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Prognostic Indices of Survivability in Caesarean Operated Buffaloes

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A B S T R A C T

The present study was conducted on 12 uterine torsion affected Mehsana buffaloes. The buffaloes were equally divided in to two groups and surgically managed to relive dystocia with or without supplementation of ascorbic acid. All the buffaloes were monitored for survivability up to 30 days post-caesarean section. Irrespective of the supplementation of ascorbic acid, buffaloes survived up to 30 days post operatively were included in group I (n=7), While buffaloes not survived up to 30 days post-operatively were included in group II (n=5). Previous handling of the cases in field and duration of illness were significantly ($P<0.05$) associated with survivability of buffaloes. The mean TAC concentration was significantly ($P<0.05$) increased after 48h and 96h of caesarean operation in group I. The MDA concentration was significantly ($P<0.05$) reduced at 96h of caesarean operation in the group I than group II. The ALT concentration was significantly ($P<0.05$) reduced after 48h as compared to its level before caesarean section in group I. Concentration of cortisol was also significantly ($P<0.05$) reduced after the caesarean operation in group I. In conclusion, total antioxidant capacity, malondialdehyde and cortisol can be used as prognostic indicators in caesarean operated buffaloes.

Introduction

Dystocia is one of the economically important reproductive disorder reported in various domestic animals *viz.*, buffalo (Dabas *et al.*, 2013), cow (Khudhair *et al.*, 2020), mare (Dabas *et al.*, 2014; Fotariya *et al.*, 2020), goat (Patel *et al.*, 2020), dog and cat (Traas, 2008). Among different types of dystocia, uterine torsion has been reported to be a major cause of maternal dystocia in buffaloes (Amin *et al.*, 2011) which is fatal to both fetus and the dam. Critical evaluation of uterine torsion in buffaloes revealed that it is the single largest cause of maternal dystocia in referral cases, its incidence ranges from 52 to 70%, and affects buffaloes mostly towards terminal gestation (Purohit and Gaur, 2014). There are different ways to manage dystocia in buffaloes *viz.*, mutation operations alone (Singh *et al.*, 2013) or with forced traction (Dabas *et al.*, 2013), fetotomy (Gupta *et al.*,

2017) and caesarean section (Wani *et al.,* 2018). Among the above methods, caesarean section in buffaloes is an emergency operative procedure, used as a last remedy to treat the cases of dystocia and for the delivery of fetal monsters or for delivery of fetuses with anomalies (Wani *et al.,* 2018). The operation is considered as surgery of highest magnitude due to extent of stress involved both due to dystocia and surgical trauma (Cox, 1987).

Evaluation of oxidative stress and anti-oxidant enzymes must remain the keystone of veterinary obstetrical research because it is quantitative information which can gives better understanding about the causes of oxidative stress (Bansal *et al.,* 2011) and status of animal health during oxidative stress (Thangamani *et al.,* 2019). Difficult parturition causes the stress which affects on the normal hematological and biochemical parameters. Elevated blood plasma fibrinogen, Blood urea nitrogen (BUN) and creatinine concentrations and lower plasma proteins in delayed cases of dystocia indicated progression towards severe inflammation, stress and possibly peritoneal adhesion formation (Singh *et al.,* 2017). The dystocia cases registered at the referral hospitals are mostly delayed ones and previously handled in the field which might cause additional stress and tissue damage. Survivability of the dam in such cases is always compromised and could be managed by understanding of historical perspectives and blood indices. Looking to the above facts, the present study has been conducted to understand prognostic indicators of survivability in caesarean operated buffaloes.

Materials and Methods

Twelve uterine torsion affected Mehsana buffaloes which required caesarean section to relieve dystocia were selected in the present investigation. Detailed history with respect to parity, duration of illness, previously handled in the field, etc. were recorded and obstetrical examination was performed. All the animals were randomly divided in two equal groups and surgically managed to relive dystocia with or without supplementation of ascorbic acid one hour before and 24 hours after caesarean section. Blood samples were collected immediately before caesarean section (0 hour) and thereafter post-operatively at 48 hours and 96 hours. Haemoglobin (Hb, g/dL) and packed cell volume (%) were analyzed by haemato analyzer (Exigo). Total antioxidant capacity (TAC, mmol/L), malondialdehyde (MDA, mmol/L), super oxide dismutase (SOD, units/ml) and cortisol (ng/ml) were analyzed by using commercially available colorimetric assay kit manufactured by Puregene, Genetrix Biotech Asia Pvt. Ltd. All the other serum biochemicals were estimated with the help of different kits manufactured by Agappe Diagnostics Ltd. using RX-50V Bio-chemistry Analyzer (Microlab, India).

