

*Original Research***Haemato-Biochemical Alterations in Buffaloes Suffering from Uterine Torsion****Chintan S. Pateliya, J. A. Patel, A. J. Dhami* and M. M. Pathan**

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Abstract

The study was conducted to investigate the haemato-biochemical alterations in buffaloes with uterine torsion (Gr-I, n=10) in comparison to normal parturient buffaloes Gr-II, n=6) just before parturition, at 1 hr, 1 day and 1 week after assisted or natural parturition. The cases presented to Veterinary Clinical Complex of the College in Anand and from nearby area were included in the study. Diagnosis of uterine torsion was made based on history of the case and by trans-rectal examination followed by trans-vaginal examination. All the buffaloes with uterine torsion were treated by Schaffer's method. Uterine torsion affected buffaloes revealed significantly reduced levels of haemoglobin, packed cell volume and total erythrocytes count as compared to the normal parturient buffaloes, while total leukocyte count and differential leukocyte count, viz., neutrophils, lymphocyte, monocyte and eosinophil counts showed non-significant increase as compared to normal parturient buffaloes at different peripartum periods. The uterine torsion in buffaloes was associated with significantly reduced serum total protein, calcium and phosphorus, and elevated blood glucose, serum creatinine and urea levels as compared to normal ones. It was concluded that the serum levels of creatinine and urea at the time of presentation of a case of uterine torsion can be used as the prognostic indicators for future outcome of obstetrical management of the condition.

Key words: Blood Glucose, Buffalo, Creatinine, Haematology, Serum Urea Nitrogen, Total Protein, Uterine Torsion

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Introduction

Dystocia is one of the most important obstetrical conditions that causes severe economic losses to the farmers, and requires immediate attention by the veterinarians. There are numerous causes of obstructive parturition, which have been classified as maternal and fetal or a combination of both. Uterine torsion during pregnancy (Murty *et al.*, 1999) or at parturition (Matharu and Prabhakar, 2001) is one of the

complicated causes of maternal dystocia in buffaloes culminating in death of the fetus and/or the dam if not treated early. The occurrence of uterine torsion increases adrenocortical activity and influences blood vascular cellular components as well as the metabolism of liver, kidney and muscular system (Arora *et al.*, 2013) altering haemato-biochemical and enzymatic profile (Husseini and Abd Ellah, 2008). When physical examination fails to yield a diagnosis or prognosis in difficult cases of uterine torsion (Ali *et al.*, 2011), erythrogram, leukogram and blood biochemical profiles might aid in establishing a prognosis and developing a therapeutic plan (Amin *et al.*, 2011). Hence, the present study was conducted to evaluate the peripartum haemato-biochemical alterations in buffaloes with uterine torsion relative to normal parturient ones.

Materials and Methods

A total of ten buffaloes suffering with uterine torsion and presented to Veterinary Clinical Complex of the College in Anand for treatment from the field and six normal parturient buffaloes from University farm and from nearby area were included in this study during July to December, 2018. All the buffaloes with uterine torsion were treated for detorsion by Schaffer's method. Blood samples were collected from jugular vein in heparinized vacutainer for haematological analysis and in serum activator vials for serum biochemical analysis just before, at 1 hr, 1 day and 1 week after correction of uterine torsion and assisted delivery from animals of treatment group (n=10) as well as from animals with normal parturition (n=6).

All the haematological parameters, *viz.* haemoglobin (Hb) concentration, haematocrit value /packed cell volume (PCV), total erythrocytes count (TEC), total leukocyte count (TLC) as well as differential leukocytes count (DLC) were estimated using auto-blood analyzer (Model- Abacus Junior Vet-5, Pioneer Technologies, India). Blood glucose level was measured immediately after blood sampling by using Glucometer (GlucoOne, Model No: BG-03, Morepen Laboratories Limited, Himachal Pradesh, India). The levels of serum biochemical profile, *viz.* total protein, urea, creatinine, calcium and phosphorus were determined using Diagnostic kits procured from Coral Clinical Systems, Goa, on Chemistry Analyzer (Model No: BS-120, Mindray, China). The data were analysed statistically using standard statistical procedures of analysis of variance, Duncan's multiple range test and students' 't' test on SPSS software version 20.00 to know the variations between periods within the group, and between the groups for each parameter (Snedecor and Cochran, 1994).

Results and Discussion

The findings on haemato-biochemical analysis done at different time interval peripartum in uterine torsion affected and normal parturient buffaloes are presented in Table 1 and 2, respectively.

