International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; 9(1): 307-310

www.veterinarypaper.com
Received: 09-10-2023
Accepted: 15-11-2023

RK Jadav
Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat, India

HC Nakhashi
Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat, India

BN Suthar
Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat, India

Keshav
Department of Animal Reproduction, Gynaecology and Obstetrics, College of Veterinary Science, AAU, Khanapara, Guwahati, Assam, India

Corresponding Author:
RK Jadav
Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Sardarkrushinagar, Gujarat, India

Postpartum reproductive health monitoring via hormonal and uterine involution investigations in Mehsana buffalo

RK Jadav, HC Nakhashi, BN Suthar and Keshav

DOI: https://doi.org/10.22271/veterinary.2024.v9.i1e.912

Abstract
This study was undertaken on 26 Mehsana buffaloes maintained at Livestock Research Station, S.D.A.U., Sardarkrushinagar, Gujarat (India). These buffaloes were monitored for their post-partum reproductive performance through per-rectal examination and pregnancy was confirmed at day 60 after natural service. Buffaloes were grouped retrospectively on the basis of fertile estrus in to, Group I (Buffaloes conceiving before 90 days) and Group II (Buffaloes conceiving after 90 days). Blood samples were collected on the day of calving, 10th, 20th and 30th day postpartum. The mean plasma progesterone (ng/ml) ranged between 0.18±0.01 to 0.31±0.02 in Group I and 0.24±0.01 to 0.48±0.02 in Group II with significantly (p<0.05) lower P4 in Group I buffaloes. The mean plasma tri-iodothyronine (ng/ml) and thyroxine (nmol/L) ranged between 1.23±0.55 to 2.30±0.68 and 42.67±3.64 to 57.92±4.43 in Group I, 1.02±0.15 to 1.74±0.15 and 40.48±2.40 to 44.07±2.69 in Group II, respectively and were found to be significantly (p<0.05) higher at day 20 in group I buffaloes. The gross uterine involution occurred at 28.20±1.10 and 29.80±0.20 days in group-I and group-II, respectively. The average days for the gross uterine involution did not differed significantly between the groups.

Keywords: Mehsana buffaloes, progesterone (P4), tri-iodothyronine (T_3) and thyroxine (T_4), uterine involution

Introduction
The Buffaloes are used as a source of milk and meat largely in tropical and sub-tropical countries and occupy an important place in the agricultural economy of India. Reproductive performance of dairy cows after the voluntary wait period is highly related to the health status of the uterus after calving (Ferguson *et al.*, 2000) [5]. Postpartum uterine infection has a negative effect on reproductive performance as it increases the calving to first service interval and decreases the conception rate (Fourichon *et al.*, 2000) [6]. The changes in blood constituents can reflect the physiological condition as well as nutritional and health status of cows. Appropriate thyroid gland function and activity of thyroid hormones (TH) are considered crucial to sustain the productive performance in domestic animals and circulating TH can be considered as indicators of the metabolic and nutritional status of the animals (Todini *et al.*, 2007) [18]. Following parturition, Involution of the uterus to its normal non-pregnant size and physiological function is a normal phenomenon in mammals. Several investigators have studied the phenomenon of uterine involution in post-partum buffaloes. Some investigators reported shorter periods (< 35 days) required for completion of involutiona and others reported longer periods (> 40 days) in the buffaloes (Nakhashi, 2006; Basem *et al.*, 2017; Vala *et al.*, 2018) [12, 2, 19]. From economical point of view these changes should occur earlier after calving, because of any delay in the completion of uterine involution, re-establishment of ovarian and estrous activities decreases the reproductive efficiency of animal by prolonging subsequent calving interval. Therefore, keeping these facts in view, the study on hormonal profile of Tri-iodothyronine (T_3), Thyroxine (T_4), Progesterone (P4) and gross uterine involution during postpartum period in Mehsana buffaloes conducted.

