International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2018; 3(5): 28-32

www.veterinarypaper.com
Received: 27-07-2018
Accepted: 28-08-2018

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Eavaluation of haemato-biochemical effects of dorsolumbar epidural xylazine-lignocaine anaesthesia in Cattle

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Abstract
The study was conducted on 14 cattle to evaluate effects of xylazine-lignocaine dorsolumbar epidural anaesthesia on haemato-biochemical parameters. Animals divided in two groups A and B. Cattle in group A, received mixed anesthetic consisting of xylazine hydrochloride @ 0.025 mg/kg and lignocaine hydrochloride @ 0.1 mg/kg whereas, in group B, received mixed anesthetic consisting of xylazine hydrochloride @ 0.025 mg/kg and lignocaine hydrochloride @ 0.2 mg/kg by dorsolumbar epidural anaesthesia. The haematological parameters like Hb, PCV, TEC, TLC and lymphocyte count decreased significantly except neutrophil in both the groups during anaesthesia. Eosinophil count and monocyte count altered non-significantly during anaesthesia in both group A and group B. Biochemical parameters like ALT, AST, BUN and serum creatinine increased significantly during anaesthesia in both the groups. The study illustrated that alterations in the haemato-biochemical parameters were transient during anaesthesia and values were returned to base level 24 h after anaesthesia.

Keywords: Dorsolumbar, epidural, anaesthesia, haematological, biochemical.

Introduction
The local anaesthesia like paravertebral or epidural nerve block is preferred for most abdominal surgeries in cattle because of side effects from general anaesthesia and recumbency. Dorsolumbar epidural anaesthesia is produced by administration of local anaesthetic viz. lignocaine HCl more commonly. Recently alpha-2- adrenergic agonists viz. xylazine HCl is used to increase depth and duration of anaesthesia. Combination of xylazine and lignocaine is found to be better than xylazine and lignocaine alone (Molaei *et al.*, 2010) [6]. Dorsolumbar epidural anaesthesia is recently used technique for laparotomy in cattle, buffalo, camel, horse and donkey.

Anaesthetic drug have temporary effects on renal blood flow and causes alteration in cell membrane permeability in liver which results in change in levels of biochemical enzymes in blood. Shifting of fluid from extravascular compartment to intravascular compartment to maintain cardiac output during the anaesthesia causes alteration in haematological values (Singh *et al.*, 2005) [9].

Alpha-2-adrenergic agonists administered epidurally produce direct effect on sensory transmission and mediate analgesia (Lemke, 2007) [5]. Local anaesthetic agents reversibly block action potential along nerve axon by interference with voltage negative gated sodium channel (Skarda and Tranquilli, 2007) [10].

The present work was conducted to study haemato-biochemical response of dorsolumbar epidural anaesthesia produced by combination of Xylazine hydrochloride and Lignocaine hydrochloride in cattle.

Materials and methods
Total 14 clinical cases of cattle presented at T.V.C.C., COVAS, Parbhani for laparotomy were included for this study. The animals were divided irrespective of age, sex, productive and reproductive status into two groups viz. Group A and Group B, each comprising of seven animals. Animals included in present research have age 3.5 years to 11 years and body weight 200 kg to 400 kg.

Each animal was restrained in trevis in standing position and the skin above the first interlumbar (L1-L2) space was prepared aseptically. The first lumbar intervertebral space was located 1.5 to 2.0 cm caudal to imaginary line drown across cranial border of transverse process of second lumbar vertebra. Skin weal was prepared by using 1 ml lignocaine hydrochloride at site of epidural anaesthesia. An 18 gauge spinal needle with stylet was inserted vertically through skin weal. Needle was advanced until abrupt reduction to needle passage was noted. This was indicated piercing of interarcuate ligament and entry of needle tip in epidural space of vertebral canal. Stylet was removed from needle to confirm position of needle tip in epidural space. The entrance into the epidural space was identified by hanging drop technique. After confirming that there was no blood or CSF present in the aspirate, drug was administered at speed of 0.5 ml/second and needle was removed immediately.

Blood samples were collected to estimate various haemato-biochemical parameters. Blood samples were collected before, immediately after onset of anaesthesia and 24 hour after completion of surgery. The haematological parameters such as haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC) and differential leukocyte count (DLC) were determined. The biochemical parameters such as alanine transaminase (ALT), aspartate transaminase (AST), blood urea nitrogen (BUN) and serum creatinine were estimated before anaesthesia, during anaesthesia and 24 hour after anaesthesia in each animal.

