



Blood Plasma Minerals and Biochemical Profile of Anestrus and Endometritic Cows Reared in Tribal Areas of Himachal Pradesh, India

Ankita Sharma¹, Madhumeet Singh^{2*} and Pravesh Kumar³

¹Department of Veterinary Gynaecology and Obstetrics
Khalsa College of Veterinary and Animal Science, Amritsar, India

^{2,3}Department of Veterinary Gynecology and Obstetrics, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur, HP, India

ABSTRACT

Blood samples were collected from 227 infertile (Endometritis; n=123, Anoestrus; n=104) cows from five different tribal locations of Himachal Pradesh viz. Lahaul, Spiti, Kinnaur, Pangi and Bharmour. Significantly, lower levels of potassium were recorded in the Kinnaur district in both anestrus (3.33 ± 0.09 mmol/L) and endometritic (3.30 ± 0.12 mmol/L) cows as compared to other tribal areas. Significantly, higher levels of AST ($p < 0.01$) were found in anestrus cows of Pangi (103.76 ± 6.07 U/L) followed by Bharmour (93.34 ± 14.43 U/L). The levels of cholesterol were significantly higher in anestrus cows of Lahaul (189.63 ± 16.99 mg/dl) followed by Bharmour (184.54 ± 19.57 mg/dl) and Pangi (162.03 ± 13.83 mg/dl). The levels of creatinine were significantly higher ($p < 0.05$) in anestrus cows of Spiti as compared to other tribal areas. The levels of ALT were significantly higher in anestrus cows of Spiti (37.22 ± 2.01 U/L) followed by Pangi (34.44 ± 3.19 U/L) and Lahaul (29.46 ± 7.35 U/L). In the case of endometritic cows, values of ALT were significantly higher in Spiti (42.41 ± 2.64 U/L) followed by Lahaul (23.37 ± 4.9 U/L). The levels of total protein were found significantly higher in endometritic (8.34 ± 0.31 g/dl) cows of Lahaul as compared to other tribal areas.

Key words: Anestrus, Endometritis, Tribal, Infertility.

How to cite: Sharma, A., Singh, M., & Kumar, P. (2022). Blood Plasma Minerals and Biochemical Profile of Anestrus and Endometritic Cows Reared in Tribal Areas of Himachal Pradesh, India.

The Indian Journal of Animal Reproduction, 43(2), 50–53. 10.48165/ijar.2022.43.2.11

INTRODUCTION

Anestrus and Clinical endometritis are the most commonly encountered reproductive ailments in cattle, owing

to reduce reproductive efficiency, infertility, affecting live-stock productivity and economics to a great extent (Niaz *et al.*, 2022). These are the most prevalent forms of infertility in cows of tribal areas of Himachal Pradesh also, as the

*Corresponding author.

E-mail address: madhumeet2004@gmail.com (Madhumeet Singh)

Received 01-05-2023; Accepted 01-06-2023

Copyright @ Journal of Extension Systems (acspublisher.com/journals/index.php/ijar)

overall prevalence has been recorded as 44.27% and 42.77% for anestrus and clinical endometritis, respectively (Sharma *et al.*, 2021). Anestrus is usually a multifactorial condition associated with inadequate nutrition, environmental stress, uterine pathology and improper management practices (Kumar *et al.*, 2014). Chelated mineral mixture supplementation has been shown to improve nutritional status and reproductive performance in anestrus cattle (Joshi *et al.*, 2020). Clinical endometritis (CE) is a common uterine infection of cattle instigated by numerous pathogenic bacteria (Yanez *et al.*, 2022). Due to a lack of awareness regarding the diagnosis and treatment of this devastating condition, farmers usually cull exaggerated animals even after having better genetic potential (Sheldon *et al.*, 2006). The present study was aimed to identify the blood plasma concentration of minerals and biochemicals in cows reared in tribal areas viz. Pangri, Bharmaur, Kinnaur, Lahaul and Spiti.

