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Physico-biochemical characteristics of fetal fluids in uterine torsion affected buffaloes

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ABSTRACT

Physical and biochemical characteristics of both allantoic and amniotic fluids of 19 uterine torsion affected buffaloes were compared with those of 13 dystocia other than uterine torsion and 8 normally calving buffaloes. In the torsion affected buffaloes, colour of allantoic fluid varied from reddish to dark brown (28.5% to 35.6%, respectively) while the colour of amniotic fluid was dirty white in 45.4 % cases. The allantoic fluid of uterine torsion affected buffaloes had significantly higher ($P<0.05$) levels of urea, sodium, glutamate pyruvate transaminase (GPT), glutamate oxaloacetate transaminase (GOT) than normally calving buffaloes, while the amniotic fluid had significantly ($P<0.05$) higher levels of urea, phosphorus and GOT than both normally calving buffaloes and those suffering from dystocias other than uterine torsion. To conclude, the changes registered in certain biochemical parameters of fetal fluids in both torsion and dystocia affected buffaloes were merely the reflection of stress rather than an indicator of association with etiopathology of uterine torsion.

Key words: Buffalo, uterine torsion, fetal fluids, dystocia

Buffaloes are highly prone to uterine torsion than any other maternal cause of dystocia. The incidence of uterine torsion is very high during first or early second stage of parturition in pluriparous buffaloes (Kumar, 1990). Fetal fluids are excretion of fetus and are responsible for giving protection to fetus *in utero* (Hafez, 1997). Fetus itself along with allantoic and amniotic fluid sacs play a prime role in dilatation of cervix to make the delivery effective. Physical and biochemical characteristics of fetal fluids across the gestation length have been studied earlier in the normally calving buffaloes (Rajasundaram *et al.*, 1990), which indicated that significant alterations in their biochemical constituents. Therefore, to elucidate association between changes in fetal fluids and occurrence of uterine torsion, it would be imperative to study physico-biochemical characteristics in torsion affected buffaloes and compare them with normally calving and those suffering from dystocias other than uterine torsion.

MATERIALS AND METHODS

The present investigation was conducted on 40 parturient buffaloes, which included 19 uterine torsion affected buffaloes (Torsion group), 13 dystocia affected buffaloes other than uterine torsion (Dystocia group) and 8 normally calving buffaloes (Control group). From all these buffaloes, both allantoic and amniotic fluids were collected prior to fetal delivery in separate sterilized beakers by puncturing the respective sacs with disposable needles. The aliquots of fetal fluid samples after suitable labeling, were stored at -20°C in 30ml tissue culture vials for biochemical analysis.

Physical characteristics of fetal fluids were observed immediately after collection, viz. colour, volume and pH. The pH was estimated by broader and narrow range pH paper strips. Biochemical constituents including urea nitrogen, creatinine, total protein, calcium, phosphorus, glutamate pyruvate transaminase (GPT) and glutamate oxaloacetate transaminase (GOT) were analysed by autoanalyser (Beckman- Clinical system- 700 USA) using auto pack kits (Bayer Diagnostics Pvt. Ltd. Baroda). Sodium and potassium concentrations in fetal fluids were estimated by flame photometer (model CL-26 D Elico Pvt. Ltd. Hyderabad, India). Significance of differences of mean in physical and biochemical constituents among various groups were calculated by Student's 't' test (Singh *et al.*, 1991).

RESULTS AND DISCUSSION

The physical characteristics of fetal fluids of Torsion, Dystocia and Control groups are summarized in

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Table 1. Physical characteristics of fetal fluids in torsion and dystocia affected buffaloes