Results

Haemoglobin, packed cell volume, total erythrocyte count and total leukocyte count levels was decreased significantly ($P<0.05$) during anaesthesia and returned to base value 24 hours after anaesthesia in both the groups A and group B. In both group A and group B, neutrophil count was increased significantly ($P<0.05$) whereas significant ($P<0.05$) decrease observed in lymphocyte count during anaesthesia. Non-significant fluctuations in eosinophil and monocyte count were observed during anaesthesia in both the groups. The mean ± S.E. values of haematological parameters have been represented in table 1 and Fig. 1-8.

Table 1: Mean ± S.E. values of haematological parameters

Effect	Group	Score		
		BA	DA	AA
Hb (gm%)	A	8.86 ± 0.65	7.77 ± 0.65*	8.46 ± 0.66
	B	9.69 ± 0.59	8.60 ± 0.56*	9.49 ± 0.58
PCV (%)	A	27.71 ± 1.27	24.57 ± 1.04*	26.29 ± 1.11
	B	30.57 ± 1.56	27.14 ± 1.50*	28.86 ± 1.56
TEC (million/µl)	A	5.66 ± 0.37	5.10 ± 0.35*	5.74 ± 0.49
	B	6.77 ± 0.50	6.19 ± 0.37*	6.62 ± 0.50
TLC(thousands/µl)	A	9.96 ± 1.05	8.09 ± 0.79*	9.61 ± 1.00
	B	11.20 ± 0.73	9.39 ± 0.61*	10.79 ± 0.66
Neutrophils (%)	A	62.14 ± 2.98	67.86 ± 3.10*	62.68 ± 3.95
	B	61.29 ± 2.36	66.14 ± 2.25*	62.14 ± 2.28
Eosinophils (%)	A	3.29 ± 0.64	3.00 ± 0.49	3.71 ± 0.99
	B	3.86 ± 0.63	3.43 ± 0.75	3.71 ± 0.36
Monocytes (%)	A	5.43 ± 0.61	4.14 ± 0.59	4.43 ± 0.65
	B	6.29 ± 1.19	5.86 ± 1.28	5.14 ± 0.74
Lymphocyte (%)	A	29.14 ± 2.61	25.00 ± 2.49*	29.00 ± 2.75
	B	28.57 ± 1.78	24.57 ± 1.76*	29.00 ± 1.62

Means bearing different superscripts differ significantly at corresponding intervals ($P<0.05$)
*$P<0.05$ = Significant at 5% level

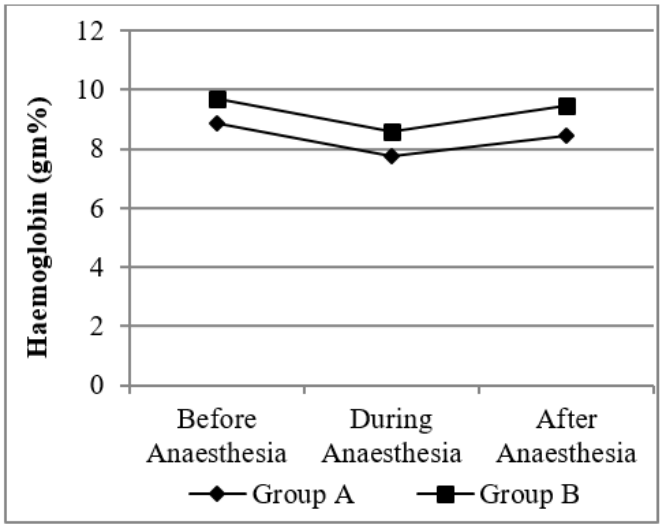

Fig 1: Haemoglobin (gm%)

