Post parturient neonatal behaviour and their relationship with maternal behaviour score, parity and sex in Surti buffaloes

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ABSTRACT

Present study was conducted to investigate the post parturient behavioural activities of Surti buffaloes (\(n = 25\)) and their calves using low light-intensity cameras and digital video recorder at five stages (I: from calving to half an hour, II: 6–6:30 hours, III: 12–12:30 hours, IV: 18–18:30 hours and V: 24–24:30 hours after calving) over a period of 24 h immediately after calving. Based on their maternal behaviour score (MBS) dams were categorized into two classes that is, group 1 (MBS = 1: very aggressive and 2: very attentive) and group 2 (MBS = 3: indifferent and 4: apathetic) where dam scored MBS 1 represented very aggressive and 4 apathetic. Overall eating time was significantly \((P < .05)\) higher in buffalo cows of group 2 (8.87 ± 1.34 min) than in group 1 (5.37 ± 0.50 min). Dams of both the groups spent significantly \((P < .05)\) longer time in sniffing and licking calf’s body and licking ano-genital area of calf during stage I than later stages. Significantly \((P < .05)\) longer time intervals from birth to standing (53.03 ± 3.04 min) were observed in group 2 calves. A positive correlation \((P < .01)\) was observed between the time interval from birth to suckling and duration of active teat seeking (0.525). It may be inferred that post parturient neonatal behaviour have certain level of relationship with maternal behaviour score, whereas, parity and sex did not show any significant effect on MBS in Surti buffaloes.

1. Introduction

The behavioural events between mother and calf during early post-partum period have an important bearing on the survival of neonate and hence on the productive and reproductive performances of buffalo cows. In buffaloes immediately after calving there is a critical period (Gordon 1996) where mother–offspring bond establishes through fast learning (imprinting) using specific cognitive skills. In imprinting there is a rapid formation of permanent close attachment between an animal (calf) and salient environmental object (dam). During this period buffalo cows remain standing for longer duration to make close contact with their young ones in order to recognize (Usmani et al. 1990) and nurse them properly. Several studies had shown that cows spent maximum time in care giving behaviours like licking (Illmann & Spinka 1993; Val-Laillet et al. 2004) whereas, least priority have been given to maintenance behaviourial activities viz. eating (Huzzey et al. 2005) and ruminating (Pahl et al. 2014) during early post-partum period. To ensure strong mother–offspring bonding and good expression of maternal behaviours (licking, nursing and protection) longer periods of dam–calf contact may be recommended under extensive and organic dairy farming (Grandinson 2005). Since little is known on cow–calf relationship in buffaloes, the current study has been designed to investigate the post parturient neonatal behaviour and its relationship with maternal behaviour score, parity and sex in Surti buffaloes.

2. Materials and methods

2.1. Study area

The present study was conducted on Surti buffaloes maintained at Livestock Research Station of Navsari Agricultural University, Navsari, Gujarat, India between November 2012 and March 2013. The study place is located at 20°15′ to 74°23′ Latitude and 21°23′ to 74°23′ E longitude at an elevation of 800 m above the mean sea level. The climate of the region is sub-humid tropical with heavy rainfall. Generally, winter (November–February) remains fairly cold and dry, summer (March–June) is moderately hot and humid while monsoon (July–September) is hot and extremely humid.

2.2. Experimental design and animals

Initially we selected 30 animals for the study however due to below average birth weight of calf, delayed let down of milk in dam we excluded the data of 5 animals and finally a total of 25 Surti buffaloes, 8 primiparous and 17 multiparous (2–9 parity) were categorized into two classes viz. groups 1 and 2 based on the maternal behaviour score (MBS). To study the
2.3. Management of experimental animals

The experimental buffaloes were housed in individual calving pens before one week of expected date of calving. The calving pens have both covered and open space as per Bureau of Indian Standards specifications. The open paddock was surrounded by 1.5 m high brick wall with two metallic door lock gates on each side. All the animals were fed as per farm routine practices whereas; fresh and clean drinking water was accessed freely round the clock.

2.4. Behavioural recording

For observing the post parturient behaviours of dam and calf, video recording was done with a low light-intensity camera and a time-lapse digital video recorder (Gobbler H.264 Network DVR). Four cameras were fit in the calving pen (two dome type and two bullet type) and one camera was also placed in open paddock. To facilitate behavioural data recording at night the calving pens were illuminated with 40 W compact fluorescent lamp. The intensity of lights was sufficient to note down all the behavioural activities. As the animals were accustomed to the similar light during the night at the farm, such illumination during the experiment was not likely to influence the behaviour of the animals. To extract all the data on behaviour from DVR, a specialized coding sheet for data on behaviour from DVR, a specialized coding sheet for each parameter was used.

2.5. Statistical analysis

The frequency of each behaviour activity as well as percentage of animal showing these activities at different time intervals were recorded. For each group (N = 2) the same behavioural traits were recorded repeatedly at different point of time (N = 5). The PROC GLM procedure was used for repeated measure analysis of variance using SAS 9.3. The Duncan Multiple Range Test was used for mean separation within and between groups over different time periods. The PROC CORR procedure was used for estimation of correlation coefficient among analysis variables.