Materials and Methods

Livestock Research Station, SDAU. Sardarkrushinagar is located in north Gujarat. The average minimum and maximum ambient temperature and relative humidity of the zone ranged from 17.95 °C and 32.25 °C and 48.5% and 73% respectively, during the period of study. All the buffaloes were maintained in well ventilated hygienic sheds and were fed green fodder, hay and compounded concentrate, as per standard feeding schedule followed on the farm. These buffaloes had free access to drinking water. Every Mehsana buffalo was vaccinated according to schedule and had frequent deworming treatments with broad spectrum anthelminthic medications before and after the monsoon. A total of 26 advanced pregnant Mehsana buffaloes irrespective of parity and body weight with a history of normal calving were selected for the study. Blood samples were collected from all the buffaloes on the day of calving, 10th, 20th and 30th day postpartum by puncturing external jugular vein in heparinized vials, centrifuged at 3000 rpm for 10 minutes. The plasma samples were stored at -20 °C till analyzed for hormonal assay. The progesterone in blood plasma was estimated by using commercially available enzyme linked immune-sorbent assay (ELISA) kits manufactured by DBC diagnostics Biochem Canada Inc, Canada. The Tri-iodothyronine (T_3) and Thyroxine (T_4) in blood plasma was estimated by using commercially available enzyme linked immune-sorbent assay (ELISA) kits manufactured by Labor Diagnostics Nord GmbH & Co. KG, Germany. The progress of gross uterine involution was felt through per-rectal examination. Uterus and cervix were considered completely involuted when they returned to their normal size, tone and location in pelvic cavity. Measurements were taken by using palm and a centimeter scale following transrectal palpation of the reproductive tract and the findings were recorded as diameter of cervix (cm), gravid horn (cm) and non-gravid horn (cm). Buffaloes were grouped retrospectively on the basis of first fertile estrous as Buffaloes which conceived before 90 days post-partum (Group-I) Buffaloes which conceived after 90 days post-partum (Group-II). The data obtained from research work were analyzed statistically using‘t-test’ as per standard statistical procedure. (Snedecor and Cochran., 1994) [16].

Hormonal Profile

Progesterone

The mean plasma progesterone **(**ng/ml) level ranged between 0.18±0.01 to 0.31±0.02 in Group I and 0.24±0.01 to 0.48±0.02 in Group II. The level was found to be significantly (p<0.05) lower at 20th day postpartum within the groups as compared to that of the other days except with a non-significant difference between 20th day and on day of calving in group I buffaloes. It indicated that the plasma P4 concentration remained low (less than 1 ng/ml) up to day 30th post-partum in both the group. Similarly a very low or negligible level of progesterone have been reported during postpartum period in buffaloes (Patil *et al.* (2013) [13].

The statistical analysis showed significant (p<0.05) lower progesterone levels in Group I as compared to Group II at all the days of postpartum. These findings nearly agreed with the Dhami *et al.* (2012) [3] who reported that value of the control group buffaloes was non-significantly lower than that of the retained fetal membrane groups. Whereas, Dolatkhah *et al.* (2013) [4] reported that the P4 concentration had no significant differences between healthy and endometritic postpartum dairy cows. Lower P4 levels observed in the group I may be due to earlier post-partum period (up to 30th day) of the study which gets the support of Kalasariya *et al.* (2017) [9] in buffaloes.

Table 1: Progesterone (ng/ml, Mean ± SE) at different days in different groups of postpartum Mehsana buffaloes

Days of Postpartum	Groups		Overall mean
	G1 (n=13)	G2 (n=13)	
Day of calving	$0.20\pm0.01^{a}_{p}$	$0.30\pm0.04^{b}_{p}$	0.25±0.02
10th	$0.31\pm0.02^{b}_{q}$	$0.45\pm0.02^{a}_{q}$	0.37±0.02
20th	$0.18\pm0.01^{a}_{p}$	$0.24\pm0.01^{b}_{r}$	0.21±0.01
30th	$0.29\pm0.02^{b}_{q}$	$0.48\pm0.02^{a}_{q}$	0.38±0.01

Means with different superscripts within rows & subscripts within columns differ significantly at 5 percent level

Tri-iodothyronine (T_3)

The mean plasma tri-iodothyronine **(**ng/ml) level ranged between 1.23±0.55 to 2.30±0.68 in Group I and 1.02±0.15 to 1.74±0.15 in Group II with an increasing trend from day of calving to 20th day postpartum. These findings are in agreement with the reports of Stojic *et al.* (2001) [17] in Murrah buffaloe. The T_3 levels were significantly (p<0.05) lower at day 20th in Group II as compared to Group I buffaloes which is in agreement with the lower concentrations of T_3 in non-conceiving as compared conceiving buffaloes (Ghuman *et al*., 2011) [7], lower reproductive performance with decrease in T_3 in postpartum in lactating cows (Nahed Saleh *et al*., 2011) [11]. Variations in the T_3 levels have been attributed to food, environment and especially temperature influence, significant breed differences for thyroid status, Lower T_3 due to negative energy balance and due to high metabolic demands during peak milk production in buffaloes.

