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Haematological and certain biochemical changes in dystocia affected goats

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Abstract
The present study evaluated the effect of origin of dystocia (maternal and fetal) on certain haemato-biochemical parameters in goats. A total of 18 goats were selected and divided into three groups as maternal dystocia (Gr-I; n=6), fetal dystocia (Gr-II; n=6) and normally kidded goats (Gr-III; n=6). The blood sample was collected at four different intervals *viz*., just prior to (P1), immediately after (P2), on 7th day (P3) and 11th day (P4) of assisted or normal kidding. The results indicated that values of Hb, TLC, MCH, MCHC, were significantly (p<0.05) higher in fetal dystocia, whereas values of PCV and TEC counts were significantly (p<0.05) higher in goats with maternal dystocia. The calcium and phosphorus concentration was non-significantly low in dystocia goats when compared to normal kidding. It was concluded that the certain hematological parameters *viz*. Hb, PCV, TEC, TLC, MCH and MCHC altered in dystocia affected goats, which useful for proper post-maneuver management of this ailment.

Keywords: Calcium, dystocia, goat, hematology, phosphorus

Introduction
Dystocia is a difficulty in parturition that requires assistance to deliver the fetus; besides, it reduces the offspring viability and causes maternal injury. Generally, dystocia is classified into fetal and maternal causes. The reported incidence of this malady in goats ranges from 8.25% (Sharma *et al*., 2014; Bhattacharya *et al*., 2015) [21, 3] to as high as 39.38% (Gopal *et al*., 2015) [9]. It is one of the major causes of economic loss to goat farmers through the loss of kids, dams, or both along with reduces milk production in surviving goats (Odedara *et al*., 2017) [17]. Dystocia has also decreased future fertility due to injury to the birth canal and post-kidding uterine infection (Satish *et al*., 2017) [20]. Sometimes, physical examination of goats fails to suggest the severity of the infection and at that time, haemato-biochemical changes in blood can be used as a valuable tool to determine the severity before and after the correction of dystocia (Ghoneim *et al*., 2016) [7]. It also facilitates deciding and choosing pre- and post-obstetrical management of the dam regarding electrolyte therapy, anti-stress and hepato-protectant therapy (Ghoneim *et al*., 2016) [7]. Alterations in hematological values indicate the fiery changes in cellular metabolism occurring due to maternal and fetal dystocia (Thangamani *et al*., 2019) [24]. A Perusal of the literature revealed that no systemic studies were carried out on hematological and biochemical changes associated with maternal and fetal dystocia in goats that were presented with varying degrees of severity. Therefore, present study was aimed to investigate the effect of dystocia type on particular hematological and biochemical parameters in goats.

Materials and Methods
A total of 18 Mehsana goats in her first to fifth parity for one year were selected for the present study. Out of these. 12 goats suffering from dystocia presented at the Veterinary Clinical Complex, Deesa for the treatment and were divided into two groups based on the cause of dystocia as Gr-I (maternal dystocia, n=6) and Gr-II (fetal dystocia, n=6). Six normally kidded goats were selected from panjrapole kant and served as a control group (Gr-III). The obstetrical assistance was provided by either forced traction, mutation, or cesarean operation as the need emerged in each case. The goats were treated with broad spectrum antibiotics

(Ceftriaxone @ 15-50 mg/kg b. wt. IV, INTACEF®-0.5, Intas Pharmaceutical Pvt. Ltd., Ahmedabad, analgesics (Meloxicam @0.3 mg/kg b. wt. IV, MELONEX®, Intas Pharmaceutical Pvt. Ltd., Ahmedabad) and 500 ml normal saline solution, IV as supportive fluid therapy. Blood was collected aseptically from each goat at the time of clinical presentation just prior to relieving the dystocia/just prior to kidding (P1), immediately after relieving the dystocia/just after the kidding (P2), on day 7 (P3) and day 11 (P4) post obstetrical maneuver/ kidding. The collected blood was divided into two aliquots and used for hematological and biochemical analysis. The plasma was separated by centrifugation at 3000 rpm and was stored at -20º C temperature till the analysis. The hemoglobin (Hb), total leucocytes count (TLC), total erythrocyte count (TEC), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were estimated by using automated blood analyzer (celtac® alpha, NIHON KOHDEN, Japan). The plasma calcium concentration was estimated by the versenate EDTA method (Cheng and Bray, 1951). The plasma inorganic phosphorus was measured using the standard diagnostic kits (Coral Clinical System (India) Pvt. Ltd., Goa. Data were analyzed by analysis of variance (Snedecor and Cochran 1967) [22].