MATERIALS AND METHODS

Blood samples were collected from 227 infertile (Endometritis; n=123, Anestrus; n=104) cows reared in five different high altitude tribal locations of Himachal Pradesh viz. Pangri, Bharmaur, Kinnaur, Lahaul and Spiti. A 10 ml blood sample was collected in heparinised centrifuge tubes and was centrifuged at 3000 rpm for 10 minutes in a portable centrifuge machine. The harvested plasma was collected in small Eppendorf tubes of 5 ml capacity, stored at -20°C and transferred to the Department of Veterinary Gynaecology and Obstetrics, CSKHPKV, Palampur in a portable deep freezer for mineral and biochemical estimation. Minerals and blood biochemicals viz. Calcium, Magnesium, Inorganic phosphorus, Cholesterol, Creatinine, AST, ALT and Total Protein were estimated from plasma in a fully automatic biochemistry analyzer Mispa nano (Agappe Diagnostics Ltd., India) by using standard kits (Agappe Diagnostics Ltd., India).

RESULTS AND DISCUSSION

The overall concentration of calcium, phosphorus and magnesium in anestrus cows were 7.41, 6.08 and 1.62 mg/dl, respectively and were within the normal range. In the present study, the overall values of sodium in anestrus and endometritic cows were 128.36 mmol/L and 129.95 mmol/L, respectively. In normal cyclic cows, the plasma sodium concentrations were reported to be significantly lower than in repeat breeder cows (Pandey *et al.*, 2009) which was in contrary to the current findings. Differences

in plasma sodium concentration among repeat breeders and normal cyclic cows might be due to differences under integrated individual feeding systems (Togtokhbayar, 2006). Low levels of potassium were recorded in the Kinnaur district in both anestrus (3.33±0.09 mmol/L) and endometritic (3.30±0.12 mmol/L) cows as compared to other tribal areas. The overall mean value chloride in anestrus and endometritis cows was 91.28±1.02 mmol/L and 93.62±0.86 mmol/L respectively. No significant difference was found in the values of chloride among different tribal areas of Himachal Pradesh.

Overall cholesterol concentration in anestrus and endometritic cows of all tribal areas was 137.69±6.26 mg/dl and 141.00±5.79 mg/dl, respectively. The values were within normal reference values (62-177 mg/dl) of cholesterol in cows (Merck Veterinary Manual 2005). The levels of cholesterol were found significantly higher in anestrus cows of Lahaul (189.63±16.99 mg/dl) followed by Bharmour (184.54±19.57 mg/dl) and Pangri (162.03±13.83 mg/dl). Similar results were reported by Mahour *et al.* (2011) where the mean cholesterol level in the cows during anestrus was 125.01±9.65 mg/dl. The serum cholesterol levels were reported higher in endometritic cows as compared to normal cyclic and anestrus cows (Ahmad *et al.*, 2004). The overall creatinine levels in anestrus and endometritic cows were 1.08±0.03 mg/dl and 1.15±0.04 mg/dl, respectively. The levels of creatinine were significantly higher ($p<0.05$) in anestrus cows of Spiti as compared to other tribal areas.

Similar results were also obtained by Kumar (2018) where the value of creatinine was 1.11±0.01 mg/dl. The overall values of ALT in anestrus and endometritic cows were 27.5±1.63 U/L and 26.46±1.76 U/L, respectively. The levels of ALT were significantly higher in anestrus cows of Spiti (37.22±2.01 U/L) followed by Pangri (34.44±3.19 U/L) and Lahaul (29.46±7.35 U/L) whereas, in the endometritic cows, values of ALT were significantly higher in Spiti (42.41±2.64 U/L) followed by Lahaul (23.37±4.9 U/L). The overall concentrations of AST in anestrus and endometritic cows were 81.41±3.70 U/L and 76.36±3.47 U/L, respectively. Significantly higher levels of AST ($p<0.01$) were found in anestrus cows of Pangri (103.76±6.07 U/L) followed by Bharmour (93.34±14.43 U/L). The overall concentrations of total protein in anestrus and endometritic cows were 7.45±0.22 g/dl and 7.16±0.20 g/dl, respectively. Significantly higher levels were found in anestrus cows of Pangri (8.53±0.15 g/dl; $p<0.05$) and endometritic cows of Lahaul (8.34±0.31g/dl; $p<0.01$) as compared to other tribal areas. In contrast to our findings, significantly lower total protein levels were recorded in anestrus (Pariza *et al.*, 2013) and endometritic cows (Ahmad *et al.*, 2014).