Thyroxine (T_4)

The mean plasma thyroxine (nmol/L) level ranged between 42.67±3.64 to 57.92±4.43 in Group I and 40.48±2.40 to 44.07±2.69 in Group II with an increasing trend from day of calving to 20th day postpartum. Similar to the present study, range of T_4 have been observed in dairy cows at parturition and five days after parturition (Kasagic *et al*., 2011) [10]. The T_4 levels were significantly (p<0.05) lower at day 20 in group II as compared to Group I buffaloes which is in accordance with, lower concentrations of T_4 in non-conceiving as compared conceiving buffaloes (Ghuman *et al*., 2011) [7], lower reproductive performance with decrease in T_4 in postpartum lactating cows (Nahed Saleh *et al*., 2011) [11] and non-significant differences between cyclic and acyclic Sahiwal cow at 50 and 60 days postpartum (Sarfraj Ali *et al*., 2012) [14]. Variations in the T_4 levels have been attributed to food, environment and especially temperature influence, significant breed differences in thyroid status in cows, Lower T_4 due to negative energy balance and due to high metabolic demands during peak milk production in cows.

Gross Uterine Involution

Per-rectal Observations: Per-rectally, the reduction in diameter of uterine horn and cervix, location of genitalia and

gradual increase in tonicity of genitalia was considered to know the gross uterine involution. On 15th day postpartum, both the uterine horns and cervix were palpated. Out of 26 buffaloes of both the groups, the genitalia of 18 (69.23%) buffaloes were at pelvic floor within the pelvic cavity while eight (30.76%) buffaloes had uterine horns hanging at pelvic brim. However, these eight buffaloes regained intrapelvic position of genitalia on and before 21th day postpartum. The increasing perceptibility in terms of tonicity, elasticity and curling of horns was observed from 15th to 21st day postpartum and it further continued to be better at 30th day postpartum progressing towards that of the normal genitalia in both the groups. The mean gross uterine involution was found to be occurred non-significantly at 28.20±1.10 days in group-I and at 29.80±0.20 days in group-II buffaloes (Table 2). These findings are in close agreement with those of Khasatiya (2003) [20] in Surti buffaloes and Nakhashi (2006) [12] in Mehsana buffaloes. The overall mean gross uterine involution was found to occur at 29.00±1.30 days postpartum in the present study which is in close agreement with the findings in buffaloes (Amer *et al*. 2010) [1]. Variations in days of gross uterine involution observed by different workers could be attributed to the breed of animals, effect of suckling or non-suckling, season of calving, nutritional status and endocrine balance.

Cervical Diameter

The cervical diameter **(**cm) was measured to be 6.31±0.06, 4.61±0.11 and 3.66±0.09 in Group I and 7.07±0.14, 5.64±0.23 and 3.77±0.16 in Group II buffaloes at days 15th, 21st and 30th postpartum, respectively. The statistical analysis revealed a significant (p<0.05) reducing trend in the diameter of the cervix from 15th to 30th day postpartum within the groups which agreed well with the reports in buffaloes (Nakhashi, 2006) [12] and in cows (Jadhav, 2005) [8].

Uterine Horn Diameter (Gravid and Non Gravid)

The gravid uterine horn diameter (cm) was measured to be 5.19±0.06, 3.79±0.16 and 2.79±0.13 in Group I and 5.73±0.15, 3.97±0.15 and 2.86±0.11 in group II buffaloes at days 15th, 21st and 30th postpartum, respectively. The non-gravid uterine horn diameter (cm) was measured to be 4.36±0.06, 3.21±0.06 and 2.58±0.11 in Group I and 4.58±0.13, 3.33±0.09 and 2.71±0.10 in Group II buffaloes on 15th, 21st and 30th day postpartum, respectively. A significant (p<0.05) reducing trend in the diameter of the gravid and non-gravid uterine horn from 15th to 30 day postpartum within the groups corroborates well with the reports in buffaloes (Nakhashi, 2006) [12] and in dairy cows Saut *et al*., (2011) [15].

