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Research Article

ANTIOXIDANT STATUS IN DYSTOCIA AFFECTED MURRAH BUFFALOES

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ABSTRACT

The present study was conducted to assess the activity of antioxidant enzymes, viz. superoxide dismutase (SOD), reduced glutathione (GSH) and extent of lipid peroxidation (MDA) in the blood plasma of dystocia affected (maternal dystocia as uterine torsion, n=25; fetal dystocia, n=10) and normally calved (n=8) graded Murrah buffaloes that were referred to the obstetrical unit. Further, oxidative parameters were recorded and compared between groups and also at presentation (0 hrs) and after treatment (24 hrs). Significant variation was observed in between the groups for malondialdehyde (MDA) levels, superoxide dismutase (SOD) and reduced glutathione (GSH) activity at both 0 hrs and 24 hrs. The plasma MDA concentration was elevated in dystocia affected, while decreased SOD and GSH antioxidant enzyme activities were recorded in dystocia affected buffaloes, when compared to normally calved buffaloes. It was concluded that estimation of oxidative parameters (MDA, SOD and GSH) could be used as an indicator for severity of the condition and to predict the prognosis of both maternal and fetal dystocia affected buffaloes.

Key words: Antioxidant status, Buffaloes, Dystocia, Parturition, Prognosis

India is the largest milk producer in the world with about 18.48 per cent of total milk production contributed from India as per 2014 data (BAHS, 2017). Dystocia in buffaloes causes huge economic losses to the farming and co-operative communities through loss of viable calf and postpartum complications to the dam. Nakao and Grunet (1990) and Aggarwal and Prabhakaran (2005) opined that the process of parturition was a stressful event in animals and impedance in parturition, either maternal or fetal caused further aggrevation to normal stress of parturition. The reactive oxygen species are involved in causing oxidative stress and are continuously formed *in-vivo* as an integral part of the physiological cellular metabolism, moreover increased level of reactive oxygen species (ROS) than threshold may culminate to oxidative stress (Kumar *et al*., 2010). When physical methods of examination fail to suggest the condition of the animal, antioxidants status may be used to determine the condition of the animal before and after the correction of dystocia (Bansal *et al*., 2011). Perusal of literature revealed that paucity of information in graded Murrah buffaloes regarding antioxidant status in relationship to maternal and fetal dystocia with their clinical significance during handling cases of dystocia which are presented with various severities.Therefore, the current study was undertaken to ascertain the level of antioxidant enzymes and oxidative stress in blood plasma of dystocia affected and normally calved buffaloes.

MATERIAL AND METHODS

The present study was conducted in graded Murrah buffaloes which were presented to the large animal obstetrical unit, Department of Veterinary Gynaecology and Obstetricsduring the period from September 2017 to August 2018. A total of 43 buffaloes of different parities were included in the study and were divided into three groups *viz.* Group 1: Maternal dystocia (comprising uterine torsion, n=25), Group 2: Fetal dystocia, (n=10) and Group 3: Eutocia (normal parturition, n=8) as healthy controls. Detailed obstetrical examination by per rectal and per vaginal examinations were carried out to assess the cause of fetal dystocia, side and degree of uterine torsion.

Blood samples were collected from each of the animal aseptically from jugular veinpuncture. Plasma was separated from ETDA vial containing blood by centrifuging the sample at 3000 rpm for 10 minutes and stored at -20°C until estimation of oxidative stress parameters. Blood from normally calved buffaloes were collected within 1 hour of parturition (0 hrs) and 24 hours after calving. While, from maternal and fetal dystocia affected buffaloes samples were collected just before handling of dystocia (0 hrs) and 24 hours after manual delivery.

Malondialdehyde (MDA), total protein (TP), superoxide dismutase (SOD) and reduced glutathione (GSH) were estimated as per the procedure described by Balasubramanian *et al*. (1988), Lowry *et al.* (1951), Madesh and Balasubramanian (1998) and Moren *et al*. (1979), respectively. The findings were compared between the dystocia affected and normally calved graded Murrah buffaloes before (0hrs) and after handling (24 hrs). Statistical analysis was done as per the procedures described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Changes in levels of antioxidant enzymes and lipid peroxidation products (MDA) in plasma are shown in Table 1.

Malondialdehyde

The mean plasma MDA concentration was significantly ($P<0.05$) higher in maternal dystocia affected buffaloes when compared to normally calved buffaloes and fetal dystocia affected buffaloes at presentation (0 hrs) and after handling (24 hrs). Significantly ($P<0.05$) higher mean plasma MDA concentration was observed in maternal compared with eutocia buffaloes at both 0 hrs and 24 hrs, while non-significant difference was recorded between fetal dystocia and eutocia buffaloes at both 0 hrs

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and 24 hrs. Significantly (P<0.01) higher values were recorded for the mean plasma MDA concentrations in maternal dystocia and fetal dystocia affected buffaloes at 24 hrs compared to 0 hrs, while the variation in mean plasma MDA concentration was non-significant in eutocia buffaloes between 0 hrs and 24 hrs.These findings were analogous with those of Erisir *et al*. (2006) and Sathya *et al*. (2007) who opined that variation might due to excessive stress during assisted delivery. In fact, increased lipid peroxidation in dystocia might be due to excessive straining during physical efforts of calving. On the converse, Bansal *et al.* (2011) reported no significant difference in MDA level between maternal (uterine torsion) and fetal dystocia affected buffaloes. Significant increase in MDA concentration in the present study might have occurred under stress that caused rise in adrenaline and noradrenaline which culminated to excessive production of lipid peroxidation metabolites (Freeman and Crapo, 1982 ; Anand and Kanwar, 2001).

