

EVALUATION OF HAEMATOLOGICAL AND SERUM BIOCHEMICAL PROFILES OF XYLAZINE-KETAMINE INDUCED ANAESTHESIA IN QUAILS (*COTURNIX COTURNIX*)

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ABSTRACT

Effects of xylazine and ketamine on physiological, haematological and serum biochemical parameters in common quails (Coturnix coturnix) was assessed. Six healthy quails were given intramuscular injections of xylazine @ 9 mg/kg body weight and ketamine @ 30 mg/kg body weight. Blood samples were drawn from brachial vein both before and after anaesthesia from each bird. Data was collected for analyzing the change in physiological haematological and biochemical parameters were collected before, during and after anesthesia and were compared. The results showed that the induction period was (2.02±0.20 minutes) and duration of general anesthesia was (82.5 ±3.64 min). Haemoglobin (Hb) concentration, Packed cell volume (PCV), Red blood cell (RBC) count and Glucose level showed significant changes. It was concluded that administration of anaesthesia using xylazine and ketamine may alter some haematological and biochemical values. This should be considered when evaluating blood samples from chemically immobilized or sedated quails.

Key words: Anaesthesia, biochemistry, haematology, ketamine, xylazine, quail

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INTRODUCTION

Quail is a collective name for several genera of mid-sized birds generally considered in order Galliformes (Agina and Ezema, 2017). Old world quails are found in

the family Phasianidae and new world quails are found in the family Odontophoridae (Cox *et al.*, 2007). Ketamine hydrochloride is a dissociative anesthetic of the cyclohexylamine group used for chemical restraint, induction and maintenance of anesthesia in a number of species of birds and animals (Yohannes, 2018). The use of ketamine as a sole anesthetic has been limited by muscle hypertonicity and myoclonus, violent recovery and occasional occurrence of convulsions (Muir, 2000). Ketamine is usually combined with an alpha-2-agonist

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(e.g. xylazine), a benzodiazepine (e.g. diazepam) or a phenothiazine tranquillizer (e.g. acepromazine) to enhance muscle relaxation, analgesia and to prevent seizures/convulsions and also to prolong the duration of anesthesia. Alpha-2-adrenergic agonists are mostly used in combination with opioids, dissociative anesthetics, or as pre-anesthetic sedatives that reduce the amount of anesthetic agent to be used (Sani and Onifade, 2012). The combination of xylazine and ketamine (XK) is widely used to produce short-acting general anesthesia in domestic and wild animals and birds (Cornick and Jensen, 1992) resulting in smooth induction and recovery with cataleptic effects of ketamine being ameliorated by the sedative and myorelaxing effects of xylazine (Gulanber *et al.*, 2001; Durrani *et al.*, 2009).

Determination of haematological and serum biochemical profiles in quails helps in the clinical management of disorders of the blood and bone marrow. Packed Cell Volume (PCV), hemoglobin concentration (Hb) and protein values are among the most important parameters in the assessment of health and diseases in birds and other mammals (Sani and Onifade, 2012). These factors necessitate the assessment of blood parameters and changes that may result when sedatives and other related drugs are used in birds and other animals. The aim of the present study was to determine and compare the haematological and serum biochemical values in healthy adult common quails anaesthetized with combination of xylazine and ketamine.

MATERIALS AND METHODS

The present study was carried out in six healthy domestic quails weighing between 185-265 grams, aged around 4-6 months. The health status of the birds were assessed by based on physical examination and physiological parameters i.e. rectal temperature, heart rate and respiratory rate (Butcher, 2010).

Prior to anesthesia, food and water were withheld for 3-4 hours (Girling, 2013). Body weight, cloacal temperature, heart rate and respiratory rate were recorded prior to premedication. Blood samples were taken prior to premedication. All the birds were administered a combination of xylazine and ketamine at dose rates of 9 mg and 30 mg/kg body weight, respectively (Durrani *et al.*, 2014) deep into the pectoral muscle using 1 ml tuberculin syringe. After administration of the ketamine and xylazine, all the birds were kept under close observation. Induction period, duration of anesthesia and recovery period were recorded. Cloacal/rectal temperature, respiratory rate, heart rate and body reflexes were recorded initially for every 5 minutes interval up to 20 minutes and later every 10 minutes after administration of the anesthetic combinations.

Blood was collected from cutaneous ulnar vein according to the body weight of individual birds using tuberculin syringe in vacutainers (Low, 2012). One ml of the total blood was collected from each bird before and 15 min after induction of anaesthesia and divided into EDTA containers for haematology and containers

without anticoagulant for biochemistry. The serum was obtained by allowing the blood to clot at room temperature for one hour after which it was centrifuged. Blood Hb concentration was analyzed using the Sahli's haemoglobinometer (Pampori and Iqbal, 2007) and expressed as g/dl. PCV was determined by a standard procedure using the microhaematocrit method (Dalai *et al.*, 2015) and expressed as percentage. Total erythrocytes and leukocytes were manually counted on a Neubauer haemocytometer after 1:200 dilution of blood using Natt-Herrick's (NH) solution (Walberg, 2001). Parameters such as glucose, cholesterol, total protein, albumin, and creatinine were analyzed using auto analyzer (Agina and Ezema, 2017) using Agappe diagnostic kits.

