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Role of hemato-biochemical parameters in genital prolapse of cows

VIVEK SHARMA[1], PRAVESH KUMAR[1]✉, AKSHAY SHARMA[1] and MADHUMEET SINGH[1]

C S K Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh 176 062 India

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ABSTRACT

The present study was designed to investigate the etiologies of genital prolapse in cattle of Himachal Pradesh. Out of 111 cattle enrolled for the study, 39 were suffering with genital prolapse in pregnant, post-partum and non-pregnant stages while the remaining 72 cows were in normal pregnancy, post-partum and non-pregnant stage. Blood samples were collected for hormonal (cortisol, estrogen and progesterone), minerals (calcium, phosphorus and magnesium) and biochemical (glucose, total protein, triglycerides, urea, cholesterol, SGPT, SGOT) estimations. It can be concluded that the serum hormones (estradiol and progesterone) and minerals (calcium and phosphorus) concentrations differ significantly between the genital prolapse affected and healthy cattle.

Keywords: Biochemical, Calcium, Cattle, Estradiol, Genital prolapse, Hormones, Minerals, Progesterone

Genital prolapse, the common reproductive disorder, occurs between mid to late gestation and is characterized by inside out protrusion of genital organ (Noakes *et al.* 2019). This causes delay in inter-calving interval, return to estrous, longer open days, numbers of services per conception and failure to conceive in next lactation, which leads to overall decrease in reproductive potential of animals (Rabbani *et al.* 2010). Among the bovines of Dadwal area of Himachal Pradesh, the incidence of ante-partum and post-partum prolapse among all reproductive disorders was 56.45 and 9.98% (Kumar *et al.* 2019). Pre-partum vaginal prolapse is a major reproductive disorder in bovines during last trimester (Sachan *et al.* 2019). In Iraq, among animals, the incidence of vaginal prolapse was 2.29% (Rahawy 2021) and uterine prolapse was 7.63 (Rahawy 2006) and 5.23% (Rahawy 2021). Various predisposing factors are associated with occurrence of genital prolapse. The severity of genital prolapse depends on the extent of involvement of various predisposing factors, which includes mainly nutritional imbalances (Kelkar *et al.* 1989, Ahmed *et al.* 2005), hereditary predisposition (Nanda and Sharma 1982), seasonal and managemental factors (Mishra *et al.* 1998, Akhtar *et al*. 2012) and hormonal imbalances (Galhotra *et al.* 1991). In nutritional imbalances, minerals generally play an important role. It has been found that animals affected with genital prolapse had low serum concentration of calcium, phosphorus and magnesium throughout gestation and after parturition as compared to healthy pregnant animals (Ahmed *et al.* 2005, Akhtar *et al*. 2012, Khamees *et al.* 2014, Gangwar *et al.* 2015). Similarly, the levels of hormones like estrogen and cortisol were found high whilelevels of progesterone were low in animals suffering from prolapse in comparison to normal animals (Akhtar *et al*. 2012, Noakes *et al*. 2019). Also the levels of various biochemicals were found disturbed in prolapse suffering animals (Gangwar *et al*. 2015, Sachan *et al*. 2019). Hence, the aim of this study was to determine the various reasons of gential prolapse, which affects major population of bovines in the state and affects the production and reproduction of farm animals.

Present address: [1]Dr G C Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh. ✉Corresponding author email: pk9919@rediffmail.com

MATERIALS AND METHODS

In this study, investigation on etiologies of genital prolapse in cattle was done from January 2020 to March 2021. Out of 111 cattle enrolled for the study, 39 were suffering with genital prolapse in pregnant (n=18), post-partum (n=10) and non-pregnant (n=11) stage while in control group (n=72), 39 were pregnant, 24 post-partum and 9 cows were in non-pregnant stage. All the control group animals were free from genital prolapse.

Blood samples were collected aseptically from cattle affected with the genital prolapse through the jugular venipuncture on the day of admission at Veterinary Clinical Complex of the College and owners doorstep. Blood (8 ml) was collected in heparin smeared centrifuge tubes. The samples were centrifuged @ 3000 rpm for 10 min and harvested plasma was stored at -20˚C for further hormonal analysis (cortisol, estrogen and progesterone) through ELISA technique (TECAN Austria GmbH, Austria), minerals (calcium, phosphorus and magnesium) and biochemical parameters with automatic Mispa Nano Biochemistry Analyzer (Agappe Diagnostics Ltd, India) by using standard kits respectively.

