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Research Article

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Effects of two anaesthetic combinations (xylazine-ketamine and xylazine-propofol) on clinical and hematobiochemical profile in dogs

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Abstract

The research was conducted to evaluate the effects of two anaesthetic combinations (Xylazine-Ketamine and Xylazine-Propofol) on clinical and hemato-biochemical profile in dogs. A total of 12 dogs, apparently healthy, age 2-3 years and weighing 12-17 kg were used and randomly grouped into two; X-K (Xylazine @1.1mg/kg IM-Ketamine @10mg/kg IM) and X-P (Xylazine @1.1mg/kg IM-Propofol 2mg/kg IV). Animals were permitted for the anaesthetic procedure after 2-3 days of acclimatization. Clinical parameters such as body temperature (°C), pulse rate (beats/min), respiratory rate (breaths/min.), oxygen saturation (SpO_2, %), hematological profile; hemoglobin (Hb, %), total erythrocyte count (TEC, $\times 10^6$/mm^3), total leucocyte count (TLC, $\times 10^3$mm^3), packed cell volume (PCV, %) and, serum biochemical profile; aspartate aminotransferase (AST, IU/L), alanine aminotransferase (ALT, IU/L), bilirubin (mg/dL), creatinine (mg/dL), blood urea nitrogen (BUN, mg/dL), triglyceride (TG, mg/dL) and cholesterol (mg/dL) were recorded and evaluated before 0 minute and after 10, 20, 30, 40 minutes after anesthesia in individual animal. Rectal temperature, Respiratory rate and SpO_2 decreased initially at 10 min after induction. It then increased towards the pre-anaesthetics level in both groups. Pulse rate increased initially, and this was decreased gradually towards baseline in both groups. In both groups, haematological values altered after induction with both the combinations and returned to near the baseline when the animal recovered utterly (12 hrs post-induction). Serum biochemical analysis showed that ALT, AST, bilirubin, creatinine, BUN, TG and cholesterol level seriously altered initially after 10 min of induction. In some instances (ALT, AST and TG) the changes continued up to the wake up of animals. They then gradually returned to the initial value. Results of the study reveal that the anaesthetics combination of Xylazine-Ketamine and Xylazine-Propofol exert some systemic effect in body compromising vital organs at a certain level.

Keywords: Anesthesia, Dog, Xylazine, Ketamine, Propofol.

INTRODUCTION

Anaesthesia is frequently used for surgical interventions in dogs (Cima *et al.*, 2016). In Bangladesh, keeping pet dogs is gaining popularity. Though different types of pet dog breeds with different surgical affections have been seen in major cities like capital Dhaka, Sylhet, Chottagram of Bangladesh, local dogs are common throughout Bangladesh. Anaesthesia is a chemical restraining in surgical procedure with a reversible process, aiming to perform with minimal stress, pain, discomfort, and toxic side effects to the patients (Thurmon und Short, 2007). This leads us to think to validate an anaesthetic protocol that's proved to be an efficient, safe, and cost-effective in Bangladeshi context. Anaesthesia practice is a combination of technical skills, experience, compassion and science. Successfulness of anaesthesia depends upon several factors; selection of anaesthetic drugs, its rationale, co-existing medications, species, breed, age, sex and physical factors (Nesgash

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et al., 2016). Various types of anaesthetic drugs are used in small animal practice. In dogs, thiopentone has been proved to be causing respiratory depress leading to dose-related apnea and hypotension (Plumb, 2015).