Results and Discussion

The haemato-biochemical changes in the experimental groups are presented in Table 1. Hemoglobin values were significantly (p<0.05) higher in fetal dystocia-affected goats as compared to maternal dystocia and normal kidded goats. Similar findings were also reported by Khan (2012), Wani *et al*. (2018) [27] and Verma *et al*. (2018) [26] in buffaloes. However, Patel *et al*. (2020) [18] observed a non-significantly higher level of Hb in dystocia-affected goats than in nomally kidded goats. In the present study the level of Hb was increased non-significantly during post kidding periods. Similar trends was also observed by (Bememy, 2013; Tharwat *et al*., 2013; Manat *et al*., 2016) [2, 25, 13] in normal kidded goats and support the finding of present study. Contrary to the current finding, Rejitha and Karthiayini (2014) [19] found no remarkable change in Hb value in normally kidded goats. The low Hb levels in dystocia affected goats in the present study could be due to the higher levels of Anti Diuretic hormone due to stress causing increased fluid retention (Moran *et al*., 2011) [15].

Table 1: Haemato-biochemical changes (Mean ± S.E) in dystocia affected goats (n=6 each)

Parameter	Period	Maternal dystocia	Fetal dystocia	Normal kidded
Hb (g/dL)	P1	7.81 ± 0.63^{b}	9.38 ± 0.86^{a}	6.16 ± 0.46^{c}
	P2	8.15 ± 0.87^{b}	9.36 ± 1.24^{a}	6.43 ± 0.48^{c}
	P3	9.05 ± 0.67^{a}	9.76 ± 0.96^{a}	6.90 ± 0.45^{b}
	P4	9.40 ± 0.62^{b}	10.85 ± 0.45^{a}	7.33 ± 0.43^{c}
PCV (%)	P1	23.43 ± 2.01^{a}	20.63 ± 1.95^{b}	24.26 ± 2.23^{a}
	P2	23.85 ± 2.84^{b}	20.96 ± 2.68^{c}	26.53 ± 1.76^{a}
	P3	25.26 ± 2.64^{a}	21.46 ± 1.55^{b}	24.63 ± 1.50^{a}
	P4	25.75 ± 2.59^{a}	24.45 ± 1.83^{a}	24.83 ± 1.44^{a}
TEC (10^6/µL)	P1	13.47 ± 1.25^{a}	11.66 ± 0.85^{b}	14.04 ± 2.23^{a}
	P2	13.38 ± 1.35^{b}	11.40 ± 1.25^{c}	17.35 ± 1.79^{a}
	P3	13.86 ± 1.16^{ab}	12.61 ± 2.72^{b}	15.24 ± 1.50^{a}
	P4	13.80 ± 2.75^{a}	13.34 ± 2.39^{a}	14.15 ± 1.44^{a}
TLC (10^3/µL)	P1	9.53 ± 1.18^{c}	11.59 ± 0.87^{a}	13.48 ± 0.33^{a}
	P2	10.13 ± 2.10^{c}	13.55 ± 0.92^{a}	11.63 ± 1.21^{b}
	P3	7.80 ± 1.01^{b}	12.08 ± 0.76^{a}	9.28 ± 1.33^{b}
	P4	7.11 ± 0.99^{b}	11.83 ± 0.79^{a}	13.06 ± 1.56^{a}
MCV (fL)	P1	10.88 ±0.89	17.61 ±0.94	19.28 ±3.01
	P2	18.19 ±1.15	16.19 ±1.00	16.13 ±1.70
	P3	17.00 ±1.27	17.95 ±1.10	17.03 ±1.81
	P4	18.59 ±0.91	19.72 ±0.79	17.91 ±2.25
MCH (pg)	P1	$6.11\pm0.77^{b}_{r}$	$7.97\pm0.46^{a}_{p}$	$4.92\pm0.84^{c}_{pq}$
	P2	$6.22\pm0.75^{b}_{qr}$	$8.09\pm0.45^{a}_{p}$	$3.92\pm0.56^{c}_{r}$
	P3	$6.70\pm0.67^{b}_{pq}$	$7.68\pm0.41^{a}_{p}$	$4.71\pm0.51^{c}_{q}$
	P4	$6.99\pm0.65^{c}_{p}$	$8.25\pm0.33^{a}_{p}$	$5.42\pm0.56^{b}_{p}$
MCHC (pg)	P1	33.64 ± 1.69^{b}	45.23 ± 0.73^{a}	25.50 ± 1.81^{c}
	P2	35.08 ± 2.87^{b}	44.49 ± 0.75^{a}	24.65 ± 2.63^{c}
	P3	36.49 ± 1.76^{b}	45.45 ± 0.92^{a}	28.31 ± 2.55^{c}
	P4	37.19 ± 1.44^{b}	44.42 ± 2.05^{a}	31.39 ± 3.11^{c}
Calcium (mg/dL)	P1	$6.48\pm0.24_{q}$	$6.46\pm0.19_{q}$	$6.85\pm0.40_{p}$
	P2	$6.56\pm0.22_{q}$	$6.20\pm0.22_{q}$	$6.93\pm0.29_{p}$
	P3	$7.25\pm0.13_{p}$	$7.68\pm0.26_{p}$	$7.25\pm0.56_{p}$
	P4	$7.33\pm0.26_{p}$	$7.88\pm0.29_{p}$	$7.41\pm0.17_{p}$
Phosphorus (mg/dL)	P1	3.95±0.24	3.66 ±0.21	4.11±0.24
	P2	3.93±0.17	3.70 ±0.31	4.23 ±0.06
	P3	3.40 ±0.10	3.48 ±0.50	4.15 ±0.11
	P4	3.93 ±0.20	3.93 ±1.13	3.71 ±0.33

Mean value bearing different superscripts in rows (a, b, c) and columns (p, q, r) differ significantly (p<0.05)

Significant (p<0.05) low value of PCV was found in fetal dystocia-affected goats up to day 7 post maneuvers compared to maternal dystocia and normal kidded goats. However, Ismail (2017) [10], Bemerny (2013) [2], and Rejitha and Karthiayini (2014) [19] reported non-significant variation in the PCV values during postpartum days in normal kidded goats.