Irrespective of the supplementation of ascorbic acid, buffaloes survived up to 30 days were included in survived group (Group I, n=7) and buffaloes not-survived up to 30 days were included in died group (Group II, n=5). Haemato-biochemical parameters were analysed statistically by two-way repeated measures ANOVA with terms for group, time period and their interactions. Association of history and obstetrical parameters with the survivability of dam were analyzed by chi-square test. Data analysis was done with SPSS software (IBM® SPSS® statistics, version 20.0).

Results and Discussion

History and obstetrical parameters

In the present study, significant association between handling of dystocia at field

(P=0.003) and dam survivability was found (Table 1). All the buffaloes which were not previously handled in the field were survived; while, 83.33% buffaloes previously handled in the field were died. Duration of illness was also associated significantly (P=0.007) with the survivability of dam. The survival rate was higher in buffaloes suffered since <24 h of illness (83.33%) as compared to buffaloes suffered since> 24 h (66.67%) which was in agreement with Murthy *et al.*, (1999) and Prabhakar *et al.*, (2002). Low survivability in delayed casein the present study could be due to stress of dystocia (Dhindsa *et al.*, 2019), endotoxaemic shock, haemorrhage, edema of uterus and dehydration (Sloss, 1974). All the other historical and obstetrical parameters were non-significantly associated with survivability of dam.

Table.1 Association of history and obstetrical parameters with survivability in caesarean operated Mehsana buffaloes

Particulars		Survived (n=7) Group I	Died (n=5) Group II	Significance
Parity	Primiparous (n=2)	50% (1)	50% (1)	χ^2=0.068, d.f.=1 p=0.793
	Pluriparous (n=10)	60% (6)	40% (4)	
Duration of illness (hours)	<24 (n=6)	83.33% (5)	16.67% (1)	χ^2=7.363, d.f.=1 p=0.007
	>24 (n=6)	33.33% (2)	66.67% (4)	
Off feed since (days)	No (n=3)	100% (3)	0% (0)	χ^2=4.800, d.f.=3 p=0.187
	1 (n=4)	50% (2)	50% (2)	
	2 (n=4)	25% (1)	75% (3)	
	3 (n=1)	100% (1)	0% (0)	
Previously handled in field	Yes (n=6)	16.67% (1)	83.33% (5)	χ^2=8.571, d.f.=1 p=0.003
	No (n=6)	100% (6)	0% (0)	
Rolling given at clinic	Yes (n=10)	60% (6)	40% (4)	χ^2=0.068, d.f.=1 p=0.793
	No (n=2)	50% (1)	50% (1)	
No. of rolling	1 (n=2)	100% (2)	0% (0)	χ^2=1.566, d.f.=2 p=0.459
	2 (n=3)	66.67% (2)	33.33% (1)	
	3 (n=2)	100% (2)	0% (0)	
Site of torsion	Pre-cervical (n=3)	100% (3)	0% (0)	χ^2=2.857, d.f.=1 p=0.091
	Post-cervical (n=9)	44.44% (4)	55.56% (5)	
Side of torsion	Right (n=10)	60% (6)	40% (4)	χ^2=0.068, d.f.=1 p=0.793
	Left (n=2)	50% (1)	50% (1)	
Degree of torsion	180-270 (n=5)	40% (2)	60% (3)	χ^2=2.949, d.f.=2 p=0.228
	270-360 (n=3)	100% (3)	0% (0)	
	>360 (n=4)	50% (2)	50% (2)	
Sex of calf	Male (n=10)	60% (6)	40% (4)	χ^2=0.068, d.f.=1 p=0.793
	Female (n=2)	50% (1)	50% (1)	
Fetus livability	Live (n=1)	100% (1)	0% (0)	χ^2=0.779, d.f.=1 p=0.377
	Dead (n=11)	54.55% (6)	45.45% (5)	
Size of fetus	Normal (n=6)	83.33% (5)	16.67% (1)	χ^2=3.086, d.f.=1 p=0.079
	Overweight (n=6)	33.33% (2)	66.67% (4)	