Another general anaesthetic drug commonly practised in veterinary practice is propofol. It is a non-barbiturate, non-steroid and short-acting that can produce rapid, smooth anaesthesia induction and rapid recovery (White, 2005). The only drawback of propofol is the need for IV administration. Ketamine is a dissociative anaesthetic drug and can produce profound analgesia. Using ketamine alone causes inadequate muscle relaxation and increase muscle tone in the dog (Hall *et al.*, 2013). Another drawback of ketamine is that it produces short-term anaesthesia, which is not optimal for long surgical interventions (Seliškar *et al.*, 2007). Therefore, for better results, ketamine is used in conjugation with other sedatives. Xylazine, and α2-adrenoceptor agonist, is used as a sedative and analgesic in veterinary practice. Xylazine as an alpha 2-agonist stimulates an alpha-2 adrenergic receptor in cerebral presynaptic nerve ends, inhibits the release of catecholamine and dopamine resulting in analgesic and sedative effects, and hinders nerve conduction in the central nervous system leading to relaxation of striated muscles. Xylazine is usually used in combination with ketamine during anaesthetic applications (Özkan *et al.*, 2010). Considering the numerous factors that influence the successfulness of anaesthesia, two anaesthetic combinations (Xylazine-Ketamine and Xylazine-Propofol) were designed to compare the anaesthetic effects considering the clinical and hemato-biochemical profiles and conclude with best anaesthetic combination leading to optimal anaesthesia with no or minimal post-operative adverse effects in dogs.

MATERIALS AND METHODS

This study was conducted with the approval of the Animal Experiment and Ethics committee (AEEC), Department of Surgery and Obstetrics (DOS), Bangladesh Agricultural University (BAU), Mymensingh.

Animal's preparation and restraining

A total of 12 male dogs, apparently in good health, age 2-3 years and weighing 14-17 kg were captured from University (BAU) campus and its vicinity area. After 2-3 days of acclimatization, the anaesthetic procedure (induction of anaesthesia) was carried out following a period of 12 hours fasting to avoid vomiting and respiratory disorders. The dog was restrained by squeezing to aside by pressing the movable part of the cage. A piece of gauze was used to tie the jaw and turned around to fasten around the neck. The dog was placed on the operating table in sternal recumbency, with head slightly lower than the hindquarters. An assistant controlled the hind limbs and head.

Experimental design

Dogs were randomly grouped into two; X-K (Xylazine- Ketamine) and X-P (Xylazine- Propofol). We recorded clinical parameters, haematological and serum biochemical profiles in both pre and post (10, 20, 30 and 40 minutes) anaesthetic procedure.

Blood sample collection

Blood samples (approx. 5 ml) was collected aseptically from the cephalic vein and was immediately transferred dividing half into each of EDTA and Clot activator tube.

Haematological profile

A fully automated haematology analyzer (Sysmex XS-2000i, Japan) was used for the estimation of the haematological profiles such as Hemoglobin concentration (Hb), total erythrocyte count (RBC), total leukocyte count (WBC) and packed cell volume (PCV).

Serum biochemical profile

For Serum biochemical profile estimation, serum was separated with the help of centrifugation (at 3000 rpm for 15 min). A fully automated serum analyzer (Microlab Biochemistry, Germany) was used for the estimation of serum biochemical profile; aspartate aminotransferase (AST), alanine aminotransferase (ALT), bilirubin, creatinine, blood urea nitrogen (BUN), triglyceride (TG) and cholesterol (Col).

Anaesthetic procedure

All animals were subjected to injection with atropine sulphate @0.05 mg/kg IM before proceeding anaesthesia. Animals under both the groups were premedicated by xylazine HCL @1.1mg/kg IM. After 10 min and 15 min, induction was carried out with ketamine HCL @10mg/kg IM and Propofol @2mg/kg IV for Group X-K and Group X-P, respectively. In case if needed maintenance dose was given half the dose given

for induction. After induction, the gauze tying the jaw was removed. The mouth was opened, and the tongue was pulled out with a tongue forceps.

Clinical parameters

Individual animal body temperature, heart rate and respiratory rate were recorded immediately before, and 10, 20, 30, 40 and 50 minutes after administration of the anaesthetic drug. The heart rate was recorded through auscultation. The respiratory rate (breaths/min) was recorded with the aid of stethoscope and by counting the chest movement/excursion of thoraco-abdomen. The SpO2, pulse rate and temperature were monitored from Patient Monitor (Oxysmart- M®, Oxycon Co., Ltd, China). For recording of SpO2, pulse rate and temperature, different sensors were attached with the tongue of the animal. Simultaneously, the body temperature was recorded via the rectum using a clinical thermometer to avoid error in patient monitor.