Name of fetal fluid	Physical characteristics		Torsion group n=14 (%)	Dystocia group n=12 (%)	Control group n=8 (%)
Allantoic fluid	Colour	- Amber	4 (28.5)	4 (33.3)	7 (87.5)
		Colourless	1 (7.1)	2 (16.6)	-
		Reddish	4 (28.5)	6 (49.1)	-
		Dark brown	5 (35.6)	-	1 (12.5)
	Volume	(in liters)	9.72±0.89[a]	12.60±3.18[a]	10.15±1.15[a]
	pH		7.07±0.08[a]	7.00±0.08[a]	6.78±0.18[a]
Amniotic fluid	Colour		**n=8 (%)**	**n=11 (%)**	**n=11 (%)**
		- Whitish	3 (27.22)	5 (45.2)	7 (87.5)
		Dirty white	5 (45.4)	3 (27.22)	-
		Blood Mixed	2 (18.1)	2 (18.1)	1 (12.5)
		Yellowish	1 (9.0)	1 (9.0)	-
	Volume	(in liters)	2.77±0.44[a]	2.60±0.48[a]	2.38±0.35[a]
	pH		7.96±0.17[a]	7.96±0.17[a]	8.06±0.22[a]

Means with same superscripts in a row are not significantly different ($p<0.05$)

Table 1. The colour of allantoic fluid was dark brown (35.6%) in torsion affected buffaloes while it was reddish in majority of dystocia affected buffaloes (49.1%). The reasons for reddish to brown colour of allantoic fluid in torsion affected buffaloes could be due to degenerative changes in fetal membranes caused by ischemia of uterine and placental tissues. Reddish appearance of allantoic fluid in both torsion and dystocia affected buffaloes could be attributed to rupture of blood vessels occurring during colicy symptoms or detorsion procedure adopted.

The normal colour of amniotic fluid i.e. milky whitish was observed in majority of normally calving buffaloes (87.5%). Whereas the colour of amniotic fluid was dirty white in majority of torsion affected buffaloes (45.5%). The colour of amniotic fluid in torsion affected buffaloes might have become dirty white because of mixing of respiratory and digestive secretions of fetus immediately after its death, as fetuses delivered are usually dead. Singh *et al.*, (1998) reported the incidence of dead fetuses in torsion affected cases as 81%. Further, the cytological studies of amniotic fluid in torsion affected buffaloes had clearly revealed that there is significant increase in non-nucleated cell, which might have made the colour of amniotic fluid dirty white (Deosi *et al.*, 2000). The volume and pH of both allantoic and amniotic fluids did not vary significantly between different groups.

Mean concentrations of biochemical constituents in allantoic and amniotic fluids of Torsion, Dystocia and Control groups are presented in Table 2 .The levels of urea nitrogen, sodium, GPT and GOT in allantoic fluid of torsion affected buffaloes were significantly ($P<0.05$) higher while creatinine levels were significantly lower than the Control group. GPT was the only biochemical parameter, which was significantly higher in Torsion group as compared to Control and Dystocia groups. These findings were inconsistent with the results of Kochhar *et al.* (1997), who documented non-significant differences in allantoic fluid of normal and stressful foaling mares. It is well established that GPT is a liver specific enzyme, and its increased levels indicate liver damage. Thus, the present findings suggest that fetal liver might have been damaged in torsion affected buffaloes - whether it is a cause or a sequelle of uterine torsion is yet to be determined?

The higher levels of urea nitrogen in allantoic fluid might be due to increased fetal micturition under stressful condition such as uterine torsion or dystocia (Hodari *et al.*,1990). The concentrations of sodium in allantoic fluid of both Torsion and Dystocia group buffaloes were more than

Table 2. Mean (± S.E) concentrations of biochemical constituents in allantoic and amniotic fluids of Torsion, Dystocia and Control groups