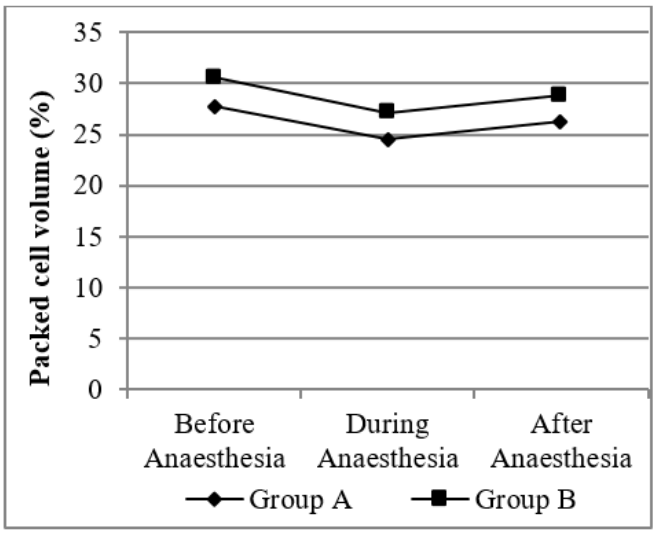

Fig 2: Packed cell volume (%)

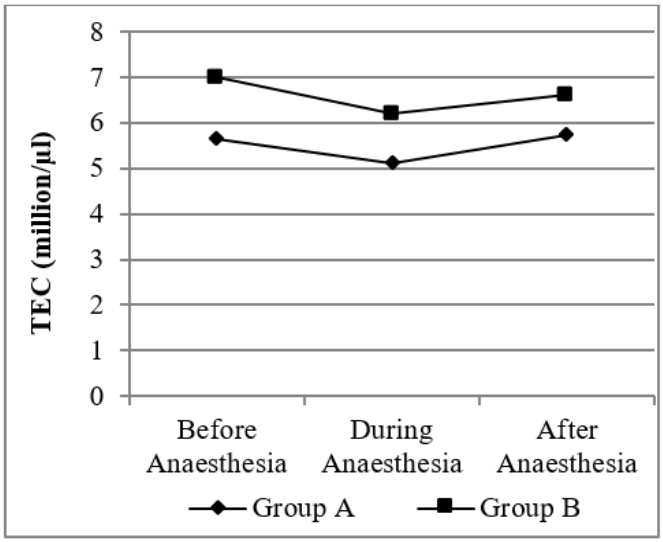

Fig 3: Total erythrocyte count (million/µl)

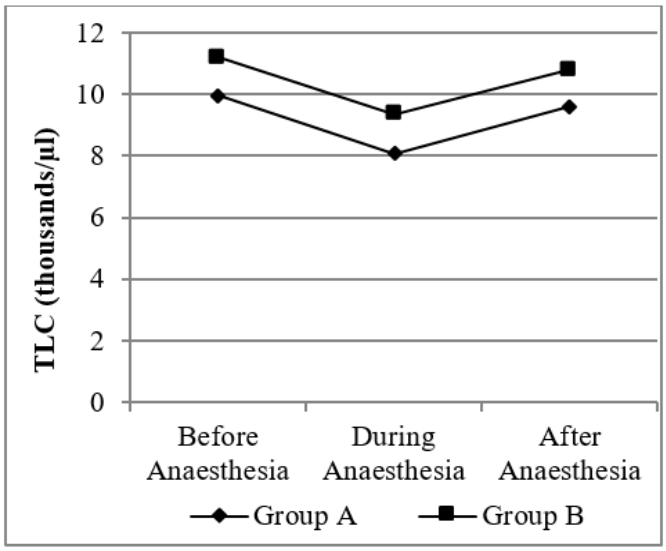

Fig 4: Total leukocyte count (thousands/µl)

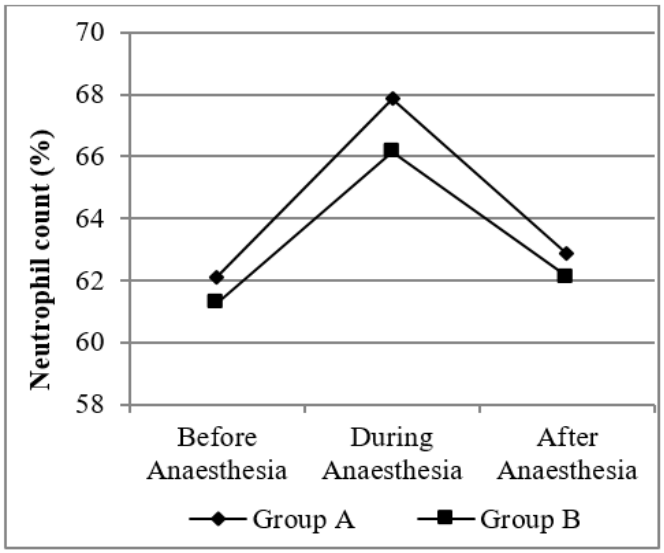

Fig 5: Neutrophil count (%)