Table 1: Blood plasma concentration of some minerals (Mean±SE) in anestrus and endometritic cows reared in different tribal areas of Himachal Pradesh

Sr. No.	Location	Clinico-gynaecological condition	Calcium (mg/dl)	Inorganic Phosphorus (mg/dl)	Magnesium (mg/dl)	Sodium (mmol/L)	Potassium (mmol/L)	Chloride (mmol/L)
1	Kinnaur	Anestrus (n=26)	8.14±0.25 (5.6-10.80)	5.82±0.24 (4.10-9.20)	1.48±0.07 (0.74-2.20)	119.50±1.37 (107.15-130.49)	3.33±0.09 (107.15-130.49)	-
		Endometritis (n=18)	8.31±0.50 (5.50-10.90)	5.09±0.57 (2.10-9.20)	1.38±0.12 (0.81-2.48)	120.87±1.85 (108.37-133.63)	3.30±0.12 (2.29-3.92)	-
2	Lahaul	Anestrus (n=8)	7.28±0.48 (5.30-9.60)	5.61±0.76 (2.9-8.6)	1.41±0.14 (0.74-2.01)	125.14±5.47 (101.53-143.50)	3.71±0.22 (2.97-4.83)	87.18±3.67 (76.6-97.8)
		Endometritis (n=17)	7.32±0.32 (5.30-9.61)	5.64±0.36 (3.40-7.50)	1.67±0.12 (0.74-2.40)	130.62±3.26 (101.53-147.97)	3.55±0.11 (2.58-4.28)	99.73±2.10 (76.6-100.1)
3	Spiti	Anestrus (n=41)	7.41±0.35 (3.60-10.90)	6.49±0.33 (3.10-10.10)	1.63±0.07 (0.90-2.25)	134.05±1.26 (118.16-152.5)	3.88±0.07 (3.01-4.72)	98.76±0.55 (96.50-101.7)
		Endometritis (n=29)	7.14±0.39 (3.90-10.90)	6.10±0.27 (3.7-8.9)	1.66±0.07 (0.90-2.30)	134.91±1.51 (120.62-148.17)	3.75±0.07 (3.01-4.45)	93.24±1.18 (87.60-98.30)
4	Pangi	Anestrus (n=30)	6.93±0.19 (4.60-8.70)	5.83±0.22 (3.70-8.00)	1.74±0.08 (1.00-2.60)	126.72±2.67 (103.99-147.2)	3.52±0.09 (2.75-4.53)	93.64±1.67 (85.80-99.9)
		Endometritis (n=24)	6.80±0.26 (4.90-8.60)	5.1±0.31 (2.80-9.30)	1.56±0.11 (1.00-2.39)	129.64±1.90 (106-145.1)	3.84±0.10 (2.43-4.95)	91.44±1.43 (79.20-100.1)
5	Bharmour	Anestrus (n=18)	7.27±0.85 (5.10-10.70)	6.09±0.81 (3.60-9.80)	1.71±0.30 (1.05-2.51)	123.47±2.97 (98.30-142)	3.69±0.14 (2.71-4.95)	87.94±1.75 (77.50-99.30)
		Endometritis (n=16)	6.81±0.33 (4.10-8.80)	6.23±0.42 (3.30-10.00)	1.92±0.08 (1.35-2.50)	130.93±3.26 (119.55-138.70)	3.22±0.06 (3.05-3.38)	93.78±1.84 (82.30-101.80)
Overall		Anestrus (n=123)	7.41±0.14 (3.60-10.90)	6.08±0.15 (2.90-10.10)	1.62±0.04 (0.74-2.60)	128.36±0.98 (98.30-152.5)	3.72±0.05 (2.29-4.95)	91.28±1.02 (76.60-101.70)
		Endometritis (n=104)	7.16±0.17 (3.90-10.90)	5.64±0.17 (2.10-10.00)	1.66±0.05 (0.74-2.69)	129.95±1.15 (99.10-148.17)	3.59±0.05 (2.29-5.14)	93.62±0.86 (76.60-101.80)

