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Pre-Partum Feeding and Elimination Behaviour of Kankrej Cows at an Organized Farm

A.K. SRIVASTAVA*, J.B. PATEL, A.P. CHAUDHARY, K.J. ANKUYA, H.D. CHAUHAN, V.K. PATEL, M.M. PAWAR and J.P. GUPTA

Department of Livestock Production & Management, College of Veterinary Science and Animal Husbandry, Kamdhenu University (Erstwhile SDAU), Sardarkrushinagar-385506, Gujarat

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ABSTRACT

Present study was carried out to assess the effect of parturition on feeding behaviour on before calving. 21 Kankrej cows were equally grouped into 3 treatments, first parity (T1), second parity (T2) and 3 or more parity (T3) cows. The behaviour of cows was recorded with two CCTV cameras and 24 hours' observations were made from recorded video for four days −1, −2, −3 and −7 prior to the calving. The feeding behaviour was assessed in terms of feeding frequency, feeding duration and watering frequency. The mean feeding frequency was the highest on the day of calving (30.33±2.07) followed by day-3 (26.62±1.43), day-2 (25.33±1.46) and Day-7 (24.43±1.40) in a day and the difference found was significant (P<0.05). The mean feeding duration (min) was the minimum on the day of calving (273.19±14.45) followed by day-7 (315.00±11.17), day-2 (315.57±9.84) and day-3 (318.10.95±1.40) in a day and the difference found was significant (P<0.05). Mean water drinking frequencies was maximum on the day of calving 4.14±0.55 compared to 3.95±0.51, 3.67±0.40 and 3.81±0.48 on −2, −3 and −7 prior to the calving, respectively, but the difference found was not significant. Hence, it may be concluded from the study that cows have higher feeding frequency, less feeding duration and higher watering frequency on the day of calving than 2-7 days before the calving. The decrease in feeding duration on the day of calving is directly related to lesser feed intake and reason might be due to increase restlessness and discomfort associated with the parturition process.

Key words: Kankrej cow, parity, feeding behaviour, elimination behaviour, pre-partum behaviour

The event of giving birth is an essential part of animal production. There are substantial economical and welfare-related challenges arising around the time of parturition, and commercial animal production have developed an extensive body of recommendations for managing parturient females. In dairy production, successful management of the calving cow aims to ensure a viable calf with no detrimental effects for the cow[16]. In a similar manner to some of the physical changes, the behaviour of cows shows gradual changes throughout gestation and then more obvious, short-term changes in the last few days before parturition. One change in behaviour that is directly related to physical change is the gradual reduction in feeding duration during the dry period as the increasing volume of the uterus limits the space available for food [8 &11]. The decrease in feed intake is also accompanied by a decrease in time spent ruminating. Kankrej is a breed of dual-purpose zebu cattle. Total estimated population of Kankrej cattle in the country is 3028.3 thousand and the share of Kankrej cattle in total Indigenous cattle population is 2.0 per cent[20]. They are well adapted to the geo-climatic conditions of Saurashtra and Kutch, have immense draught power and are known for yielding good quantity of milk with high fat content even in stress

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* Corresponding author: aksrivastavavet@gmail.com

conditions[4]. Commercialisation and realisation of Kankrej cattle as a quality milk producer has increased in recent time. The knowledge of prepartum feeding behaviour can help to reduce the frequency and intensity of abnormal behaviour and survival of the offspring. The prepartum feeding behaviour have been studied by the various researchers on dairy as well as for beef cattle abroad, but literature regarding indigenous cows is scanty. Hence, there is need to study various aspects of the prepartum feeding and elimination behaviour of indigenous cattle. Considering the above facts, the present investigation was proposed to study the prepartum feeding and elimination behaviour of indigenous Kankrej cows at organized herd.

MATERIALS AND METHODS

Present study was conducted on 21 Kankrej cows maintained at Livestock Research Station (L.R.S.) under Sardarkrushinagar Dantiwada Agricultural University (S.D.A.U.), Sardarkrushinagar, Gujarat. Animals were allotted to each treatment group namely Treatment -1 (T_1) seven heifers (I parity; which had not calved); Treatment - 2 (T_2) seven cows in second lactation (II parity) and Treatment -3 (T_3) seven cows in third or higher lactation (III or more parity).