Statistical analysis

Statistical analyses were performed using SPSS software programme. The study data were assessed using means and standard deviations (mean ± SD). In the repeated measurements, analysis of variance was applied for the statistical evaluation of all the obtained numerical data. Tukey HSD test for Post-Hoc comparisons was used. Values with a P-value under 0.05 were considered to be statistically significant.

RESULTS

The onset of anaesthesia, duration of anaesthesia and recovery from anaesthesia are shown in Table 1. The study showed a significant difference in the onset of anaesthesia, but no significant change was seen in the duration of anaesthesia. The study also showed a significant difference at $P<0.05$ in the recovery time of anaesthesia between groups.

Table 1: Effect of anaesthetics on the onset, duration and recovery time of anaesthesia

Group	The onset of anaesthesia (Sec)	Duration of anaesthesia (min)	Recovery from anaesthesia (Min)
X-K	45.75 ± 0.48	25.25 ± 0.48	47.75 ± 0.85
X-P	39.37 ± 0.28	23.50 ± 0.65	53.00 ± 1.08
P-value	0.000	0.072	0.009

X-K: Xylazine-Ketamine; X-P: Xylazine-Propofol

Effects of anaesthetics on clinical parameters

The effect of anaesthetics on rectal temperature, pulse rate, respiration rate, SpO2 is given in Table 2. In this study, we found a gradual decrease in rectal temperature from pre anaesthetized control value (37.93 ± 0.09)°C and (37.85 ± 0.03)°C throughout the experimental period and increase seen at 40 min in both Group X-K and Group X-P respectively. The variations among different observations of both groups were statically significant at $P<0.05$.

In this study, we found a gradual increment in pulse rate from pre anaesthetized control value (68.75 ± 0.48)/min throughout the experimental period and again decrease at 40 min in Group X-K. In Group X-P, the pulse rate decreased rapidly at 10 min and 20 min from the control value (67.00 ± 0.58) and then slightly increased at 30 min, again decreased at 40 min. The values of pulse rate monitored at different times of observation differed significantly ($P<0.05$) in both groups.

There was a gradual decrement in respiration rate from pre anaesthetized control value (24.60 ± 0.14)/min in Group X-K and (23.00 ± 0.58)/min in Group X-P throughout the experimental period and increment were seen at 40 min in both Groups. We observed significant ($P<0.05$) variation in respiration rate of dogs only after 30 min of induction in both groups.

We found a gradual decrement in SpO2 from pre anaesthetized control value (99.75 ± 0.63)/min at 10 min and 20 min and increase at 30 min and again decrease at 40 min in Group X-K. In Group X-P, at first

the SpO2 decreased rapidly at 10 min from control value (99.50 ± 0.29)/min and then gradually increased at 20 min, 30 min and 40 min. Differences were statically significant (P<0.05) between groups throughout the experiment. The value returned to its baseline after 12 hours in both groups in each parameter.

