al. (1994) reported that in cow heifers, dominant follicle

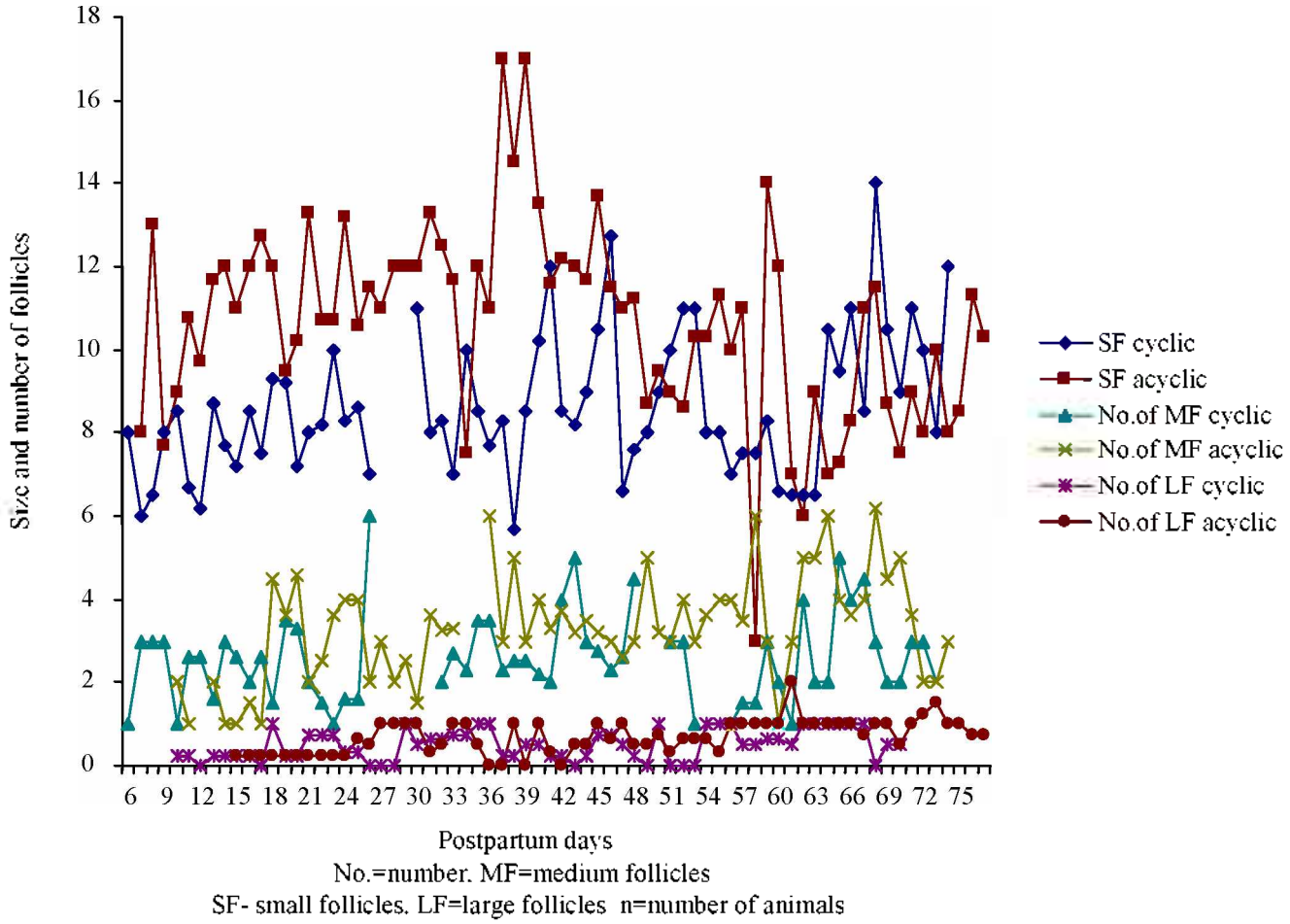

Figure 4. Mean size and number of small, medium and large follicles in cyclic (n=4) and acyclic (n=4) buffaloes during advancing postpartum period.

growth rate at any of ages showed mean value of 1.4±0.1 mm per day or regression rates of mean 1.2±0.1 mm per day. The growth interval of the consecutive waves varied between five to eight days. The mean growth rates per day in case of ovulatory and anovulatory follicles were 1.23±0.12mm and 0.86±0.10 mm, respectively. Interwave interval reported by Evans et al. (1994) in cow heifers before their first ovulation and in subsequent short and normal duration ovulating cycle were 6.8±0.7 to 9.9±0.5 days. Largest follicle which ovulated, increased very fast and its size difference as compared to second largest follicle became much more near ovulation. Ovulatory follicles persisted for shorter period than anovulatory follicles in individual animal (Figure 2 and 3). These observations are supported by the work of Murphy et al. (1990) and Pierson and Ginther (1988) who reported that in cattle ovulating follicle grew more rapidly ($p<0.05$) and persisted for a shorter period as compared to most of the non ovulating dominant follicle.