Haematological Findings

The mean values of haemoglobin (Hb) concentration, packed cell volume (PCV) and total erythrocytes count (TEC) were found to be statistically similar among four intervals of observation in both the groups of uterine torsion affected and normal parturient buffaloes. The mean values of all three parameters were lower at all four peripartum intervals in uterine torsion affected buffaloes than the corresponding values in normal parturient buffaloes, but the differences were significant ($p < 0.05$) only at all postpartum intervals (Table 1). These results were in consonance with the earlier findings of Amer *et al.* (2008) and Karthick *et al.* (2016). The decreased values of erythrogram in torsion affected animals may be attributed to the relatively great loss of blood during labour (Amer *et al.*, 2008) or accumulation of metabolic waste products or deficiency of precursor during pregnancy leading to inhibition of erythropoiesis.

Table 1: Haematological parameters (Mean \pm SE) in uterine torsion affected (n=10) and normal parturient (n=6) buffaloes at different peripartum periods

Parameters	Group	Before Parturition	1 hr After Parturition	1 day after Parturition	1 week after Parturition
Hb (g/dl)	Affected	10.04 \pm 1.18	9.71 \pm 0.82*	10.27 \pm 0.69*	10.04 \pm 0.63*
	Normal	12.42 \pm 0.63	12.23 \pm 0.53	13.00 \pm 0.85	12.72 \pm 0.80
PCV (%)	Affected	36.70 \pm 4.02	35.13 \pm 2.85*	36.03 \pm 2.44**	34.29 \pm 2.42**
	Normal	43.53 \pm 2.16	43.28 \pm 2.27	48.54 \pm 1.99	46.15 \pm 1.91
TEC ($\times 10^6/\mu\text{l}$)	Affected	5.83 \pm 0.64	5.67 \pm 0.49*	6.06 \pm 0.38**	5.65 \pm 0.48**
	Normal	7.10 \pm 0.38	7.02 \pm 0.39	7.83 \pm 0.36	7.55 \pm 0.30
TLC ($\times 10^3/\mu\text{l}$)	Affected	11.64 \pm 0.87 ^b	11.34 \pm 1.00 ^{ab}	8.37 \pm 1.19 ^a	8.66 \pm 1.06 ^{ab}
	Normal	9.68 \pm 0.62	10.00 \pm 0.44	8.69 \pm 1.14	7.65 \pm 0.74
Neutrophils ($\times 10^3/\mu\text{l}$)	Affected	6.31 \pm 0.56 ^b	6.00 \pm 0.61 ^{ab}	4.29 \pm 0.78 ^{ab}	3.98 \pm 0.76 ^a
	Normal	5.34 \pm 0.43 ^b	5.87 \pm 0.31 ^b	4.40 \pm 0.74 ^{ab}	3.54 \pm 0.41 ^a
Lymphocytes ($\times 10^3/\mu\text{l}$)	Affected	4.79 \pm 0.49	4.82 \pm 0.46	3.63 \pm 0.58	4.11 \pm 0.50
	Normal	3.87 \pm 0.42	3.70 \pm 0.35	3.90 \pm 0.48	3.77 \pm 0.48
Monocytes ($\times 10^3/\mu\text{l}$)	Affected	0.47 \pm 0.11	0.38 \pm 0.07	0.34 \pm 0.08	0.46 \pm 0.07
	Normal	0.42 \pm 0.03	0.37 \pm 0.06	0.30 \pm 0.05	0.25 \pm 0.07
Eosinophils ($\times 10^3/\mu\text{l}$)	Affected	0.08 \pm 0.02	0.15 \pm 0.05	0.12 \pm 0.02	0.12 \pm 0.02
	Normal	0.06 \pm 0.01	0.06 \pm 0.01	0.09 \pm 0.02	0.09 \pm 0.01

Hb: Haemoglobin, PCV: Packed cell volume, TEC: Total erythrocytes count, TLC: Total leukocytes count. * $p < 0.05$, ** $p < 0.01$ between affected and control groups; Means with uncommon superscript within the row differ significantly ($p < 0.05$).

In contrary, Ali *et al.* (2011) and Nagaraju (2018) reported increased values of haemoglobin and PCV with increased degree and duration of torsion due to haemo-concentration resulted from acute dehydration as a consequence to reduced water and feed intake and oozing of fluids from congested uterine blood vessels. In the present study, most of the cases were however; attended in time before onset of severe dehydration and/or toxemia, and hence there was no haemo-concentration. Ghuman *et al.* (1997) suggested the probable reason for decline in TEC count that the erythrocytes are relatively fragile in torsion-affected buffaloes and remain so in those animals that fail to survive during post-detorsion period. However, in the

survivors, the erythrocytes get stabilized by 18 hr post-detorsion due to alleviation of stress of torsion. In present study, the erythrocytes count did not return to normal level even after one week of parturition, which was however in accordance with observations of Karthick *et al.* (2016), who found stabilized erythrocytes count by 30 days of fetal delivery.