Biochemical constituent	Allantoic fluid			Amniotic fluid		
	Torsion group n=19	Dystocia group n=13	Control group n=8	Torsion group n=19	Dystocia group n=13	Control group n=8
Urea Nitrogen (mg/dl)	128.91±16.97^{b}	126.30±22.30^{b}	69.30±7.19^{a}	149.37±16.60^{b}	135.74±25.33^{ab}	76.83±18.54^{a}
Creatinine (mg/dl)	18.57±3.10^{b}	25.14±4.65^{ab}	34.82±7.07^{a}	11.34±2.61^{a}	9.15±3.69^{a}	8.06±1.64^{a}
Total Protein (g/dl)	1.16±0.23^{ab}	0.71±0.06^{b}	1.32±0.11^{a}	1.01±0.06^{ab}	1.21±0.11^{b}	0.93±0.06^{a}
Calcium (mg/dl)	12.51±.69^{a}	13.70±1.14^{a}	9.56±1.69^{a}	9.08±1.40^{a}	13.14±1.13^{ab}	11.11±1.56^{a}
Phosphorus (mg/dl)	4.74±1.29^{a}	5.67±0.37^{a}	5.01±0.88^{a}	7.74±1.17^{b}	5.80±11.76^{b}	2.41±0.44^{a}
Sodium (meq/l)	66.72±10.13^{b}	71.39±11.76^{b}	30.67±0.22^{a}	81.96±11.40^{a}	111.53±17.88^{a}	100.06±12.78^{a}
Potassium (meq/l)	17.21±2.49^{a}	18.30±2.92^{a}	21.55±13.40^{a}	11.42±2.44^{a}	10.50±1.73^{a}	17.21±2.49^{a}
GPT * (iu/l)	54.43±10.38^{b}	30.36±5.07^{a}	22.62±2.74^{a}	60.43±19.10^{a}	51.90±13.25^{a}	24.87±5.64^{a}
GOT** (iu/l)	58.68±9.17^{b}	48.36±7.37^{b}	23.62±2.86^{a}	93.81±24.43^{b}	118.93±42.61^{b}	31.62±5.94^{a}

GPT* Glutamate Pyruvate transaminse
GOT** Glutamate Oxaloacetate transaminse
Means with dissimilar superscripts in each fetal fluid are significantly different (P<0.05) in a row

double in comparison to the Control group. Higher levels of sodium in fetal fluids indicated that fetal kidney functioning might have been impaired in both torsion and dystocia affected buffaloes. However, Meller and Slator (1971), observed that the increase in the levels of sodium in allantoic fluid during pregnancy was directly related to the increased levels of mineralo-corticoids, which in turn were associated with stress. In general, the present study revealed lower levels of sodium in allantoic fluid of buffaloes at term than reported previously (Rajasundaram *et al.*, 1990 and Amle *et al.*, 1993). The reason for the lower levels of sodium at term could be that with advancement in the stage of gestation in bovines, sodium levels decline (Soliman, 1975; Kleflin *et al.*, 1980).

It is believed that creatinine in allantoic fluid arises from damage of fetal musculature, which in turn increases protein metabolism (Benzie *et al.*, 1974). However, the reasons for lowered creatinine in allantoic fluid of torsion affected buffaloes could not be ascertained, and its association with fetal musculature damage appears unlikely. Since biosynthesis of creatinine occurs in both liver and kidney of fetus, requiring various amino acids, which are supplied mainly by liver (Murrey *et al.*, 1996). Further, higher levels of GPT, GOT and sodium in the allantoic fluid also suggest liver damage. Therefore, it is logical to hypothesize that liver dysfunctioning might have decreased the supply of various amino acids and hence, low synthesis of creatinine.

The total protein concentrations in dystocia affected buffaloes were significantly lower than torsion affected buffaloes. The reasons for this could be that three cases of hydroallantois were included in Dystocia group, which might have diluted the total protein content due to large volumes of fluid, which could be discounted by the fact that some biochemical constituents were higher in dystocia group.

In the amniotic fluid, urea nitrogen, total protein, phosphorus and GOT levels were significantly ($p<0.05$) higher in Torsion and Dystocia affected buffaloes as compared to normally calving buffaloes; differences of similar parameters were non significant between torsion and dystocia groups. Since these findings were similar to those found in allantoic fluid, therefore, the same explanation could hold true for the changes in amniotic fluid of torsion and dystocia affected buffaloes. The levels of calcium in amniotic fluid of Torsion affected buffaloes were significantly lower than Dystocia group. Since earlier studies in torsion affected buffaloes (Verma *et al.* 1988), had also shown lower serum concentration of calcium; it is logical to assume that calcium level in amniotic fluid were the reflection of maternal circulation. To conclude, the changes registered in various biochemical parameters in fetal fluids in both torsion and dystocia groups were merely the reflections of stress of

dystocia rather than in association with etiopathology of uterine torsion

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