Housing and feeding management: The animals were maintained under loose housing system. The housing space for the animals was specified as per BIS. Experimental shed was measuring 16.5 × 7.5 m (L x W) which include 3.7 x 7.5 m (L x W) covered area and remaining as open paddock area. Covered area could accommodate three cows at a time. Covered area was further divided by a six feet wall, so as to provide two separate pens to accommodate one (2.5 x 3.7 m) and two cows (5.0 x 3.7 m), respectively. Animals were free to move from one pen to other, when they were not chained. Cows were tied with metallic chain around the neck and it was reaching about 1.0 meters above the ground when animals were standing and feeding. This 1.0 m length of chain provided little movement and change of place of animal while standing. Animals were chained in morning at 8.00 hr and free at 14.00 hr. for rest of the period. The floor of the covered area was made up of concrete whereas; open paddock was made up of sandy soil and no bedding was provided to the animals. There was separate manger for three animals under covered area whereas; common water trough was present on at the end of open paddock.

Experimental cows were transferred to experimental pen approximately 8-10 days prior to their expected date of calving. Daily routine of the advanced pregnant shed was followed for the experimental animals. They were offered concentrate in morning 8.00 hrs, dry fodder at 11.00 hrs and green fodder at 15.00 hrs daily as per the availability of fodder. They were allowed to feed in continuous feeding manger, inside the shed. Pregnant cows and heifers were fed concentrate mixture (*Banasdan*) individually for maintenance at the rate of 1.50 kg per animal. The green fodders fed to entire herd in general were Maize (*Zee mays*), Sorghum (*Sorghum bicolor*), Cowpea (*Vigna sinensis*), Sunflower (*Helianthus annus*), Lucerne (*Medicago sativa*) and Hybrid napier grass (*Pennisetum purpureum*). The feeds and fodders were supplied uniformly throughout the year. The dry fodders fed to animals were Jowar and Bajara straw, *Dicanthium annulatum* and Gotars. Both green and dry fodders were fed after chaffing. The animals had free access to fresh and clean drinking water all the time. Cleaning of shed was done twice daily in morning and evening. All animals were vaccinated against Foot and Mouth Disease and Haemorrhagic Septicemia and routinely dewormed. They were also tested annually for positive reactors of Brucellosis, Johne's disease and Tuberculosis.

Behavioural observations and CCTV camera: The behaviour of the animals was recorded in the farm and confined condition

with the help of two CCTV cameras CPLUS® which were installed in the experimental animal shed. The first Dome (Non IP- CP-USC-DA13L2) type camera was installed above the manger wall whereas, another one **(**Bullet Non IP- CP-VCG-ST24L2) was placed opposite of the first camera on the periphery wall of the open paddock. The cameras were installed in the experimental shed in such a way that gave the best possible view of activity across the whole shed. The signal from the cameras went through a video multiplexer DVR (8 Channel x 4 HDCVI with Remote CPPLUS-UVR-804E2) to record 24 hours of video in 2TB HDD surveillance. From HDD the data were transferred through USB (Pen drive) and finally stored in the 2 TB (Trillion bytes) Seagate® Expansion portable drive and further observations were made with desktop computer.

The prepartum feeding and elimination behaviour was observed seven days before the expected date of parturition. The exact calving time (defined as the time where the calf was fully expelled) was obtained from video recordings. The final 24 hr prior to calving was assigned as day −1. Days −2, −3 and −7 comprised hours −25 to −48, hours −49 to −72, and hours −145 to −168, respectively. Day 1 comprised hours 1–24 and day 2 comprised 25–48 hr after the parturition[10].

Recording of observations: Feeding state of cow was defined as cow places head through feed barrier and eats, with muzzle no more than 10 cm away from the feed manger[14]. Drinking state was defined as cow moves muzzle within 10 cm of water in trough. Ends when muzzle is more than 10 cm away from water. The number of times the cow opted for feeding state, during 24-hour period was recorded and referred as feeding frequency. The duration of more than 2 minutes was considered as feeding frequency. The time duration between two successive feeding events was recorded as feeding duration and this period was sum up for the 24-hour period and referred as feeding duration. The number of times the cow opted for water drinking state, during 24-hour period was recorded and referred as watering frequency. The number of times the cow passes the urine, during 24-hour period was recorded and referred as urination frequency. The number of times the cow defaecated, during 24-hour period was recorded and referred as defaecation frequency.