Just after kidding, sympathetic system gets stimulated, and splenic contraction releases more RBC in blood circulation, resulting in increased PCV (Detweiller, 1984) [5], noted in post-obstetrical maneuver and post-kidding periods.

The total erythrocyte count was significantly (p<0.05) low in dystocia of fetal origin than maternal origin and normally kidding goats. A non-significant increasing trend was noticed from P1 to P4 in all groups. However, a non-significant decrease in TEC was observed just after the reliving of dystocia than its initial value. The result of the TEC of the present study was in accordance with Rejitha and Karthiayini (2014) [19] and Tharwat *et al*. (2013) [25]. Similarly, the higher TEC on the 10th day after relieving the dystocia was in accordance with Patel *et al*. (2020) [20] in dystocia affected goats. A decrease in TEC at kidding may attribute to the loss of RBC during parturition or because of the hemodilution effect resulting from an increase in plasma volume during lactation and consequently increased water mobilization to mammary glands through the vascular system (EI- Sharif and Assad, 2001) [6]. The TLC count was significantly (p<0.05) low in Gr-I at all the periods compared to the other two groups. Significantly higher values of TLC were found just after reliving fetal dystocia, while low TLC was recorded for P4 of Gr-I. The present findings are in close agreement with the findings of Thangamani *et al*. (2019) [24]. However, Manat *et al.* (2016) [13] obtained a significantly higher value on the 14th post-kidding days. In the present study, variations in TLC counts might be due to unhygienic/unscientific approaches adopted during the handling of dystocia at the farmer's doorstep, might have increased the inflammatory process in the genital tract and further, delayed duration of dystocia also contributed to an increased influx of inflammatory cells into the systemic circulation as opined by Jens and Ove (2006) [11].

Non-significant difference was observed between groups and within the periods in mean MCV value. Non-significant higher values of MCV were found for P4 in theGr-II,whereas lower values were found in Gr-I in P2 period. Ismail (2017) [10] and Ali *et al*. (2011) [1] also reported similar findings. The MCH level was significantly higher in Gr-I as compared to Gr-II and III. Further, the MCH values increased in all groups up to day 11 post-obstetrical maneuver or post-kidding. In contrast to the present findings, Ismail (2017) [10], Tharwat *et al.* (2013) [25], and Rejitha and Karthiayini (2014) [19] didn't find any significant changes in normal kidded goats. The MCHC values differed significantly between the groups, but a non-significant difference was observed between the periods (Table 1). Significant lower values of MCHC were found in the Gr III for P2 period, whereas higher values were found for P3 period in goats of Gr-II. Similarly, Rejitha and Karthiayini (2014) [19] found non-significant variation in MCHC values during postpartum periods in normal kidded goats.

The plasma calcium concentration (mg/dL) was significantly lower (just before and after relieving of dystocia) in Gr-I and Gr-II compared to Gr-III. The calcium level was non-significantly increased on day 7 and 11 post-obstetrical maneuvers in goats of Gr-II. Observations of the present study were correlated with those of Ismail (2017) [10] in Kilis goats. Similarly, Thangamani *et al*. (2019) [24] and Jyani *et al.* (2018) [12] recorded lower serum calcium concentration values in buffaloes. On the converse, non-significant differences in calcium values during postpartum periods were reported (Waziri *et al*., 2010; Tanritanir *et al*., 2009; Bemerny, 2013) [28, 23, 2]. The lower serum calcium concentration in the present study might be due to a calcium deficiency during the late gestation period or to the excessive contractions of the abdominal muscles associated with vigorous straining in uterine torsion and fetal dystocia (Ghuman, 2010) [8]. The plasma phosphorus concentration was non-significantly low in Gr I and Gr II compared to Gr III. Similarly, a non-significant difference in the mean phosphorus level was reported during the postpartum period by Waziri *et al.* (2010) [28] in goats. The non-significant lower phosphorus values in dystocia affected goats might be due to the more requirements of Adenosine triphosphate molecules for excessive energy production needed for excessive muscle contraction as phosphorus was required for conversion of Adenosine di-phosphate molecules to ATP molecules (Mayes and Botham, 2003) [14]. In conclusion, the increased in Hb, TLC, MCH and MCHC values in fetal dystocia, whereas PCV and TEC in maternal dystocia affected goats. The haematological changes could indicate the type of dyctocia and its post-obstetrical management. Beside this, there are several other factors that could be heavily influence the haemato-biochemical attributes like the duration of dystocia/labor, sex of the kid, liter size, parity of dam.

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