Superoxide dismutase

The mean SOD concentration was significantly (P<0.05) lower in maternal and fetal dystocia affected buffaloes compared with eutocia buffaloes at both 0 hrs and 24 hrs. Significantly (P<0.05) lower SOD activity was recorded in fetal dystocia than maternal dystocia at both 0 hrs and 24 hrs. Significantly (P<0.01) higher values were recorded for the mean SOD concentrations in maternal dystocia and fetal dystocia buffaloes at 0 hrs compared to 24 hrs, while the variation in mean SOD concentration was non-significant in eutocia buffaloes between 0 hrs and 24 hrs.The present study showed partial agreements with the studies of Ahmed *et al.* (2009) and Bansal *et al*. (2011) who recorded lower SOD activity in dystocia affected buffaloes as compared to eutocia buffaloes, while no significant difference between maternal and fetal dystocia affected buffaloes. It was opined that dystocia affected buffaloes had lowered SOD enzymes activity than those normally parturated as stressful conditions caused oxidation of blood plasma oxyhaemoglobin to methaemoglobin that generated free radicals such as superoxide ions which diminished the SOD activity in plasma (Jens and Ove, 2006). In the present study, this situation was real for the maternal and fetal dystocia affected buffaloes wherein both conditions resulted in excessive inflammation of the birth canal at parturition and excessive stress due to assisted delivery.

Reduced glutathione

The mean GSH activity was significantly (P<0.05) lower in maternal and fetal dystocia affected buffaloes compared with eutocia buffaloes at both 0 hrs and 24 hrs. Significantly (P<0.05) lowered levels of reduced GSH activity was recorded in fetal dystocia than maternal dystocia at both 0 hrs and 24 hrs. Significantly (P<0.01) higher values were recorded for the mean GSH concentrations in maternal dystocia and fetal dystocia buffaloes at 0 hrs compared to 24 hrs, while the variation in mean GSH concentration was non-significant in eutocia buffaloes between 0 hrs and 24 hrs.The observations of present study were in agreement with the reports of Sathya *et al*. (2007), Ahmed *et al.* (2009) and Bansal *et al*. (2011) who recorded lower GSH activity in dystocia affected buffaloes as compared to eutocia buffaloes, while no significant difference between maternal and fetal dystocia affected buffaloes at between 0 hrs and 24 hrs. It was inferred that lowered level of GSH in dystocia affected buffaloes might be due to higher release of eicosanoids, adrenaline and nor adrenaline induced pathways of aerobic mitochondrial energy metabolism associated with parturition which resulted in production of ROS that reduce the concentration of GSH in plasma (Nockels, 1996).

Total protein

Non significant (P<0.05) decrease in TP concentration in maternal dystocia, fetal dystocia and eutocia buffaloes was observed at both 0 hrs and 24 hrs except for slight elevation in the mean total protein concentration of fetal dystocia group at 0 hrs. Significantly (P<0.01) elevated level of total protein concentration was recorded in fetal dystocia group buffaloes at 0 hrs compared with 24 hrs, whereas the same was non-significantly higher in maternal and eutocia buffaloes between 0 hrs and 24 hrs. The findings of the present study were in consonance with earlier reports of Castillo *et al.* (2005), Sathya *et al.* (2007), Yokus *et al.* (2007) and Bansal *et al.* (2011) who suggested that increased peroxidation during normal calving and assisted delivery, disturb the lipid-protein interactions and thus slow down the protein dependent pathways that culminated to depletion of protein content. Further, the lowered total protein levels recorded in the present study might be due to stress (Manju *et al*., 1985) or might be due to liver dysfunction associated with negative energy balance (Schonfelder *et al*., 2003). Earlier reports suggested that the protein levels decreased with increased duration of maternal or fetal dystocia might be due to the stress of dystocia. This lead to deterioration of liver function, excessive utilization of proteins due to anorexia and inflammatory process (Dhindsa *et al.*, 2005) or might be due to excessive dehydration as a result of severe straining during dystocia or due to conversion of albumin and globulin into colostrum during terminal stages of gestation (Amer *et al.*, 2008).

It is concluded that estimation of oxidative parameters (MDA, SOD and GSH) was regarded as a key factor in obstetrical cases because it is the realistic information which givesan indication about the extent of oxidative damage. Hence, it could be used as an indicator for severity of the condition and prognosis of both maternal and fetal dystocia affected buffaloes. Results from the present study, suggested that monitoring oxidative and antioxidant parameters are necessary as a matter of emergency care to attempt early treatment of dystocia and to overcome the oxidative damage, oxidative

stress by including antioxidants in the therapeutic regimen for prompt recovery of the affected buffaloes.

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