Table 2: Effects of anaesthesia on clinical parameters

Clinical Parameters	**Groups**	**Observation Time**				
		0 min	**10 min**	**20 min**	**30 min**	**40 min**
Rectal Temperature (°C)	X-K	37.93 ± 0.09	33.18 ± 0.86	32.15 ± 0.32	31.73 ± 0.35	31.83 ± 0.24
	X-P	37.85 ± 0.03	36.60 ± 0.06	35.40 ± 0.06	35.15 ± 0.03	37.15 ± 0.03
	P-value	0.437	0.028	0.002	0.002	0.000
Pulse rate/min	X-K	68.75 ± 0.48	71.75 ± 1.03	88.50 ± 0.65	89.75 ± 0.48	85.25 ± 1.03
	X-P	67.00 ± 0.58	62.00 ± 0.00	58.00 ± 0.00	59.00 ± 0.58	58.00 ± 1.15
	P-value	0.058	0.000	0.000	0.000	0.000
Respiration rate/min	X-K	24.60 ± 0.14	21.75 ± 0.25	20.13 ± 0.52	18.25 ± 0.48	20.50 ± 0.87
	X-P	23.00 ± 0.58	21.50 ± 0.29	19.50 ± 0.87	17.50 ± 0.87	20.50 ± 0.87
	P-value	0.066	0.537	0.563	0.485	1.000
SpO2/min	X-K	99.75 ± 0.63	75.50 ± 0.29	78.00 ± 0.58	91.00 ± 0.58	77.50 ± 0.29
	X-P	99.50 ± 0.29	75.50 ± 0.29	78.00 ± 0.58	91.00 ± 0.58	97.50 ± 0.29
	P-value	0.730	0.000	0.000	0.000	0.000

X-K: Xylazine-Ketamine; X-P: Xylazine-Propofol

Effects of anaesthesia on haematological parameters

The effect of anaesthetics on haemoglobin, TEC, TLC, PCV is given in Table 3. The study showed gradual decrement in haemoglobin throughout the experiments in Group X-K from pre-anaesthetized control value (13.33 ± 0.05)%. In Group X-P, initially at 10 min and 20 min, the haemoglobin decreased from the control value (16.30 ± 0.06)% and slightly increased at 30 min and again decreased at 40 min. We observed a gradual decrement in TEC throughout the experiments in Group X-K from pre anaesthetized control value (6.63 ± 0.05)million/cumm. In Group X-P, initially at 10 min and 20 min, the TEC decreased from the control value (7.70 ± 0.12)million/cumm and increased at 30 min and again decreased at 40 min.

The study also showed gradual decrement in TLC throughout the experiments in Group X-K from pre anaesthetized control value (13.83 ± 0.05) thousand/cumm. In Group X-P, initially at 10 min, 20 min and 30 min, the TLC value increased from the control value (14.30 ± 0.29) thousand/cumm and again decreased at 40 min.

A gradual decrement was found in PCV throughout the experiments in Group X-K from pre anaesthetized control value (52.43 ± 0.05)%. In Group X-P, initially at 10 min, 20 min PCV value decreased from the control value (55.05 ± 0.14)% and again increased at 30 min, 40 min in the study. However, both groups showed statistically significant differences at P<0.05 in haematological parameters throughout the experiment. The value returned to its baseline after 12 hours in both groups.

Table 3: Effects of anaesthesia on haematological parameters

Haematological Parameters	**Groups**	**Observation Time**				
		0 min	**10 min**	**20 min**	**30 min**	**40 min**
Hemoglobin (%)	X-K	13.33 ± 0.05	12.98 ± 0.07	12.78 ± 0.08	12.58 ± 0.07	12.35 ± 0.10
	X-P	16.30 ± 0.06	16.00 ± 0.06	15.80 ± 0.06	15.90 ± 0.06	15.85 ± 0.14
	P-value	0.000	0.000	0.000	0.000	0.000
Total Erythrocyte Count (TEC) (million/cumm)	X-K	6.63 ± 0.05	6.54 ± 0.06	6.38 ± 0.05	6.29 ± 0.04	6.21 ± 0.02
	X-P	7.70 ± 0.12	7.58 ± 0.14	7.45 ± 0.12	7.85 ± 0.23	7.57 ± 0.23
	P-value	0.001	0.002	0.001	0.006	0.000
Total Leukocyte Count (TLC) (million/cumm)	X-K	13.83 ± 0.05	13.28 ± 0.08	12.93 ± 0.10	12.65 ± 0.10	12.33 ± 0.10
	X-P	14.30 ± 0.29	17.45 ± 0.29	19.65 ± 0.29	20.58 ± 0.58	20.22 ± 0.03
	P-value	0.198	0.000	0.000	0.000	0.000
Packed Cell Volume (PCV) (%)	X-K	52.43 ± 0.05	51.78 ± 0.07	50.98 ± 0.21	50.63 ± 0.05	50.33 ± 0.05
	X-P	55.05 ± 0.14	54.15 ± 0.20	53.60 ± 0.29	53.70 ± 0.58	53.75 ± 0.09
	P-value	0.000	0.000	0.000	0.013	0.000