Statistical Analysis: Two-way ANOVA test were performed for pre-parturient behavioural parameters such as feeding, watering, defecating and urination behaviour of pre-parturient cows. Partitioning of variance for comparing means of all other traits were done using *aov* function of 'R' Software and means were compared using Tukey HSD[21].

RESULTS AND DISCUSSION

Feeding duration: Cows of all the treatments have spent less time for feeding on the day of calving (-1 day) as compared to 2–7 days before calving (Table1). The mean feeding duration was 13.27 % less on the day of calving (315.00 vs. 273.19) as compared to 7 days before calving and difference was significant ($P<0.05$) among the days. Duration of feeding was not significant among the treatment groups; however, the effect was more pronounced in T_2 cows than T_1 heifers and T_3 cows. The decrease feeding duration on the day of calving (Day-1) is directly related to lesser feed intake. The reason for this might be due to increase restlessness and discomfort associated with the parturition process.

Reduction in feed intake was commonly seen in cows before parturition and the results are in agreement with the work of researchers [1, 2, 3, 8, 9, 10, 12, 17, 19]. Authors[13] reviewed that cows decrease their DMI by approximately 30% on the day of calving compared to the previous day and time spent at the feed bunk on the day of calving follows a similar pattern as dry matter intake, with a larger variation between individual cows.

Table 1: Feeding duration of pre-parturient Kankrej cows before parturition

Day/Treatment	Day -7	Day -3	Day -2	Day -1	Overall
T_1	298.57±15.19^{ab}	316.29±22.70^{a}	336.57±19.28^{a}	277.86±22.70^{b}	307.32±14.21
T_2	335.86±25.79^{ab}	310.57±15.50^{a}	309.00±20.37^{a}	241.71±26.87^{b}	299.29±16.53
T_3	310.57±15.18^{ab}	328.14±20.39^{a}	301.14±8.14^{a}	300.00±23.69^{b}	309.96±11.89
Overall	315.00±11.17	318.33±10.95	315.57±9.84	273.19±14.45	305.52±7.92

N.B. Means with different superscripts (row wise a,b) differs significantly.

Table 2: Feeding frequency of pre-parturient Kankrej cow before parturition

Day / Treatment	Day -7	Day -3	Day -2	Day -1	Overall
T_1	25.00±1.40^{a}	28.43±2.80^{ab}	30.29±3.12^{ab}	31.00±3.89^{b}	28.68±2.21
T_2	24.86±3.39^{a}	24.29±2.88^{ab}	21.71±1.86^{ab}	30.00±4.57^{b}	25.21±2.77
T_3	23.43±2.44^{a}	27.14±1.68^{ab}	24.00±1.21^{ab}	30.00±2.60^{b}	26.14±1.57
Overall	24.43±1.40	26.62±1.43	25.33±1.46	30.33±2.07	26.68±1.27

N.B. Means with different superscripts (row wise a,b) differs significantly.

Table 3: Water drinking frequency of pre-parturient Kankrej cow before parturition

Day / Treatment	Day -7	Day -3	Day -2	Day -1	Overall
T_1	3.86±1.03	3.71±0.97	3.86±1.06	4.29±1.17	3.93±1.01
T_2	3.57±0.72	3.14±0.55	4.00±0.98	4.57±1.07	3.82±0.74
T_3	4.00±0.82	4.14±0.55	4.00±0.76	3.57±0.65	3.93±0.63
Overall	3.81±0.48	3.67±0.40	3.95±0.51	4.14±0.55	3.89±0.44

Table 4: Defaecation frequency of pre-parturient Kankrej cow before parturition

Day / Treatment	Day -7	Day -3	Day -2	Day -1	Overall
T_1	10.71±0.68	11.00±0.79	11.29±0.61	10.86±1.01	10.96±0.63
T_2	10.43±0.37	11.14±0.55	11.14±0.40	11.57±0.90	11.07±0.37
T_3	12.00±0.58	11.71±0.87	10.86±0.67	13.00±1.31	11.89±0.45
Overall	11.05±0.34	11.29±0.41	11.10±0.32	11.81±0.63	11.31±0.29

Table 5: Urination frequency of pre-parturient Kankrej cow before parturition

Day / Treatment	Day -7	Day -3	Day -2	Day -1	Overall
T_1	4.00±0.62	4.43±0.43	4.14±0.26	4.71±0.52	4.32±0.35
T_2	4.57±0.78	4.14±0.40	4.43±0.87	5.00±0.65	4.54±0.31
T_3	4.29±0.36	3.43±0.37	3.43±0.37	4.43±0.53	3.89±0.24
Overall	4.29±0.34	4.00±0.24	4.00±0.32	4.71±0.32	4.25±0.18