Statistical analysis: The obtained data was statistically analyzed using students using t-test and one way ANOVA

Table 1. Blood plasma concentrations (Mean±SE) of hormones during pregnant, post-partum and in non-pregnant stage in genital prolapse affected and non-affected cattle

Hormone	Pregnant		Post-partum		Non-pregnant	
	Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Estradiol (pg/ml)	174.43±14.68^{a}	86.90±5.03^{b}	183.09±11.7^{a}	66.30±12.70^{b}	188.65±11.6^{a}	24.97±6.83^{b}
Progesterone (ng/ml)	2.49±0.23^{a}	3.89±0.144^{b}	0.39±0.06^{a}	0.19±0.03^{b}	0.41±0.04	0.65±0.16
Cortisol (ng/ml)	23.72±3.78	28.40±2.16	27.16±3.97^{a}	12.34±1.47^{b}	33.81±6.09^{a}	16.42±1.76^{b}

^{a,b}Values with different superscripts for the same parameter within the row differ significantly (P<0.01).

Table 2. Blood plasma concentrations (Mean±SE) of minerals during pregnant, post-partum and in non-pregnant stage in genital prolapse affected and non-affected cattle

Mineral	Pregnant		Post-partum		Non-pregnant	
	Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Calcium (mg/dl)	8.20±0.25^{ya}	9.40±0.13^{b}	7.58±0.43^{ya}	10.59±0.18^{b}	9.14±0.21^{xa}	9.26±0.19^{b}
Phosphorus (mg/dl)	4.1±0.37^{a}	5.33±0.13^{b}	3.82±0.25^{a}	5.60±0.23^{b}	3.5±0.25^{a}	5.36±0.37^{b}
Magnesium (mg/dl)	3.14±0.03	3.13±0.07	3.09±0.02	3.06±0.23	3.12±0.01	3.11±0.02

^{x,y}Values with different superscripts for the same parameter but different category within a row differ significantly (p<0.05). ^{a,b}Values with different superscripts for the same parameter within the row differ significantly (P<0.01).

Table 3. Blood plasma concentrations (Mean±SE) of biochemical parameters during pregnant, post-partum and in non-pregnant stage in genital prolapse affected and non-affected cattle

Biochemical parameter	Pregnant		Post-partum		Non-pregnant	
	Affected	Non-affected	Affected	Non-affected	Affected	Non-affected
Glucose (mg/dl)	45.75±2.68	49.38±3.09	38.24±2.97	35.52±0.16	56.51±5.33	58.21±6.30
Total protein (g/dl)	6.52±0.17	6.70±0.09	6.65±0.30^{a}	7.52±0.16^{b}	6.54±0.29	6.75±0.16
Triglycerides (mg/dl)	35.88±2.53^{a}	24.84±1.23^{b}	29.08±4.02	27.42±0.26	20.35±2.65	17.15±2.95
Urea (mg/dl)	32.3±1.65^{a}	23.94±1.15^{b}	38.27±6.33	36.72±0.87	37.82±3.78^{a}	24.07±1.46^{b}
Cholesterol (mg/dl)	74.88±6.43^{a}	110.26±4.76^{b}	77.16±9.55	101.31±7.38	67.75±9.69^{a}	120.5±11.86^{b}
SGPT (U/L)	28.82±2.14	29.75±1.38	31.66±4.05^{a}	57.03±4.79^{b}	26.44±3.61	32.86±3.83
SGOT (U/L)	90.5±8.87^{a}	70.07±3.45^{b}	87.71±8.60^{a}	126.04±8.99^{b}	110.6±28.14	89.34±10.46

^{a,b}Values with different superscripts for the same parameter within the row differ significantly at different levels of significance (P<0.01 and P<0.05).

for parametric data with Computer Software Instat Graphpad Software, 2008.

RESULTS AND DISCUSSION

There were significant elevations (P<0.01) in plasma estradiol-17β concentration levels in affected cattle as compared to non-affected cattle in all three stages (pregnant, postpartum and non-pregnant) (Table 1). Progesterone concentration was comparatively lower in affected cattle as compared to non-affected cattle and the decrease was significant (P<0.01) in pregnant and post-partum group but non-significant in non-pregnant group. Also, significant elevation (P<0.01) was observed in cortisol plasma concentration among affected cattle as compared to non-affected one both in non-pregnant and post-partum groups.

Similarly, the levels of calcium and phosphorus were significantly (P<0.01) lower in affected cattle during non-pregnant, pregnant and post-partum stage in comparison to corresponding non-affected groups (Table 2). However, no significant changes were observed in magnesium concentration in all groups.