Table.2 The oxidative stress profile and haemato-biochemical parameters in survived and died Mehsana buffaloes

Parameters	G	Time (h)			P-value		
		0	48	96	Time	Group	T*G
TAC (mmol/L)	I	$0.89\pm0.12_{a}$	$1.37\pm0.18_{b}$	$1.34\pm0.12_{b}^{A}$	0.001	0.239	0.113
	II	$0.82\pm0.14_{b}$	$1.17\pm0.22_{a}$	$0.87\pm0.14_{b}^{B}$			
SOD (units/ml)	I	125.07±6.19	106.91±5.84	106.45±5.48	0.099	0.279	0.242
	II	121.91±7.32	114.37±6.91	123.31±6.48			
MDA (mmol/L)	I	$3.12\pm0.05_{a}$	$2.79\pm0.11_{b}$	$2.62\pm0.15_{b}^{A}$	0.029	0.145	0.016
	II	$3.09\pm0.06_{ab}$	$2.92\pm0.13_{a}$	$3.17\pm0.18_{b}^{B}$			
Hb (g/dL)	I	$10.59\pm0.32_{c}$	$8.59\pm0.39_{a}$	$9.46\pm0.41_{b}$	0.001	0.426	0.486
	II	$10.02\pm0.38_{c}$	$8.00\pm0.46_{a}$	$9.26\pm0.49_{b}$			
PCV (%)	I	$31.57\pm0.92_{a}$	$26.87\pm1.15_{b}$	$30.30\pm0.77_{a}$	0.001	0.377	0.987
	II	$30.46\pm1.09_{a}$	$25.58\pm1.36_{b}$	$29.22\pm0.91_{a}$			
BUN (mg/dL)	I	66.33±10.45	58.64±8.29	50.82±5.33	0.322	0.320	0.221
	II	47.51±12.36	43.28±9.81	48.82±6.31			
TP (mg/dL)	I	$7.05\pm0.37_{c}^{B}$	$6.45\pm0.55_{b}$	$5.14\pm0.55_{a}$	0.093	0.239	0.006
	II	5.31 ± 0.43^{A}	5.14±0.66	5.69±0.65			
Albumin (mg/dL)	I	3.42±0.14	3.19±0.19	3.06±0.39	0.802	0.643	0.587
	II	3.07±0.17	2.97±0.22	3.22±0.46			
Creatinine (mg/dL)	I	$1.17\pm0.16_{b}$	$0.99\pm0.29_{b}$	$0.48\pm0.09_{a}$	0.006	0.361	0.435
	II	$0.77\pm0.19_{b}$	$0.68\pm0.35_{ab}$	$0.44\pm0.10_{a}$			
AST (U/L)	I	136.36±16.59	123.07±20.36	148.33±17.02	0.144	0.581	0.141
	II	145.20±19.63	110.96±24.09	109.44±20.14			
ALT (U/L)	I	$40.71\pm4.88_{b}$	$27.79\pm3.08_{a}^{A}$	$29.86\pm5.20_{ab}$	0.579	0.006	0.435
	II	39.60±5.77	43.30 ± 3.65^{B}	43.30±6.15			
CK (U/dL)	I	$140.62\pm16.89_{a}$	$172.02\pm18.30_{c}$	$156.83\pm14.33_{b}$	0.001	0.150	0.412
	II	$171.56\pm19.98_{a}$	$216.03\pm21.66_{b}$	$198.83\pm16.95_{b}$			
Cortisol (ng/ml)	I	$153.69\pm7.29_{c}$	$132.86\pm5.05_{b}^{A}$	$102.62\pm6.92_{a}^{A}$	0.101	0.001	0.001
	II	152.66±8.63	152.27 ± 5.97^{B}	171.06 ± 8.19^{B}			