Data were collected on physiological parameters (heart rate, respiratory rate and cloacal temperature), hematological parameters (Hb concentration, PCV, total erythrocytes, and total leukocytes and serum biochemistry parameters (glucose, cholesterol, total protein, albumin and creatinine) before and after the administration of anaesthetic combination. During the general anesthesia induction period, duration of anesthesia and recovery period were also recorded for every bird.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 17.0. Paired t-test was used to compare physiological, hematological and serum biochemical parameters taken before and after the administration of the drug combination

RESULTS AND DISCUSSION

In the present study, the mean age of selected common quails was 5 ± 0.365148 months and the mean body weight was 208.6667 ± 17.06198 grams. The mean values of the physiological, haematological and biochemical parameters are expressed in table 1 to 3. The induction time was (2.021667 ± 0.205547 minutes; $n=6$) whereas the duration time of anesthesia in the quails was (82.5 ± 3.640055 minutes; $n=6$).

In this study, general anesthesia was achieved with sufficient muscle relaxation, without muscle tremors and convulsion. Additionally, smooth and fast recovery was observed. The onset of action of xylazine and ketamine combination was relatively three minutes faster when compared to the studies by (Kamiloglu *et al.*, 2014), who found the induction period to be 5.62 ± 0.3 min, ($n=10$) after administration of xylazine at dose rate of 8 mg/kg and ketamine at dose rate of 50 mg/kg body weight intramuscularly. The induction period and duration of anaesthesia as per Durrani *et al.* (2014) had a very similar result of 1.9 ± 0.3 and 77.8 ± 18.62 with the same dose rate of drugs given to all the birds.

The anaesthetic combination of xylazine and ketamine resulted in cardio-respiratory depression as bradycardia, decreased respiratory rate and hypothermia in all the birds. A significant decrease compared to the baseline values was noticed only in respiratory rate. A study in pigeons by Duranni *et al.*, (2009) reported that xylazine-

ketamine combination creates hypothermia, respiratory depression and bradycardia by intramuscular usage of this combination. However, the decrease in body temperature was found to be associated with a slowdown in the metabolism rather than the anesthetic agents by Picollo *et al.* (2012). Similar results were reported by others (Kamiloglu *et al.*, 2014) where decrease in respiratory rate and body temperature was observed but the heart rate in all the quails remained unchanged.

From the results of the present study, Hb concentration, PCV and total erythrocyte count were decreased significantly ($P < 0.05$), whereas the total leukocyte count was decreased non-significantly in post anaesthesia. The reason for decreased Hb concentration might be due to the circulating blood cells pooling in the spleen or other reservoirs as a result of diminished sympathetic activity leading to haemodilution and subsequent reduction in PCV as per Maiti *et al.*, (2006), who conducted typhlectomy in white leghorn cockerels using xylazine - ketamine combination. This was further supported by other researchers (Mahmud *et al.*, 2014; Sankar *et al.*, 2011), who explained that pooling of red blood cells in the spleen was due to stimulated adrenocortical area and the interstitial fluid migrating in to the circulating compartment resulting in a decrease of Hb concentration. The results of haematological parameters of this study were in agreement with Yohannes (2018), who reported decrease in Hb concentration, PCV, total erythrocyte count and total

leukocyte count in dogs. On the contrary the study by Sani and Onifade (2012), in pigeons using medetomidine showed significant increase in the PCV and total erythrocyte count values at 10 to 150 minutes possibly due to a decrease in heart rate, an increase in mean arterial pressure followed by a drop, which causes a decrease in cardiac output and peripheral vasoconstriction, which is subsequently followed by vasodilation brought on by alpha-2 agonists.

Although most measured biochemical values did not differ significantly from baseline values, we found significant changes in the concentration of glucose. In all the quails, the concentration of glucose increased significantly after the administration of the drug. This might be the result of administration of xylazine. The hyperglycemic effects of Alpha-2-adrenergic agonists such as xylazine are known (Kilic, 2008). Similar results were obtained in a study evaluating biochemical changes in ostriches using xylazine-ketamine combination (Ai-Sobayil and Omer *et al.*, 2011). The same authors suggested that the impact of xylazine on the pancreas, which inhibits insulin secretion without affecting glucagon secretion, can cause hyperglycemia by causing a reduction in plasma insulin levels

CONCLUSION

The present anaesthetic protocol combination of xylazine (9 mg/kg) and ketamine (30 mg/kg) was found to be safe in the birds with regard to haematological

and serum biochemical parameters as the variations remained within the normal acceptable range. The quality of sedation, induction, maintenance and recovery from general anaesthesia were good without any complications. These results should be taken into account when blood samples are evaluated in anesthetized or chemically immobilized quails.

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Table.1. Observations on physiological parameters (Mean ± SE) (n=6)

Parameters	Before anaesthesia	Fifteen minutes after induction period of anesthesia
Cloacal temperature(° F)	106.83±0.58	106.61±0.54
Heart rate(beats/min)	336.83±14.96	326.83±15.79
Respiratory rate (breaths/min)	49.83±3.27	39.83±3.11

Table.2. Observations on haematological parameters (Mean ± SE)(n=6)

Parameters	Before anaesthesia	Fifteen minutes after induction period of anesthesia
Haemoglobin(g/dL)	8.50±0.37	8.03±0.33
Packed cell volume (%)	48.50±3.85	44.00±4.07
Total erythrocyte count (106/µL)	3.82±0.02	3.11±0.02
Total leucocyte count (103/µL)	19.24±0.14	19.22±0.14

Table.3. Observations on serum biochemical parameters (Mean ± SE) (n=6)

Parameters	Before anaesthesia	Fifteen minutes after induction period
Glucose (mg/dL)	327.00±34.32	380.33±25.76
Cholesterol (mg/dL)	159.17±5.66	158.00±12.07
Total protein (g/dL)	3.55±0.25	3.7±0.34
Albumin (g/dL)	1.95±0.28	1.93±0.18
Creatinine (mg/dL)	0.46±0.05	0.45±0.06

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