Table 2: Blood plasma concentration of some biochemical (Mean±SE) in anestrus and endometritic cows reared in different tribal areas of Himachal Pradesh

Sr. No.	Location	Clinico-gynaecological condition	Cholesterol (mg/dl)	Creatinine (mg/dl)	AST/SGOT (U/L)	ALT/SGPT (U/L)	Total Protein (g/dl)
1	Kinnaur	Anestrus (n=26)	120.06±6.16 ^{ab} (11.40-165.60)	1.07±0.05 ^{xy} (0.60-1.60)	38.63±4.18 ^b (11.90-88.00)	9.95±1.57 ^{by} (2.10-39.90)	6.62±0.27 ^y (5.10-11.40)
		Endometritis (n=15)	110.39±7.01 (79.50-190.00)	1.19±0.09 (0.60-1.70)	35.69±4.40 ^b (11.90-59.00)	9.85±2.35 ^{by} (4.10-35.80)	6.82±0.37 ^{ab} (4.80-10.00)
2	Lahaul	Anestrus (n=8)	189.63±16.99 ^a (114.4-249.2)	0.92±0.10 ^y (0.50-1.30)	80.34±15.31 ^{ab} (22.8-141.3)	29.46±7.35 ^b (3.6-58.5)	7.11±0.52 ^{xy} (4.8-9.2)
		Endometritis (n=16)	179.3±13.08 (100.4-234)	0.99±0.09 (0.5-1.9)	76.66±9.66 ^b (17.9-121.5)	23.37±4.9 ^x (1.7-76.1)	8.34±0.31 ^a (6.4-9.7)
3	Spiti	Anestrus (n=28)	91.19±5.87 ^b (29.57-140.3)	1.30±0.06 ^{ax} (0.80-1.89)	89.8±6.21 ^b (37-155.9)	37.22±2.01 ^a (23-55)	6.72±0.71 ^{xy} (2.97-13.1)
		Endometritis (n=28)	116.06±10.22 (45.95-233.3)	1.18±0.07 (0.59-1.89)	84.77±4.8 ^b (41-134.5)	42.41±2.64 ^a (15.8-64)	5.51±0.43 ^b (3.07-10.10)
4	Pangi	Anestrus (n=30)	162.03±13.83 ^b (74.4-236.9)	0.89±0.05 ^b (0.5-1.6)	103.76±6.07 ^a (17-148.1)	34.44±3.19 ^b (5.3-79.9)	8.53±0.15 ^x (6.50-10.5)
		Endometritis (n=24)	161±9.57 (74.4-229.6)	1.19±0.12 (0.50-2.6)	82.29±7.65 ^b (26.7-155)	21.55±2.55 ^b (2.7-41.8)	8.01±0.18 ^b (6.30-9.20)

Sr. No.	Location	Clinico-gynaecological condition	Cholesterol (mg/dl)	Creatinine (mg/dl)	AST/SGOT (U/L)	ALT/SGPT (U/L)	Total Protein (g/dl)
5	Bhar-mour	Anestrus (n=18)	184.54±19.57 ^b (74.34-247.9)	1.23±0.08 ^b (0.6-1.9)	93.34±14.43 ^b (55-139.2)	26.52±6.22 ^x (11.40-52.30)	8.15±0.91 ^{xy} (5.60-11.30)
		Endometritis (n=16)	175.17±16.07 (55.71-249.2)	1.17±0.06 (0.78-1.59)	88.96±6.17 ^a (59.30-150.2)	22.50±1.81 ^b (14.40-38.5)	8.22±0.36 ^b (5.64-10.1)
Overall		Anestrus (n=110)	137.69±6.26 (11.40-249.30)	1.08±0.03 (0.5-1.9)	81.41±3.70 (14.30-155.90)	27.5±1.63 (2.10-79.9)	7.45±0.22 (2.97-13.10)
		Endometritis (n=99)	141±5.79 (45.95-242)	1.15±0.04 (0.5-2.6)	76.36±3.47 (11.9-155)	26.46±1.76 (1.10-76.1)	7.16±0.20 (3.07-10.10)