Means bearing different subscripts (a,b,c) differ significantly within row (P<0.05)
Means bearing different superscripts (A,B) differ significantly within column (P<0.05)
G = Group

Oxidative stress profile and haemato-biochemical parameters

In present experiment, the mean TAC (mmol/L) concentration before caesarean and at 48h post-caesarean did not differ significantly between group I and II (Table 2). However, TAC level after 96h of caesarean section in group I was significantly (P<0.05) higher than group II. Further, the mean TAC concentration was significantly (P<0.05) increased after 48h and 96h of caesarean operation in group I. While, the TAC concentration did not differ significantly before and after caesarean at 96h in group II. The TAC concentration was significantly (P<0.05) increased by 53.93% at 48h and 50.56% at 96h in group I. While, it was significantly (P<0.05) increased by 42.68% at 48h and non-significantly increased by 6.10%

at 96h in group II. The mean SOD (units/ml) concentration did not differ significantly between group I and II as well as before and after caesarean operation in both the groups. The MDA concentration was significantly (P<0.05) reduced at 96h of caesarean operation in the group I as compared to group II. Further, the MDA concentration was significantly (P<0.05) reduced after caesarean (48 and 96h)in the group I. In the present study, MDA concentration was significantly (P<0.05) reduced by 10.58% at 48h and 16.03% at 96h of caesarean operation in group I. While, it was non-significantly reduced at 48h (5.50%) and increased at 96h (2.59%) in group II. Erisir *et al.,* (2006) reported significantly higher (P<0.001) plasma MDA in cows with caesarean section than in the normally parturited buffaloes. They opined that caesarean section induce an inflammatory reaction associated with the occurrence of a systemic oxidative stress evidenced by the elevation of MDA concentration. The oxidative stress was not reduced in died buffaloes in the current study may be the reason for their death.

ALT concentration was significantly (P<0.05) reduced after 48h than before the caesarean section in group I; whereas, the corresponding figures did not changed in group II. Singh *et al.,* (2009) also found significant decrease in ALT concentration after obstetrical maneuvering as compared to before obstetrical maneuvering. The mean cortisol level was significantly (P<0.05) reduced at 48h and 96h of caesarean operation in survived buffalo group as compared to died buffalo group. Further, the concentration of cortisol was also significantly (P<0.05) reduced after the caesarean operation by 13.55% at 48h and 33.23% at 96 h in group I; however, mean cortisol remained non-significantly higher at 96h (12.06%) in group II throughout the study. Prabhakar *et al.,* (1999b) and Prabhakar *et al.,* (2002) also found significantly declined cortisol concentration in dystocia affected buffaloes.

The cortisol level was significantly (P<0.05) reduced in group I after 48h and 96h as compared to its initial level before caesarean which was in accordance with Prabhakar *et al.,* (1999b) and Prabhakar *et al.,* (2002). Moreover, the cortisol level was significantly (P<0.05) lower at 96h in group I as compared to group II.

There was no significant difference in mean Hb and PCV level between group I and II. In contrary to present study, Verma *et al.,* (2018) found significantly difference in Hb value between survived and died buffaloes after caesarean. There was no significant difference in AST, TP and albumin concentration in both the groups in the current study. The findings of the present study are in accordance with Singla and Sharma (1992) and Singh *et al.,* (2009).

Although, Amer and Hashem (2007) found significantly higher AST level before as compared to after obstetrical treatment. The TP was not altered significantly before and after obstetrical treatment in buffaloes (Prabhakar *et al.,* 1999a). Contrary to our findings, Chauhan *et al.,* (2019) reported significantly higher AST level in died buffaloes as compared to survived buffaloes. The mean concentration of creatinine did not differ significantly between the groups. However, the creatinine concentration significantly (P<0.05) reduced after the caesarean section (96h) in both the groups.

From the above findings it was concluded that the dam survivability could be better in non-manipulated and early presented dystocia cases in buffaloes. Further, total antioxidant capacity, malondialdehyde and cortisol can be used as prognostic indicators in caesarean operated buffaloes.

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