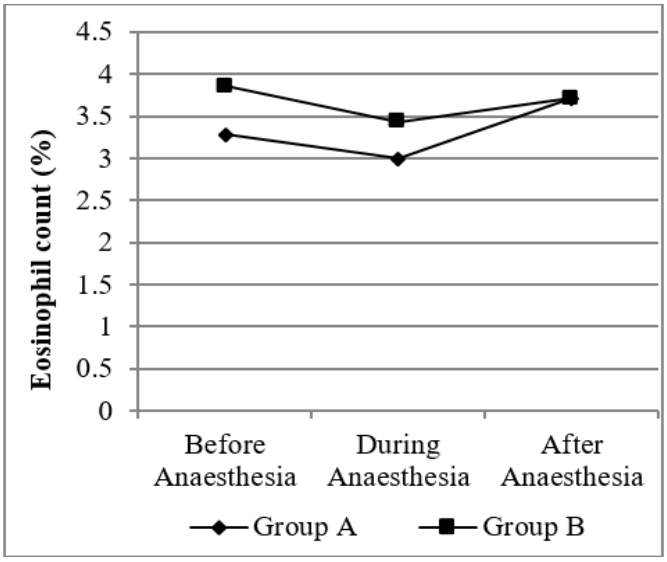

Fig 6: Eosinophil count (%)

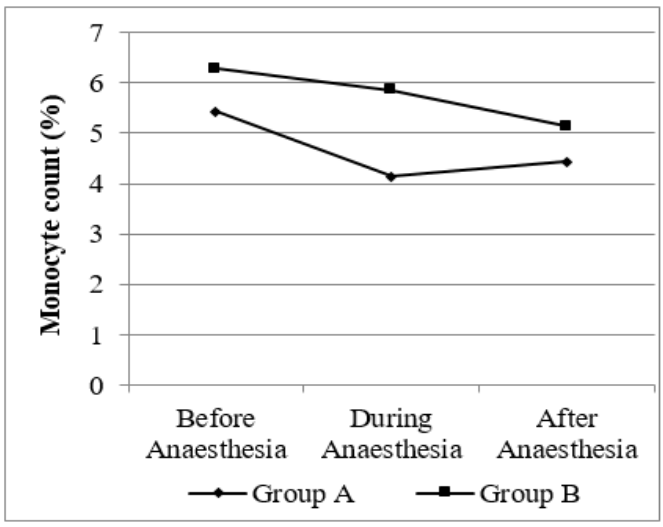

Fig 7: Monocyte count (%)

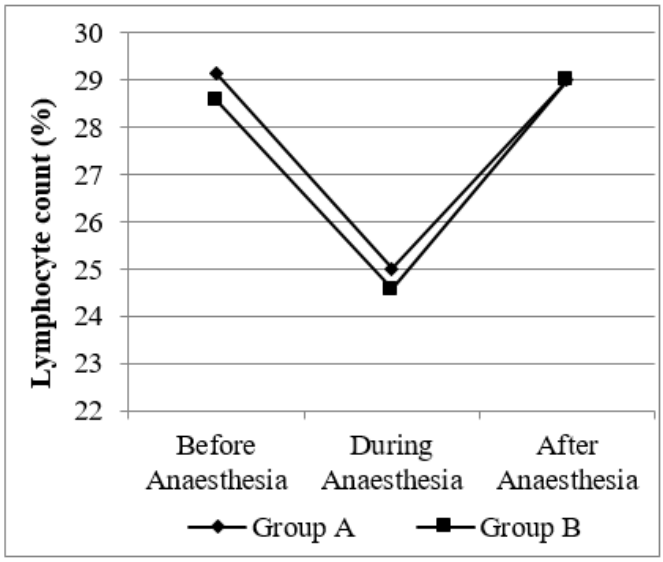

Fig 8: Lymphocyte count (%)

Aspartate transaminase, alanine transaminase, blood urea nitrogen and serum cretinine levels were increased significantly ($P<0.05$) during anaesthesia and levels of all these parameters returned to base value 24 hours after anaesthesia in both the groups A and B. The mean ± S.E. values of biochemical parameters have been represented in table 2 and Fig. 9-12.