In uterine torsion affected buffaloes, the mean TLC was significantly ($p < 0.05$) lower at 1 day after parturition than before parturition, whereas the values observed at 1 hr and 1 week after parturition were intermediary. No such trend or variation was observed in normal parturient buffaloes. The mean TLCs were found to be non-significantly higher in uterine torsion affected buffaloes than normal parturient buffaloes before parturition and also at 1 hr and 1-week post-parturition (Table 1). These findings were in accordance with the observations of Ali *et al.* (2011), who reported non-significant increase in TLC in torsion affected buffaloes than the normal parturient buffaloes, whereas, Karthick *et al.* (2016) reported the significant increase in TLC in uterine torsion affected buffaloes than normal parturient buffaloes. Such results may be due to stress exerted on the affected animals (Amer *et al.*, 2008). The reduction in TLC after parturition may be due to migration of neutrophils towards uterine lumen and mammary gland (Karthick *et al.*, 2016) to alleviate stress and infection, if any.

The mean neutrophil count in uterine torsion affected buffaloes showed continuous decreasing trend being higher prior to parturition and reduced significantly ($p < 0.05$) at 1 week after parturition (Table 1). Similarly, in normal parturient buffaloes, the mean neutrophil count was significantly ($p < 0.05$) higher before and 1 hr after parturition than 1 week after parturition. The neutrophils were found to be non-significantly higher before, and at 1 hr and 1 week after parturition in torsion affected buffaloes than normal parturient buffaloes. The present observations were analogues with the findings of Amer *et al.* (2008) and Ali *et al.* (2011). Significant increase in neutrophil count in torsion affected buffaloes was probably due to a typical response to the stress exerted on the affected animal and increased levels of cortisol (Amer *et al.*, 2008). There were no significant differences in the values of lymphocyte, monocytes and eosinophils among four periods studied in any of the groups. Moreover, the values of all DLC parameters were non-significantly higher in uterine torsion affected than normal parturient buffaloes at most of the peri-parturient periods (Table 1).

Biochemical Findings

The mean blood glucose level was significantly ($p < 0.05$) higher at 1 hr after parturition than before parturition, 1 day and 1 week after parturition in both the groups. The level was also significantly ($p < 0.05$) higher in uterine torsion affected buffaloes than normal parturient buffaloes just before parturition and at 1 day after parturition. Furthermore, the blood glucose level in torsion affected buffaloes at 1 week after parturition dropped to normal one. The findings of the present study were in alliance with the report of Amer *et al.* (2008). Hyperglycemia in affected animals may be due to activation of stress axis and increased

cortisol release which leads to gluconeogenesis (Amer *et al.*, 2008). Moreover, the animals with torsion become anorectic, which increases liver glycogenolysis (Coles, 1986) leading to increased circulatory blood glucose levels.

Table 2: Blood glucose and serum biochemical and mineral profiles at different peripartum periods in uterine torsion affected (n=10) and normal parturient (n=6) buffaloes (Mean ± SE)

Parameters	Group	Before parturition	1 hr after parturition	1 day after parturition	1 week after parturition
Blood Glucose (mg/dl)	Affected	112.30±9.90 ^b	152.80±9.88 ^c	101.10±10.41 ^{ab}	80.00±6.47 ^a
	Normal	87.83±5.10 ^{a*}	122.00±12.52 ^b	75.67±5.21 ^{a*}	71.83± 2.50 ^a
Serum Total Protein (g/dl)	Affected	6.51±0.24 ^{ab}	6.34±0.22 ^{ab}	6.12±0.19 ^a	7.03±0.26 ^b
	Normal	10.13±0.53 ^{**}	10.85±0.64 ^{**}	10.24±0.69 ^{**}	11.76±0.54 ^{**}
Serum Urea Nitrogen (mg/dl)	Affected	26.67±2.08 ^b	24.28±1.90 ^b	22.22±1.40 ^{ab}	17.47±2.17 ^a
	Normal	18.76±3.28	17.72±2.76	14.18±2.54 [*]	13.93±1.92
Serum Creatinine (mg/dl)	Affected	2.85±0.03 ^c	1.82±0.06 ^b	1.78±0.09 ^b	0.96±0.01 ^a
	Normal	0.92±0.02 ^{**}	0.95±0.02 ^{**}	0.98±0.01 ^{**}	0.95±0.01
Serum Calcium (mg/dl)	Affected	9.33±0.39	9.23±0.32	9.23±0.56	8.93±0.43
	Normal	10.81±0.60	10.66±0.61	10.70±0.59	10.74±0.39 ^{**}
Serum Phosphorous (mg/dl)	Affected	2.23±0.13	2.78±0.37	2.73±0.39	2.72±0.36
	Normal	5.39±0.34 ^{**}	4.84±0.37 ^{**}	4.74±0.54 ^{**}	4.85±0.32 ^{**}

Means bearing uncommon superscripts within the row (a,b,c) differ significantly ($p < 0.05$); * $p < 0.05$ and ** $P < 0.01$ between affected and control groups.