Although, researchers [7 & 14] have reported less feeding duration on the day of calving compared to 2–4 days before calving but the difference found was not significant. The difference in the result might be due to different methodology in the experiments. Researcher[8] suggested that cows eat less on the day of calving because of the calving process and the associated stress. This stress can be due to social conflicts, deficiencies in housing and dietary changes during the dry period. Reduction in feeding time a few hours before calving may be due to shift in the motivational priorities of the cows or shift in the Dry matter intake (DMI) on the day of calving is a good indicator of the quality of dry cow management, as cows that eat more on the day of calving will get a better start to their lactation. Authors[17] suggested that rumination time and time spent feeding show promise as tools to identify cows close to calving.

Feeding Frequency: Mean feeding frequencies with their standard error of pre-parturient Kankrej cow during various days before parturition (Table 2) revealed that cow of all the treatments had taken feed for more times on the day of calving (-1 day) as compared to 2–7 days before calving. The difference found was significant ($P<0.05$). There was a gradual increase in the feeding frequency during the period and maximum was on the day of calving.

The mean frequency of feeding was almost 24.15 % higher on the day of calving (24.43 vs. 30.33) as compared to 7 days before calving and difference was significant ($P<0.05$) among the days. Frequency of feeding was not significant among the treatment groups. The feeding frequency might be higher on the day of calving likely due to increase in restlessness and to the discomfort associated with calving.

Water drinking frequency: The pre-parturient cows of all the treatments have drunken water more frequently on the day of calving (-1 day) as compared to 2–7 days before calving but the difference found was not significant. Mean water drinking frequencies was 8.66 % higher on the day of calving (4.14 vs. 3.81) as compared to 7 days before calving. But this was not true for the T_3 cows as they drunk less frequently on the day of calving than other days of observation. Further, the watering frequency was not significant among the treatment groups.

Other study showed that there was decrease in water intake on the day of calving, for example, researchers[7] observed non-significant reduction in water drinking duration; whereas[9&10] noticed non-significant less water intake of cows. In present study we have neither taken water intake nor duration, but considered watering frequency, hence it may not be compared. Less water frequency in T_3 cows on the day of calving may be due to unwillingness of older cows to move because of heavy weight. Higher watering frequency on the day of calving in T_1 heifers and T_2 cows may be due to increase in restlessness and to the discomfort associated with calving.

Frequency of defaecation: Cows of T_3 group defecated more frequently than the T_2 cows and T_1 and the difference found was not significant. The defaecation frequency was also non-significant among the days of observation. Further, mean defaecation frequency was 6.88 % higher on the day of of calving (11.81 vs. 11.05) as compared to 7 days before calving. All the cows defecated more frequently on the day of calving than other days of observation.

Defaecation frequency in the present study was in normal range as given by authors[15&18]. Although, it was higher than the values observed by[5] in lactating Kankrej cows in 5 min scan sampling process. The reason might be the attributed to the observation process as in the present study the frequency were counted for 24-hour period continuously. Generally, defaecation is performed while the animal is walking, standing, grazing or getting up[15], but in the present study it was observed that some of the periparturient cows defaecated while they were lying, which was unusual. Reason for this might be attributed to difficulty in standing with gravid uterus.

Frequency of Urination: Cows of T_2 group urinated more frequently than the T_1 cows and T_3 cows and the difference found was not significant Table. All the cows urinated 9.79 % more frequently on the day of calving (day-1) as compared to 2–7 days before calving but the difference found was not significant.

Urination frequency in the present study was similar to the findings of[5] in lactating Kankrej cows, but less than the study of[18] in crossbred lactating cows. In the present study the cows urinated less frequently than they defecate as reported by[6]. Our study further revealed that none of the peri-parturient cows were observed to urinate while they were lying, similarly as reported by[15] that most urination takes place while cattle are grazing, not while they are resting.

CONCLUSION

It may be concluded from the study that Kankrej cows have higher feeding frequency, less feeding duration and higher watering frequency on the day of calving than 2-7 days before the calving. Elimination behaviour was at par throughout the observation period. The decrease in feeding duration on the day of calving is directly related to lesser feed intake and reason might be due to increase restlessness and discomfort associated with the parturition process. This stress behaviour was more prominent in primiparous than multiparous Kankrej cows. Dry matter intake (DMI) on the day of calving is a good indicator of the quality of dry cow management, as cows that eat more on the day of calving will get a better start to their lactation.