In pregnant group, significant elevations were observed in triglycerides (P<0.01) for pregnant; urea (P<0.01) and SGOT (P<0.05) for pregnant and non-pregnant animals as compared to non-affected one (Table 3). Post-partum group showed significant (P<0.05) decline in total protein and SGPT during pregnant, and SGOT during pregnant and post-partum stage in affected cattle. Whereas, in non-pregnant group, significant (P<0.05) increase and decrease was observed in urea and cholesterol concentration, respectively for affected cattle as compared to non-affected cattle.

Estradiol concentrations reported in healthy buffaloes during normal pregnancy were 86.2±3.7 pg/ml but these levels increased to 172±6.3 pg/ml in animals which showed prolapse (Akhtar *et al*. 2012). Similarly, the levels of progesterone concentration also decreased to 2.6±0.4 ng/dl in prolapse suffering buffaloes from 4.8±0.3 ng/dl in normal pregnant buffaloes. The increased estradiol levels were found responsible for relaxation of pelvic ligaments and perineal muscles predisposing to genital prolapse (Ali *et al.* 2012). Similarly, feeding of sub-terrain clover, soya bean meal, moldy maize and barley having high estrogenic

content and presence of follicular cyst on ovaries results in elevation of estrogen (Todoroki and Kaneko 2006). When the level of estradiol increases due to number of associated reasons in the animal body during pregnancy, it causes shift in estrogen and progesterone ratio, which is very important for maintaining pregnancy, and any imbalance in ratio may cause genital prolapse (Zicarelli 2000).

Calcium, phosphorus and magnesium play an important role in proper functioning of various muscles and constitute musculo-skeleton system of body, which assist in parturition, maintains tonicity of uterus and helps in uterine involution (Roberts 1971, Schonewille 2013). Levels of calcium, phosphorus and magnesium recorded in cattle during uterine prolapse were comparatively low (5.56±0.19, 3.30±0.30 and 1.42±0.09 mg/dl, respectively) as compared to normal cows (10.34±0.44, 5.33±0.21 and 3.79±0.37 mg/dl, respectively) (Khamees *et al*. 2014). Similarly, low levels of calcium, phosphorus and magnesium were observed in buffaloes affected with prolapse (5.56-7.25, 2.61-3.88 and 1.46-3.0 mg/dl) as compared to healthy buffaloes (11.21-11.77, 4.64-6.55 and 3.50-4.98 mg/dl)(Shahzad *et al*. 2016). Similar trends were recorded for these three minerals in our study (Table 2).

The concentrations of glucose in pre-partum stage were 31.0±3.67 mg/dl, which was required for coordination of endocrine functions (Lucy *et al.* 2014). For animals affected with genital prolapse, there might be upsurge of cortisol up to 55.25±6.68 mg/dl (Gangwar *et al.* 2015) because of induced stress (Keller-Wood *et al*. 2014). All these changes further increased the protein metabolism because of catabolic effect of stress (Gyton and Hall 2003) and also due to exponential increase in size of fetus during last stage of pregnancy which ultimately increases the levels of serum urea and decreases total protein levels (Rodriguez *et al.* 1996). The recorded levels of serum urea in affected animals were 38.24±3.12 as against 31.96±4.16 mg/dl in normal animals (Gangwar *et al.* 2015). Similarly, total protein levels were 6.82±0.20 g/dl and 5.82±0.34 g/dl in healthy and affected bovines, respectively (Gangwar *et al.* 2015). On the contrary, levels of triglycerides increased because of mobilization of fat depot due to stress hormones. In normal buffaloes, the levels were 18.12±1.44 mg/dl, which increased to 45.25±7.74 mg/dl in affected buffaloes (Gangwar *et al.* 2015).

Hence it can be concluded that the serum hormones (estradiol and progesterone) and minerals (calcium and phosphorus) concentrations differ significantly between the genital prolapse affected and healthy cattle**.**

REFERENCES

Ahmed S I, Ahmad L A, Lodhi N A and Samad H A. 2005. Clinical, haematological and serum macro mineral contents in buffaloes with genital prolapsed. *Pakistan Veterinary Journal* **25**: 167&70.

Akhtar M S, Lodhi L A, Ahmad I, Qureshi Z I and Muhammad G. 2012. Serum ovarian steroid hormones and some minerals concentrations in pregnant Nilli-Ravi buffaloes with or without pre-partum vaginal prolapse. *Pakistan Veterinary Journal* **32**: 265&68.

Ali M A, Lodhi L A and Hassan F. 2012. Serum progesterone and estradiol-17α profiles in Nilli Ravi buffaloes (*Bubalus bubalis*) with and without dystocia. *Pakistan Veterinary Journal* **32**(4): 571&74.