In cyclic animals, largest follicle mean size was more from day 6 to 41 pp and then again from day 56 to 65 pp (Figure 5). Savio et al. (1990) reported that early return to active follicular development in dairy cows and the fact that some cows ovulated before day 10 after calving demonstrated the ability of the ovary to resume activity early after calving. Mean diameter of second largest follicles in cyclic animals were larger during first 18 days pp, thereafter size was more in case of acyclic animal group throughout the study (Figure 5). Appearance of large follicle in cyclic animals during early postpartum period might have enhanced involution in case of cyclic animals (Figure 4). Mean population of small sized follicle was less in cyclic animals upto day 50 pp and medium size follicles growth pattern were more or less similar in both groups throughout the study period (Figure 4).

Although, the number of observations in the present study were not large enough to conclude the findings, however, the results revealed that in case of postpartum buffaloes, 63 percent were silent ovulators without estrus behaviour. Ultrasonographic ovarian structure observations showed that 50 percent subsequent to post ovulation were confirmed to have corpora lutea. The result of first heat

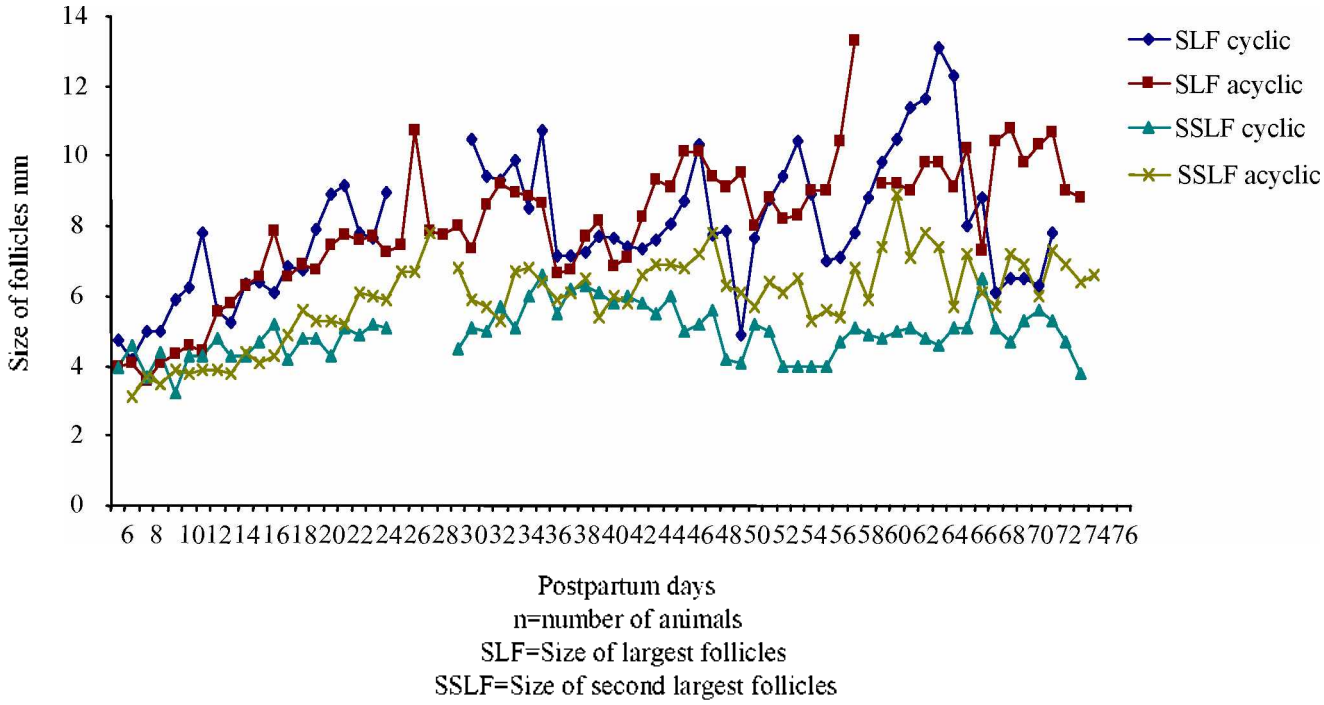

Figure 5. Mean size of largest and second largest follicles in cyclic (n=4) and acyclic (n=4) buffaloes during advancing postpartum period.

showed that 63 per cent animals exhibited estrus between 47 to 74 days pp and only 40 per cent of these heats resulted in ovulation. Presence of large follicles (>8.5 mm) showed initiation of ovarian activity during the postpartum period of buffaloes. The month of calving followed by longer days showed suppressing effect on the follicular ovulation.

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