^{ab} Values with different superscripts for the same parameter and condition within a column differ significantly (p<0.01)

^{xy} Values with different superscripts for the same parameter and condition within a column differ significantly (p<0.05)

Superscripts a, b indicates p<0.01 and x, y indicates p<0.05 significance

CONCLUSIONS

The present study not only emphasizes the importance of area-specific mineral mixtures that can help to eliminate the fast-spreading malady in the geographically tough terrains of Himachal Pradesh but also opens new doors for further research.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- Ahmad, I. M.R., Hosseini, A., Gheisari, H.R. and Yavari, M. 2014. Preliminary trial in treatment of postpartum endometritis with intrauterine application of hyper immune serum in dairy cows. *Asian Pac. J. Reprod.*, **4**: 360-365.
- Ahmad, I., Lodhi, L.A., Qureshi, Z.I. and Younis, M. 2004. Studies on blood glucose, total proteins, urea and cholesterol levels in cyclic, non-cyclic and endometritic crossbred cows. *Pak. Vet. J.*, **22**(4): 92-94.
- Joshi, P.M., Patel, D.C., Patel, P.D. and Sarvaiya, N.P. 2020. Effect of chelated mineral mixture on blood profile and fertility in anoestrus buffaloes of tribal areas of Dahod district in Gujarat, India. *The Indian J. Vet. Sci. Biotechnol.*, **15**(3), 61-65.
- Kumar, P. 2018. Infertility in bovines of Himachal Pradesh – Prevalance, diagnosis and therapeutic management. PhD thesis, submitted to Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya Palampur, India.
- Kumar, P.R., Singh, S.K., Kharche, S.D., Sharma, G. C., Behera, B.K., Shukla, S.N., Kumar, H., Agarwal, S.K. 2014. Anestrus in cattle and buffalo: Indian perspective. *Adv. Anim. Vet. Sci.*, **2**(3): 124 – 138.
- Mahour, S.S., Nema, S.P., Shukla, S.P., Shrivastava, N. and Mehta, H.K. 2011. Biochemical profile of postpartum anoestrus and induced estrus crossbred cows. *Indian J. Field Vet.*, **6**(3): 53-55.
- Merck Veterinary Manual. 2005. Serum Biochemical Reference Ranges. Ninth ed. Merck & Co., Inc., USA.
- Niaz, S., Naikoo, M., Islam, R., Lone, F.A. and Khan, A.A. 2022. Induction of Estrus in Postpartum Anestrus Crossbred Cattle. *The Indian J. Vet. Sci. Biotechnol.*, **18**(4): 21-25.
- Pandey, V., Singh, A.K. and Sharma, N. 2009. Blood biochemical profile in fertile and repeat breeding crossbred cows under field conditions. *Vet. Pract.*, **1**:45-48.
- Pariza, K.F., Alam, J., Islam, M.R., Hossain, M.M., and Awal, M.A. 2013. Investigation of haematological and biochemical profiles of anoestrus zebu cows. *Bangladesh J. Vet. Med.*, **11**(1): 57-60.
- Sharma, A., Singh, M., Sharma, A. and Kumar, P. 2021. Aetiologies and therapeutic management of infertility in cows reared in high altitude tribal areas of Himachal Pradesh. *Indian J. Anim. Sci.*, **91**(12): 1054-1056.
- Sheldon, I.M., Lewis, G.S., LeBlanc, S. and Gilbert, R.O. 2006. Defining postpartum uterine disease in cattle. *Theriogenology*, **65**(8):1516-1530.
- Togtokhbayar, N. 2006. In: Proceedings of improving animal productivity by supplementary feeding of multinutrient blocks, controlling internal parasites and enhancing utilization of alternate feed resources. FAO-IAEA-TECDOC-1495.p.211.
- Yanez, U., Herradon, P.G., Becerra, J.J., Pena, A.I., Quintela, L.A. 2022. Relationship between Postpartum Metabolic Status and Subclinical Endometritis in Dairy Cattle. *Animals*, **12**: 242.