X-K: Xylazine-Ketamine; X-P: Xylazine-Propofol

Effects of anaesthesia on Biochemical parameters

The effects of anaesthetics on Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), bilirubin, creatinine, Blood Urea Nitrogen (BUN), Triglyceride (TG), cholesterol are given in Table 4. The Table shows sudden decrement in AST from pre-anaesthetized control value (38.88 ± 0.05) IU/L at 10 min and 20 min, and increment at 30 min and then again decreased at 40 min in Group X-K. In Group X-P, also at 10 min sudden decrement of AST seen from the control value (38.85 ± 0.03) IU/L and gradually increased at 20 min, 30 min and 40 min. Variations were statically significant at $P<0.05$ in 20 min and 40 min. The study showed a sudden decrement in ALT from pre-anaesthetized control value (98.20 ± 0.27) IU/L at 10 min, 20 min, 30 min and increment at 40 min in Group X-K. In Group X-P, at 10 min sudden decrement of ALT seen from the control value (98.45 ± 0.03) IU/L and sudden increment at 20 min and finally gradually decreased at 30 min and 40 min. A significant ($P<0.05$) difference was observed in all values except at 30 min.

We observed a sudden increment in bilirubin from pre-anaesthetized control value (0.48 ± 0.05)mg/dl at 10 min and suddenly decreased at 20 min and again gradually increased at 30 min and 40 min in Group X-K. Whereas, in Group X-P, at 10 min and 40 min sudden decrement of bilirubin seen from the control value (0.35 ± 0.03) mg/dl and no change was seen at 20 min and 30 min. The variation between groups was statically significant at $P<0.05$ in 10 min and 40 min.

Results showed a sudden increment in creatinine from pre-anaesthetized control value (0.60±0.07)mg/dl at 10 min and 20 min and again gradually decreased at 30 min and 40 min in Group X-K. In Group X-P, at 10 min sudden increment was seen and decreased at 20 min and again suddenly increased at 30 min and 40 min from the control value (0.35 ± 0.03)mg/dl. Also, a significant variation at $P<0.05$ was observed in parameters between groups in 10 min and 20 min. The value returned to its baseline after 12 hours in both groups.

The study showed a gradual increment in BUN from pre anaesthetized control value (14.38±0.13)mg/dl at 10 min and 20 min and gradually decreased at 30 min and again increased at 40 min in Group X-K. In Group X-P, a gradual increment was seen throughout the experiments