Table 2: Thyroid hormone level (Mean ± SE) at different days in different groups of postpartum Mehsana buffaloes

Thyroid hormones	Days of Postpartum	Groups		Overall mean
		G1 (n=13)	G2 (n=13)	
Tri-iodothyronine (T_3) (ng/ml)	Day of calving	$1.23±0.55^{a}_{p}$	$1.02±0.15^{a}_{p}$	1.12±0.35
	10th	$1.80±0.50^{b}_{q}$	$1.45±0.09^{b}_{q}$	1.62±0.29
	20th	$2.30±0.68^{a}_{r}$	$1.74±0.15^{b}_{r}$	2.02±0.41
	30th	$1.64±0.43^{c}_{q}$	$1.47±0.09^{c}_{qr}$	1.56±0.52
Thyroxine (T_4) (nmol/l)	Day of calving	$42.67±3.64^{a}_{p}$	$40.48±2.40^{a}_{p}$	41.57±3.02
	10th	$45.05±2.02^{b}_{p}$	$42.87±4.18^{b}_{p}$	43.96±3.10
	20th	$57.92±4.43^{a}_{q}$	$44.07±2.69^{b}_{p}$	50.99±3.56
	30th	$46.22±3.54^{c}_{pq}$	$43.62±4.14^{c}_{p}$	44.92±3.84

Means with different superscripts within rows & subscripts within columns differ significantly at 5 percent level for each hormones

Table 3: Comparative diameter (cm, Mean ± SE) of cervical and uterine horn at different days in different groups of postpartum Mehsana buffaloes

Particulars	Days of postpartum	Groups		Overall mean
		G1 (n=13)	G2 (n=13)	
Cervical diameter (cm)	15th	$6.31±0.06^{a}_{p}$	$7.07±0.14^{b}_{p}$	6.69±0.10
	21st	$4.61±0.11^{b}_{q}$	$5.64±0.23^{a}_{q}$	5.12±0.17
	30th	$3.66±0.09^{c}_{r}$	$3.77±0.16^{c}_{r}$	3.71±0.13
Gravid uterine horn(cm)	15th	$5.19±0.06^{b}_{p}$	$5.73±0.15^{a}_{p}$	5.47±0.10
	21st	$3.79±0.16^{c}_{q}$	$3.97±0.15^{c}_{q}$	3.87±0.15
	30th	$2.79±0.13^{d}_{r}$	$2.86±0.11^{d}_{r}$	2.81±0.12
Non-gravid uterine horn(cm)	15th	$4.36±0.06^{a}_{p}$	$4.58±0.13^{a}_{p}$	4.46±0.09
	21st	$3.21±0.06^{b}_{q}$	$3.33±0.09^{b}_{q}$	3.28±0.07
	30th	$2.58±0.11^{c}_{r}$	$2.71±0.10^{c}_{r}$	2.64±0.10
Gross uterine involution (Days)		$28.20±1.10^{a}$	$29.80±0.20^{a}$	29.00±1.30

Means with different superscripts within rows & subscripts within columns differ significantly at 5 percent level for each particulars

Conclusion

The study concluded that the statistical analysis showed significant (p<0.05) lower progesterone levels in Group I as compared to Group II at all the days of postpartum. Tri-iodothyronine (ng/ml) and Thyroxine (nmol/L) were lower in these buffaloes up to 30 days, with a significantly lower level at the 20th day postpartum. It may be due to earlier post-partum period (up to 30th day) of the study and the overall mean gross uterine involution was found to occur at 29.00±1.30 days postpartum in both groups, with a significant reducing trend in the diameter of the cervix and uterine horn.

Acknowledgement

We thank Livestock Research Station and college of veterinary science and animal husbandry SDAU, Sardarkrushinagar for providing necessary facilities for successful completion of research work.