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REFERENCES

1. Adin G, Solomon R, Nikbachat M, Zenou A, Yosef E, Brosh A, and Miron J 2009. Effect of feeding cows in early lactation with diets differing in roughage-neutral detergent fiber content on intake behavior, rumination, and milk production. *Journal of Dairy Science* **92**(7)**:** 3364-3373.
2. Bao J and Giller P S 1991. Observations on the changes in behavioral activities of dairy-cows prior to and after parturition. *Irish Veterinary Journal*. **44**(4-6): 43-47.
3. Broom D M and Fraser A F 2007. Domestic Animal Behaviour and Welfare. CAB International. 4th ed. Oxford University Press, New York, USA. Pp. 438.
4. Chaudhary A P 2016. Kankrej breed: An incredible germplasm of zebu cattle. *Indian Journal of Animal Production and Management* **32(3-4):** 150-160.
5. Chauhan H D 2010. 'Effect of housing systems on production performance and behaviour of Kankrej cows during different seasons'. Ph.D. Thesis. Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat.
6. Hancock J (1953). Grazing behaviour of cattle. *Animal Breeding Abstracts* **21:** 1–13.
7. Houwing H, Hurnik J F and Lewis N J 1990. Behaviour of periparturient dairy cows and their calves. *Canadian Journal of Animal Science* **70**: 355-362.
8. Hulsen J 2006. Cow signals. *The Practical guide for dairy cow management.* Roodbont Publishers: Zutphen, Netherlands.
9. Huzzey J M, Von Keyserlingk M A G and Weary D M 2005. Changes in feeding, drinking, and standing behavior of dairy cows during the transition period. *Journal of Dairy Science* **88**: 2454-2461.
10. Jensen M B 2012. Behaviour around the time of calving in dairy cows. *Applied Animal Behaviour Science* **139** (3-4): 195-202.
11. Jordan W A, Lister E E, Wauthy J M and Comeau J E 1973. Voluntary roughage intake by nonpregnant and pregnant or lactating beef cows. *Canadian Journal of Animal Science*, **53**(4): 733-738.

12. Lidfors, L. M.; Moran, D.; Jung, J.; Jensen, P. and Castren, H. (1994). Behaviour at calving and choice of calving place in cattle kept in different environments. *Applied Animal Behaviour Science*. **42**: 11-28.

13. Matamala, F., Strappinib, A. and Sepulveda-Varasc, P. (2021). Dairy cow behaviour around calving: Its relationship with management practices and environmental conditions. *Australian Journal of Veterinary Science* **5**: 9-22.

14. Miedema H M, Cockram M S, Dwyer C M and Macrae A I 2011. Changes in the behaviour of dairy cows during the 24 hr before normal calving compared with behaviour during late pregnancy. *Applied Animal Behaviour Science* **131**(1-2): 8-14.

15. Phillips C J C 2002 *Cattle Behaviour and Welfare*. Blackwell Science, Oxford. Pp. 274.

16. Rørvang, M. V.; Nielsen, B. L.; Herskin, M. S., and Jensen, M. B. (2018[b]). Prepartum maternal behavior of domesticated cattle: a comparison with managed, feral, and wild ungulates. *Frontiers in Veterinary Science*. **5:** 45-54.

17. Schirmann K, Chapinal N, Weary D M, Vickers L and Von Keyserlingk M A G 2013. Rumination and feeding behavior before and after calving in dairy cows. *Journal of Dairy Science* **96**(11): 7088-7092.

18. Sharma R N 1983. 'Feeding and milking behaviour of crossbred cattle'. M.Sc. Thesis. Kurukshetra University, Kurukshetra, India.

19. Soriani N, Trevisi E and Calamari L 2012. Relationships between rumination time, metabolic conditions and health status in dairy cows during the transition period *Journal of Animal Science* **90**(12): 4544-4554.

20. Srivastava A K, Patel J B, Ankuya K J, Chauhan H D, Pawar M M and Gupta J P 2019. Conservation of indigenous cattle breeds. *Journal of Animal Research* **9(1):**1-12.

21. Team R C 2019. R: a language and environment for statistical computing, version 3.0. 2. Vienna, Austria: R Foundation for Statistical Computing; 2013.