Table 4: Effects of anaesthesia on Biochemical parameters

Biochemical Parameters	**Groups**	**Observation Time**				
		0 min	**10 min**	**20 min**	**30 min**	**40 min**
AST (IU/L)	X-K	38.88 ± 0.05	11.85 ± 0.44	9.00 ± 0.20	14.20 ± 0.18	11.70 ± 0.21
	X-P	38.85 ± 0.03	11.15 ± 0.14	12.15 ± 0.09	13.70 ± 0.12	18.00 ± 0.12
	P-value	0.674	0.185	0.000	0.057	0.000
ALT (IU/L)	X-K	98.20 ± 0.27	62.88 ± 1.00	62.80 ± 0.45	61.35 ± 0.56	66.25 ± 0.85
	X-P	98.45 ± 0.03	49.95 ± 0.14	61.60 ± 0.12	60.20 ± 0.12	54.85 ± 0.14
	P-value	0.420	0.001	0.043	0.132	0.000
Bilirubin (mg/dl)	X-K	0.48 ± 0.05	0.68 ± 0.05	0.33 ± 0.03	0.42 ± 0.03	0.55 ± 0.03
	X-P	0.35 ± 0.03	0.25 ± 0.03	0.35 ± 0.03	0.35 ± 0.03	0.20 ± 0.00
	P-value	0.067	0.000	0.537	0.127	0.000
Creatinine (mg/dl)	X-K	0.60 ± 0.07	0.85 ± 0.03	1.15 ± 0.05	1.08 ± 0.08	1.05 ± 0.03
	X-P	0.35 ± 0.03	0.75 ± 0.03	0.65 ± 0.03	0.90 ± 0.00	1.05 ± 0.03
	P-value	0.017	0.050	0.000	0.102	1.000
BUN (mg/dl)	X-K	14.38 ± 0.13	16.65 ± 0.35	17.23 ± 0.52	17.20 ± 0.34	17.90 ± 0.41
	X-P	14.70 ± 0.12	15.05 ± 0.09	15.29 ± 0.06	15.60 ± 0.17	16.05 ± 0.14
	P-value	0.105	0.017	0.010	0.006	0.015
TG (mg/dl)	X-K	92.75 ± 0.48	63.85 ± 0.43	50.23 ± 0.89	66.50 ± 1.85	54.75 ± 1.80
	X-P	93.00 ± 0.58	57.00 ± 2.89	64.50 ± 2.60	73.00 ± 2.31	64.00 ± 2.31
	P-value	0.750	0.097	0.008	0.070	0.020
Cholesterol (mg/dl)	X-K	318.00 ± 0.41	206.50 ± 1.26	218.75 ± 1.55	198.25 ± 0.85	198.25 ± 0.48
	X-P	317.50 ± 0.29	219.50 ± 5.48	307.50 ± 7.22	310.50 ± 7.22	296.50 ± 7.22
	P-value	0.356	0.096	0.001	0.001	0.001

X-K: Xylazine-Ketamine; X-P: Xylazine-Propofol

from the control value (14.70 ± 0.12)mg/dl.Statistically significant at $P<0.05$ difference was observed in BUN between groups throughout the experiment.

We found a sudden decrement in TG from pre-anaesthetized control value (92.75 ± 0.48)mg/dl at 10 min and 20 min. It increased at 30 min and again decreased at 40 min in Group X-K. In Group X-P, sudden decrement was seen at 10 min from the control value (93.00 ± 0.58)mg/dl and increased at 20 min and 30 min and again decreased at 40 min. Variation in values was statistically significant at $P<0.05$ in 20 min and 40 min.

There was also a sudden decrement in cholesterol from pre- anaesthetized control value (318.00 ± 0.41)mg/dl at 10 min and increased at 20 min and again decreased at 30 min and 40 min in Group X-K. In Group X-P, also sudden decrement was seen at 10 min from the control value (317.50 ± 0.29)mg/dl and increased at 20 min and 30 min and again decreased at 40 min. Variations in cholesterol values were statically significant at $P<0.05$ in 20 min, 30 min and 40 min.

However, the values returned to its baseline after 12 hours in both groups.

DISCUSSION

Effects of anaesthesia on clinical parameters in dog

We found a decrease in rectal temperature from their pre anaesthetized control values in both groups. It correlates with previous reports on the reduction of rectal temperature after induction with the combination of Xylazine-Ketamine presented by Sindak *et al.* (2010). The decrease in rectal temperature might be due to the depression of the thermo-regulator centre (Gleed, 1987). We also observed an increase in pulse rate in Group A (X-K) throughout the experiment. A decrease in pulse rate was observed in Group B, which is similar to other report (Hossen *et al.*, 2004b). A decrease in respiratory rate was found in both groups induced with X-K and X-P, respectively. The decrease in the respiratory rate in Group A (X-K), which is similar to the report of Hossen *et al.* (2004b). The decrease in respiration rate might be due to the potent effect of ketamine in the initial stages. Its respiratory stimulant effect might have counteracted the depressant effect of xylazine. SpO2 was decreased from pre-anaesthetized control value in both groups. In Group A, the SpO2 decreased significantly ($P<0.05$) after induction. After that, it gradually increased towards the base value at the end of the experiment. Similar findings were also reported by Abdel-Hady *et al.* (2017). A decrease in SpO2 has also been documented during continuous infusion of propofol in dogs by (Sankar *et al.*, 2011). The initial decrease in SpO2 might be due to the depression caused by the anaesthetic drugs on the ventilatory function of the lungs. Low pulse oximeter readings are indicative of reduced arterial oxygenation and diminished tissue perfusion. However, vasoconstriction may also lead to low pulse oximeter readings.