In torsion affected buffaloes, the level of serum total protein was significantly ($p < 0.05$) lower at 1 day after parturition than 1 week after parturition with intermediary levels just before and 1 hr after parturition, while in normal parturient buffaloes, the differences were non-significant. Moreover, significantly ($p < 0.01$) lower levels of serum total protein were recorded in uterine torsion affected buffaloes than the normal parturient ones at all four peripartum periods. Decline in total protein level has previously been documented in torsion affected buffaloes (Amer *et al.*, 2008; Arora *et al.*, 2013). The hypoproteinaemia in affected buffaloes may be attributed to stressful condition (Manju *et al.*, 1985) or liver dysfunction and negative nitrogen balance because of increased utilization of protein due to anorexia and reduced protein intake or it might be a result of dehydration (Amer *et al.*, 2008).

In uterine torsion affected buffaloes, the serum urea nitrogen (SUN) and creatinine levels were the highest just before parturition, then it reduced slowly and non-significantly after parturition reaching to the lowest concentration at 1 week postpartum with significant ($p < 0.05$) difference, whereas in normal parturient buffaloes, the creatinine was constant, but SUN decreased non-significantly during postpartum periods. The SUN levels were observed to be non-significantly higher, except at 1 day postpartum, and creatinine was significantly ($p < 0.05$) higher in uterine torsion affected buffaloes than normal parturient buffaloes at different peripartum periods except at 1 week postpartum. The present findings on SUN and creatinine were

comparable with the previous reports of Amer *et al.* (2008) and Satish *et al.* (2018). The elevated SUN levels in uterine torsion affected animals might be due to stress exerted elevation of cortisol levels, increased protein catabolism, higher ADH activity and decreased renal blood flow due to severe pain thus causing retention of SUN and creatinine within the body (Arthur *et al.*, 1989, Dhindsa *et al.*, 2005). Further, Amer *et al.* (2008) stated that the increased levels of urea and creatinine could be related to stress condition of the affected buffaloes or may be due to reduced blood flow to kidneys as most of the blood is pooled in the twisted uterus. The initial high serum creatinine concentration could also be attributed to increased energy mobilization during the pre-calving period (Kudlac *et al.*, 1995). In uterine torsion, ureters lying in the broad ligaments were found constricted causing reduced urine output and affected renal functions resulted in increased blood creatinine values (Ghuman, 2010). Several studies have concluded that poor prognosis was indicated when a substantial increase in serum/plasma urea and creatinine levels were recorded at the time of presentation of a case of uterine torsion (Ghuman, 2010).

The values of serum calcium and phosphorus concentrations were observed to be statistically similar at all four intervals in both uterine torsion affected and normal parturient buffaloes. Further, the mean concentrations of serum calcium at all intervals were found to be apparently lower in uterine torsion affected buffaloes than in normal parturient animals, with significant ($p < 0.01$) difference only after 1 week of parturition. Serum phosphorus profile was found significantly ($p < 0.01$) lower, almost one half, in uterine torsion affected buffaloes as compared to normal parturient buffaloes at all intervals studied. Similar observations on serum phosphorus profile were recorded in previous studies on uterine torsion affected cases by Ali *et al.* (2011) and Nagaraju (2018). However, in present study, the levels of serum phosphorus were comparatively much lower than previous reports. The hypophosphatemia in torsion affected animals may be attributed to transcellular shift of phosphorus (from extracellular volume to either soft tissues or bones), poor dietary intake especially when associated with impaired gastro-intestinal absorption or diarrhea, and increased phosphate excretion resulting from renal and non-renal causes (Berkelhammer and Bear, 1984). The degree of alterations in the haemato-biochemical profiles varies according to the duration and severity of uterine torsion. In the present study, all the affected buffaloes were attended and detorted within 24-36 hours of onset of clinical signs, hence little variations were recorded in haemato-biochemical profiles.

Conclusion

From the present study, it was concluded that uterine torsion alters the haemato-biochemical profile according to the duration and severity of condition and that when physical examination fails to predict the prognosis in difficult cases of uterine torsion, erythrogram, leukogram as well as serum levels of creatinine and urea may be used as the prognostic indicators for obstetrical management of the case.

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