3. Results

3.1. Post parturient maternal behaviour

The various post parturient behavioural activities of buffalo dams were observed at five different stages (Table 1). Perusal of data revealed that the time spent in lying by cows of maternal behaviour score in Surti buffaloes a method proposed by Sandelin et al. (2005) was utilized. In this method, dams were classified from 1 to 4 score where score 1: very aggressive; cow was willing and did fight the handler to protect calf, score 2: very attentive; cow remained in close proximity with mild aggression, but did not fight the handler to protect calf, score 3: indifferent; cow remained in proximity, showed no aggression toward handler, but remained in sight of calf and score 4: apathetic; cow showed no emotion toward calf and score 4: apathetic; cow showed no aggression toward handler, but remained in sight proximity with mild aggression, but did not fight the handler to protect calf, score 2: very attentive; cow remained in close proximity. However, considering the number of animals in each maternal behaviour score, dams with score 1 and 2 were categorized as group 1 whereas, scores 3 and 4 as group 2.

| Behaviour (in min.)       | Groups | Stages               | I      | II       | III      | IV       | V       | Overall |
|---------------------------|--------|----------------------|--------|----------|----------|----------|---------|---------|
| Lying                     | 1      | 17.683 ± 2.70 (11)   |        |          | 21.086 ± 2.25 (12) | 19.924 ± 2.23 (13) | 18.674 ± 2.58 (13) | 19.37 ± 1.19 (49) |
|                           | 2      | 13.738 ± 2.55 (07)   |        |          | 18.457 ± 4.43 (07) | 27.228 ± 1.78 (06) | 25.002 ± 5.00 (04) | 20.36 ± 1.99 (24) |
| Eating                    | 1      | 3.650 ± 1.20 (06)    | 5.709 ± 1.10 (13) |          | 6.342 ± 1.10 (14) | 4.220 ± 0.91 (14) | 6.396 ± 1.19 (08) | 5.372 ± 0.50 (55) |
|                           | 2      | 4.383 ± NE (01)      | 8.829 ± 1.52 (07) |          | 10.669 ± 2.85 (06) | 8.728 ± 5.92 (03) | 6.050 ± 1.93 (02) | 8.876 ± 1.34 (19) |
| Ruminating                | 1      | 1.017 ± NE (01)      | 15.733 ± 2.20 (13) |          | 11.769 ± 3.65 (09) | 16.633 ± 2.42 (09) | 13.854 ± 2.60 (13) | 14.25 ± 1.33 (45) |
|                           | 2      | 18.050 ± NE (01)     | 12.372 ± 4.03 (06) |          | 15.860 ± 4.22 (05) | 26.817 ± 0.20 (06) | 18.607 ± 4.07 (05) | 18.50 ± 1.91 (23) |
| Self-licking              | 1      | 1.606 ± 1.48 (03)    | 0.080 ± 0.01 (06) |          | 0.119 ± 0.02 (06) | 0.363 ± 0.12 (09) | 0.077 ± 0.01 (08) | 0.105 ± 0.14 (32) |
|                           | 2      | 0.750 ± 0.48 (02)    | 0.150 ± 0.05 (02) |          | 0.193 ± 0.06 (05) | 0.625 ± 0.56 (02) | 0.254 ± 0.14 (02) | 0.34 ± 0.11 (13)   |
| Sniffing and licking      | 1      | 1.159 ± 1.71 (16)    | 1.145 ± 0.39 (14) |          | 0.990 ± 0.25 (12) | 0.852 ± 0.28 (11) | 0.257 ± 0.05 (12) | 0.86 ± 0.79 (65)   |
| calf’s body               | 2      | 11.544 ± 1.96 (08)   | 0.643 ± 0.40 (07) |          | 0.643 ± 0.10 (07) | 0.617 ± 0.33 (02) | 0.289 ± 0.08 (04) | 0.371 ± 1.10 (28)   |
| Licking of ano-genital    | 1      | 3.243 ± 0.49 (16)    | 0.833 ± 0.33 (11) |          | 0.365 ± 0.12 (08) | 0.352 ± 0.15 (09) | 0.141 ± 0.03 (11) | 0.125 ± 0.24 (55)   |
| area of calf              | 2      | 4.012 ± 0.85 (07)    | 0.447 ± 0.16 (05) |          | 0.319 ± 0.07 (07) | 1.967 ± NE (01)   | 0.129 ± 0.06 (04) | 0.46 ± 0.42 (24)    |

Note: LSM showing different superscripts in lower case (in a row) and upper case (in a column) letters differ significantly (P < .05). Figures in parentheses are the members of animals used to derive LSM. NE: not estimated.