Table 2: Mean ± S.E. values of biochemical parameters

Effect	Group	Score		
		BA	DA	AA
ALT (IU/L)	A	17.21 ± 4.75	23.81 ± 5.13*	15.51 ± 1.84
	B	30.59 ± 6.32	36.57 ± 6.72*	29.67 ± 5.44
AST (IU/L)	A	24.22 ± 5.97	37.03 ± 7.65*	27.23 ± 6.71
	B	24.29 ± 5.85	37.86 ± 7.28*	26.40 ± 5.57
BUN (mg/dL)	A	43.24 ± 6.24	56.91 ± 7.69*	42.90 ± 5.39
	B	33.74 ± 7.24	49.47 ± 10.53*	32.84 ± 6.02
Serum creatinine (mg/dL)	A	1.05 ± 0.14	1.53 ± 0.12*	1.02 ± 0.11
	B	1.35 ± 0.29	1.80 ± 0.29*	1.41 ± 0.30

Means bearing different superscripts differ significantly at corresponding intervals ($P<0.05$)
*$P<0.05$ = Significant at 5% level

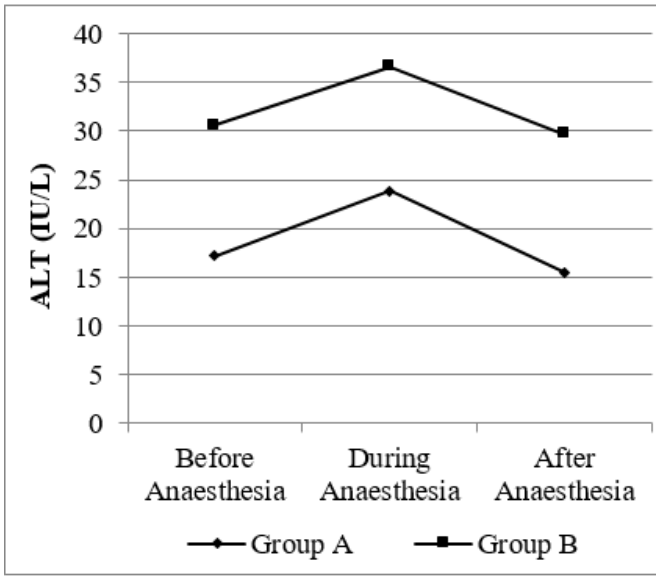

Fig 9: Alanine transaminase (IU/L)

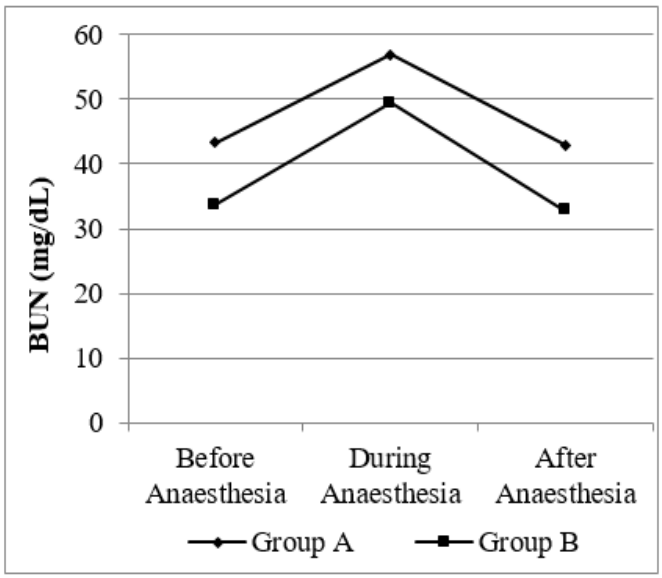

Fig 11: Blood urea nitrogen (mg/dL)

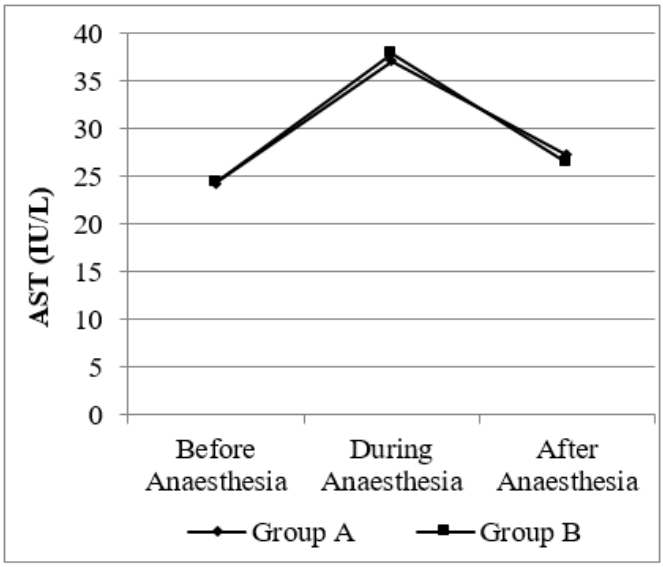

Fig 10: Aspartate transaminase (IU/L)