Effects of anaesthesia on haematological parameters in dog

There was a decrease in haemoglobin concentration from pre anaesthetized control value throughout the experimental period in Group A (X-K). Here, the haemoglobin level showed a decreasing trend until 40 minutes. Similar findings were also reported by (Sankar *et al.*, 2011). In different species during continuous infusion of ketamine. The decrease in haemoglobin level might be due to the splenic pooling of erythrocytes that occur with most of the anaesthetics. The TLC level also decreased in groups; this may be due to splenic pooling of blood constituents at the maximal depth of anaesthesia (Jena *et al.*, 2014). The decreased TLC and PCV found in our study might be due to pooling of circulating erythrocytes in the spleen or other reservoirs secondary to decreased sympathetic stimulation or due to inter compartmental fluid shift maintaining the normal cardiac output as described by Ferreira *et al.* (2015).

Hemoglobin levels showed a decreasing trend till 20 minutes and increases at 30 min and finally decrease at 40 min again in Group B (X-P). A significant decrease in haemoglobin has also been reported during continuous infusion of propofol in dogs by Abdel-Hady *et al.* (2017). The decrease in haemoglobin level in the present experiment might be due to the splenic pooling of erythrocytes that occur with most of the other anaesthetics. It might also be due to shifting of fluids from the extravascular compartment to the intravascular compartment in order to maintain the cardiac output in animals (Church *et al.*, 1994) or due to haemodilution in response to fluid therapy (Muir *et al.*, 2008). One or a combination of these mechanisms might be responsible for the decrease in the value of haemoglobin. A decrease in TEC was also found in the study, which correlates with other reports of Hossen *et al.* (2004a) and Ratnesh *et al.* (2014).

Effects of Ketamine and Propofol on biochemical parameters in dog

In our study, we observed a decrease in ALT value from its pre-anaesthetized control value in both groups. Khurana *et al.* (2014) also reported a decrease in ALT values during Diazepam-Propofol and Acepromazine maleate-Propofol anaesthesia in dogs. The decrease in ALT activity in our study might be due to less alteration in cell membrane permeability in response to haemodynamic changes by the anaesthetic agents. In the present study, creatinine value increased from pre anaesthetized control value in both groups. Similar findings were also reported by Abdel-Hady *et al.* (2017) after Xylazine-Ketamine anaesthesia in the dog. During continuous administration of ketamine in dogs, ketamine might reduce renal cortical blood flow by constricting the blood vessels, hence decreases glomerular filtration rate and increases serum BUN and creatinine levels. This study shows both increased and decreased value of BUN from pre anaesthetized control value in both groups. The increase in serum BUN levels has been reported by Lim *et al.* (2000) after ketamine and xylazine administra-

tion in dogs in dogs. Similar results have been reported by Ashraf *et al.* (2019) in spotted deer during chemical immobilization with ketamine hydrochloride for on-demand translocation of these animals. The increase in serum blood urea nitrogen and creatinine after Xylazine-Propofol anaesthesia may be attributed to a temporary inhibitory effect of these drugs on renal blood flow and consequent decrease in glomerular filtration rate increasing their levels.

Based on the findings of the present study it can be concluded that Xylazine-Ketamine and Xylazine-Propofol anaesthetic combinations exert some systemic effect on haematology as well as on some vital organs like liver and kidney, which are responsible for detoxification and elimination of the waste product. Some serum enzymes are used as reliable indicators of the functionality of these organs. So, the veterinarian should be aware during general anaesthesia with these anaesthetics in dogs.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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