References

1. Amer HA, Zeid ANZ, Barakat TM. Endometrial cytology and bacteriological isolates from buffaloes with retained fetal membranes and their effects on the reproductive efficiency. Journal of American Science. 2010;6(11):115-121.
2. BGad A, Kandiel MMM, El-Azab AI, Sosa GAM, Essawy SAA. Ultrasonographic Monitoring of Uterine Involution in Postpartum Buffalo Cows. Journal of Advanced Veterinary Research. 2017;7(4):93-99.
3. Dhami AJ, Thavani KL, Patel JA, Sarvaiya NP. Post-abortion and post-partum serum progesterone profile and breeding efficiency in buffaloes retaining fetal membranes. Buffalo Bulletin; c2012, 31(4).
4. Dolatkhah B, Mahdavi AH, Rahmani HR, Edriss MA, Khorvash M. Cytologic and histologic characteristics of endometritis in postpartum dairy cows. Annals of Biological Research. 2013;4(4):70-76.
5. Ferguson JD, Galligan DT. Assessment of reproductive efficiency in dairy herds. Compend Contin Ed Prac Vet. 2000;22:S150-S158.
6. Fourichon C, Seegers H, Malher X. Effect of disease on reproduction in the dairy cow: A meta-analysis. Theriogenology. 2000;53:1729-1759.
7. Ghuman SP, Singh SJ, Honparkhe M, Ahuja CS, Dhami DS, Nazirand G, *et al*. Differential Fertility in Dairy Buffalo: Role of Thyroid and Blood Plasma Biochemical Milieu. Iranian Journal of Applied Animal Science. 2011;1(2):105-109.
8. Jadhav PD. Study of postpartum resumption of ovarian activity and uterine involution, monitored by ultrasonography and hormonal assays in Gir and Crossbred cows. Ph.D. Thesis submitted to M. A. F. S. U, Nagpur; c2005.
9. Kalasariya RM, Dhami AJ, Hadiya KK, Borkhatariya DN, Patel JA. Effect of peripartum nutritional management on plasma profile of steroid hormones, metabolites and postpartum fertility in buffaloes, Veterinary World. 2017;10(3):302-310.
10. Kasagic D, Biljana R, Gvozdi D, Mirilovi M, Matarugi D. Endocrine and metabolic profile in holstein and red holstein heifers during peripartal period. Acta Veterinaria (Beograd). 2011;61:555-565.
11. Saleh N, Mahmud E, Waded E. Interactions between insulin like growth factor 1, thyroid hormones and blood energy metabolites in cattle with postpartum inactive ovaries. Nature and Science. 2011;9(5):56-63.
12. Nakhashi HC. Fertility management in postpartum Mehsani buffaloes through clinical, biochemical and hormonal investigations. Ph. D. Thesis submitted to Gujarat Agricultural University, Sardarkrushinagar, Gujarat; c2006.
13. Patil RD, Patel JA, Dhami AJ, Sarvaiya NP. Clinical, cultural, endocrine and therapeutic evaluation of postpartum metritis in surti buffaloes. Indian Journal of Animal Reproduction; c2013, 34(1).
14. Sarfraj Ali, Awasthi MK, Khan JR, Tiwari RP, Poyam MR. Influence of blood metabolites and metabolic hormones on postpartum ovarian activity in cows. Indian Journal of Animal Reproduction; c2012, 33(1).
15. Saut JPE, Oliveira RSBR, Martins CFG, Moura ARF, Tsuruta SA, Nasciutti NR, *et al*. Clinical observations of postpartum uterine involution in crossbred dairy cows. Uberlândia. 2011;17(1):16-25.
16. Snedecor GW, Cochran KG. Statistical Methods. 8th Edition, Oxford and IBH Publishing Co, New Delhi, India; c1994.
17. Stojic V, Gvozdic D, Kirovski D, Judith NA, Huszenicza GY, Samanc H, *et al*. Serum Thyronine and Tri-iodothyronine concentrations prior to and after delivery in primiparous Holstein cows. Acta Veterinaria (Beograd). 2001;51(1):3-8. (C.f.ABA. 69: 5795).
18. Todini L, Malfatti A, Valbonesi A, Trabalza-Marinucci M, Debenedetti A. Plasma total T_3 and T_4 concentrations in goats at different physiological stages, as affected by the energy intake. Small Ruminant Research. 2007;68:285-290.
19. Vala KB, Kavani FS, Raval RJ, Tank PH. Evaluation of Uterine Involution by Rectal Palpation and Ultrasonography in Peripartum Nutritional Supplemented Jaffarabadi Buffaloes. Int. J Curr. Microbiol. App. Sci. 2018;7(6):1955-1963.
20. Chaudhary JK, Khasatiya CT, Parmar SC, Patel RV, Patel MD. Serum progesterone and oestradiol-17β profile in norgestomet primed postpartum silent estrus surti buffaloes. Wayamba J Anim. Sci., Article. 2015(1427620266):1095-1103.