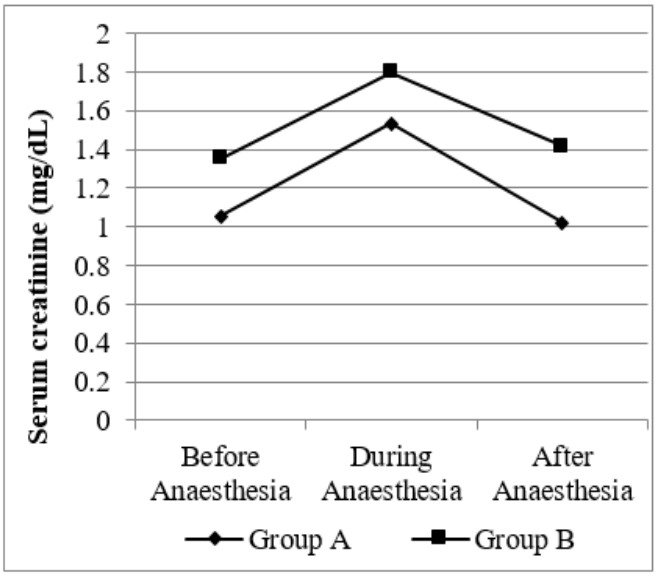

Fig 12: Serum creatinine (mg/dL)

Discussion

Pooling of the circulating blood cells in the spleen or other reservoirs secondary to decreased sympathetic activity could be the reason for the decrease in Haemoglobin, packed cell volume, total erythrocyte count, total leukocyte count and lymphocyte count during anaesthesia. The decrease in these haematological values during the period of anaesthesia or sedation might also be due to shifting of fluid from extravascular compartment to intravascular compartment in order to maintain the normal cardiac output in the animals (Kinjavdekar *et al.,* 2000, Singh *et al.,* 2005, Moulvi *et al.,* 2011a and Pandey *et al.,* 2017) [2, 9, 7, 8]. Neutrophilia possibly could be due to adrenocortical stimulation and subsequent effect of glucocorticoids on circulating neutrophils (Grubb *et al.,* 2002, Singh *et al.,* 2005 and Moulvi *et al.,* 2011) [1, 9, 7].

Some alteration might be take place in cell membrane permeability, which may permit this enzyme to leak from the cells with intact membranes (Singh *et al.,* 2005) [9]. The increase in Aspartate transaminase level might be due to the hypoxia produced due to respiratory centre depression as a result of systemic absorption of xylazine. Alpha-2 agonists including xylazine are potent CNS depression agents (Pandey *et al.,* 2017) [8]. An increase in blood urea nitrogen and creatinine levels might be attributed to the temporary inhibitory effect of drug on the renal blood flow (Kinjavadekar *et al.,* 2000, Singh *et al.,* 2005, Moulvi *et al.,* 2011 and Pandey *et al.,* 2017) [2, 9, 7, 8]. Increased hepatic urea production from amino acid degradation could account for the observed increase in blood urea nitrogen has been reported earlier researcher (Singh *et al.,* 2005) [9]. The fluctuations in creatinine values may be attributed to a temporary inhibitory effect of the drug on renal blood flow, which in turn might have caused a rise in creatinine (Kinjavdekar *et al.,* 2000, Singh *et al.* 2005 and Moulvi *et al.,* 2011) [2, 9, 7].

The observations of various haemato-biochemical parameters recorded in this study suggested that the alterations in these parameters recorded at various time intervals following epidural injection of xylazine and lignocaine combination were not of great magnitude. The changes were transient and more or less same in animals of all the groups and returned to base levels within 24 hour after anaesthesia. Thus, xylazine and lignocaine combination can be safely used for epidural anaesthesia in cattle.

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