Galhotra M M, Georgie G C and Dixit V P. 1991. FSH, LH and prolactin in antepartum vaginal prolapsed of buffaloes (*Bubalus bubalis*) in relation to cortisol and degree of stress. *Indian Veterinary Journal* **68**: 332&35.

Gangwar C, Kumar R, Singh S P, Singh S, Srivastava M K and Saxena A. 2015. Serum metabolites and macro mineral profile of pre-partum buffaloes affected with cervico-vaginal prolapse. *Indian Journal of Animal Sciences* **85**(6): 575&77.

Gyton C A and Hall J E. 2003. *Textbook of Medical Physiology*. 10th edn. Saunders-An Imprint of Elsevier, Pennsylvania.

Kelkar M A, Khar S K and Mandakhot V M. 1989. Studies on the antepartum prolpase of the vagina in buffaloes and plasma trace element concentrations. *Experimentelle Veterinarmedizin* **43**: 315&18.

Keller-Wood M, Feng X, Wood C E, Richard E, Antony R V, Dahl G E and Tao S. 2014. Elevated maternal cortisol leads to relative hyperglycemia and increased still birth in ovine pregnancy. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* **307**(4): R376&86.

Khamees H A, Alfras A A and Fahad T A. 2014. The relationship between the postpartum uterine prolapse incidence and some macro minerals serum level deficiency in buffalo cows in Basrah province. *AL-Qadisiya Journal of Veterinary Medical Sciences* **13**: 94&97.

Kumar P, Sharma A, Singh M, Chandel A and Ananya. 2019. A retrospective analysis of obstetrical problems in buffaloes of Dadwal area (District Hamirpur) of Himachal Pradesh. *Himachal Journal of Agriculture Research* **45** (1&2): 100&03.

Lucy M, Butler S and Garverick H. 2014. Endocrine and metabolic mechanisms linking postpartum glucose with early embryonic and foetal development in dairy cows. *Animal* **8**: 82&90.

Mishra U K, Agrawal R G and Pandit R K. 1998. Incidence of prolapse of genitalia in Murrah buffaloes in relation to season, pregnancy, parity and management. *Indian Veterinary Journal* **75**(3): 254&55.

Nanda A S and Sharma R D. 1982. Incidence and etiology of prepartum prolapse of vagina in buffaloes. *Indian Journal of Dairy Sciences* **35**(2): 168&71.

Noakes D E, Parkinson T J and England G C W. 2019. Vaginal wall and cervix through the vulva. *Veterinary Reproduction and Obstetrics*. 10th edn. Elsevier Company Ltd., London. pp. 195&197.

Rabbani R A, Ahmad I, Lodhi L A Ahmad N and Muhammmad G. 2010. Prevalence of various reproductive disorders and economic losses caused by genital prolapse in buffaloes. *Pakistan Veterinary Journal* **30**(1): 44&48.

Rahawy M A. 2006. Reproductive disorders in Iraqi buffalo cows in Ninavah province. Fourth Scientific Conference College of Veterinary Medicine, University of Mosul.

Rahawy M A. 2021. Study on postpartum disorders and their relationship with the reproductive performance in Iraqi cow-buffaloes. *Iraqi Journal of Veterinary Sciences* **35**(2): 313&17.

Roberts S J. 1971. Veterinary Obstetrics and Genital Diseases. (2ndedn). C.B.S. Publisher and Distributors, Delhi.

Rodriguez M N, Tebot I, Bas A, Niievas C, Leng L, Cirio A and Le Bas A. 1996. Renal functions and urea handling in pregnant

and lactating Corridale ewes. *Canadian Journal of Animal Sciences* **76**: 469&72.

Sachan V, Singh V and Saxena A. 2019. Study on biochemical changes during peri-parturient prolapse in murrah buffaloes. *Haryana Veterinarian* **58**(S.I.): 98&101.

Schonewille J T. 2013. Magnesium in dairy cow nutrition: an overview. *Plant Soil* **368**: 167&78.

Shahzad Q, Imran M, Khan H, Wadood A A, Khan M A, Binyameen M and Niazi A A. 2016. Serum concentrations of calcium, inorganic phosphorus and magnesium in cyclic, noncyclic and repeat breeder buffaloes. *Buffalo Bulletin* **35**: 73&76.

Todoroki J and Kaneko H. 2006. Formation of follicular cysts in cattle and therapeutic effects of controlled internal drug release. *Journal of Reproduction and Development* **52**: 1&11.

Zicarelli L. 2000. Considerations about the prophylaxis of the uterine and vaginal prolapse in Italian Mediterranean buffalo and cows. *Bubalus Bubalis* **3**: 71&90.