The post parturient behavioural activities of dams and their calves were observed immediately after calving till 24 h post-partum. The 24 h post-partum period was divided into 4 intervals of 6 h each and during every interval individual buffalo was observed for 30 min. During these intervals the postural states and maternal behavioural activities like lying, eating, rumination, self-licking, sniffing and licking the calf’s body and licking the ano-genital area of the calf were recorded for each dam. The time at which these observations were recorded has been shown below as stages:

- Stage I: From calving to half an hour
- Stage II: 6–6:30 hours after calving
- Stage III: 12–12:30 hours after calving
- Stage IV: 18–18:30 hours after calving
- Stage V: 24–24:30 hours after calving

During post-partum period the calves (13 male and 12 female) were observed for both postural states and the elapsed times between birth and the behavioural activities viz. lifting of the head, fore leg and hind leg, standing time, suckling and teat finding. Further, duration between udder to teat finding, teat finding to suckling and duration of active teat seeking along with number of suckling and standing attempts were also observed.
group 2 was significantly higher during IV and V stages than stage II. Overall eating time was significantly ($P < .05$) higher in buffalo cows of group 2 than in group 1. During stage I, the extent of self-licking behaviour was significantly ($P < .05$) higher in group 1 which diminished with the progression of post-calving period. However, dams of both the groups spent significantly ($P < .05$) longer time in sniffing and licking calf’s body and licking ano-genital area of calf during stage I than later stages.

### 3.2. Effect of maternal behaviour score (MBS) on neonatal behaviour

There was non-significant effect of parity and sex of calf on MBS. The MBS for primiparous and pluriparous buffaloes were 2.75 ± 0.37 and 2.06 ± 0.18, respectively. The MBS of dams of male and female calves were 2.23 ± 0.201 and 2.33 ± 0.310, respectively. The time interval between birth to post-parturient neonatal activities viz. head lifting, teat finding, duration of active teat seeking and number of standing attempts were higher in group 1 calves as compared to group 2 calves. However, the duration from birth to fore leg, hind leg lifting, standing and suckling were higher in group 2 calves than group 1 calves (Table 2). Further, the time interval between udder to teat finding, teat finding to suckling and number of suckling attempts were also higher in group 2 calves than the group 1 calves. The perusal of Table 2 had also indicated that MBS was significantly ($P < .05$) higher in buffalo dams in group 2 than in group 1. Significant ($P < .05$) increase in time intervals from birth to hind leg lifting and standing were observed in group 2 calves than those in group 1.

### 3.3. Relationship among neonatal behaviour, MBS, parity and sex

The correlation coefficients among MBS and various behavioural activities of calf have been depicted in Table 3. Moderate, positive and significant ($P < .05$) correlation was found between maternal behaviour score and suckling attempts, time interval between teat findings to suckling. However, a strong, positive and significant ($P < .01$) correlation has been observed between head lifting and lifting of fore leg and time taken in lifting fore limb to time taken in lifting hind limb and standing. Further, time interval between birth to suckling and time taken in birth to teat finding (0.894), udder to teat finding (0.602) and duration of active teat seeking (0.525) had shown a positive and significant ($P < .01$) correlation. However, a negative and significant ($P < .01$) correlation was observed between time interval between teat finding to suckling and duration of active teat seeking period.

### 4. Discussion

In the present study buffalo dams had shown mainly three types of behavioural activities viz. maintenance behaviour, care giving (epimeletic) behaviour and few abnormal behavioural activities. Most of the time buffalo dams showed the calf-related behaviour just after calving whereas, other
Correlation is significant at \(P < .05\).

**Correlation is significant at \(P < .01\).
of high MBS dams which might be attributed to the fact that in spite of lower MBS the buffalo dams of group 2 have assisted their calves to get milk earlier. Furthermore, several factors viz. udder configuration, breed, poor calf vigour, abnormal maternal behaviour in heifers, type of floor, etc. are known to affect above mentioned behavioural events (Lidfors et al. 1994; Paranhos Da Costa et al. 1994).

The results of this study showed a strong, positive and significant ($P < .01$) correlation between head lifting and lifting of fore leg and time taken in lifting fore limb to time taken in lifting hind limb and standing which may be because all these events occur in sequence, first calf lifts its head then tries lift fore leg followed by lifting of hind leg then finally tries to stand hence there is relationship between these events. Further, relationship between these two aspects can be attributed to the fact that calf vigour and degree of maternal care both influence neonatal behaviour. We observed a positive and significant ($P < .01$) correlation between time interval birth to sucking and time taken in birth to teat finding, udder to teat finding and duration of active teat seeking which might be due to the fact that after birth calf tries to locate the udder and teats by trial and error method hence these events are interrelated. Furthermore, a negative and significant ($P < .01$) correlation was found between time interval between teat finding to suckling and duration of active teat seeking period which might be attributed to the fact that when calf takes more time to suck after locating the teats the duration of active teat period is supposed to be prolonged.

5. Conclusion

The findings of present investigation revealed that post parturient neonatal behaviour have certain level of correlation with MBS. However, parity and sex did not show any significant relationship with calf behaviour in Surti buffaloes. Further, the lack of effect of parity may also be due to reduced number of animals and a large group size may alter these results. Hence, a keen knowledge of mother–offspring interaction immediately after calving may help to evolve good management practices during early post-partum period. Further, there is need of in-depth studies regarding offspring protection behaviour in the context of quality of human–animal relationship and relationship between offspring protection and maternal care.

Disclosure statement

No potential conflict of interest was reported by the authors.

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