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Electrocardiographic and haemato-biochemical profile of an apparently healthy Indian Sloth bear (*Melursus ursinus ursinus*): A case report

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Abstract
The study aims to report the baseline electrocardiographic and haemato-biochemical values in an adult healthy Indian Sloth bear. The amplitude of P wave was recorded higher in dorsal recumbent position. The Q wave amplitude value was more in right lateral recumbency. R wave amplitude was more in right lateral recumbency whereas R wave duration was more in dorsal recumbency. Higher S wave was obtained in dorsal recumbency. Amplitude and duration of T wave was greater in right lateral recumbency. PR interval and QT interval were more in right lateral recumbency whereas RR interval, PR segment and ST segment were more in dorsal recumbency. Heart rate was higher in right lateral recumbent position. The hemoglobin concentration, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration and hematocrit level were comparatively higher in Indian Sloth bear than most domestic animals. However, differential count, eosinophil percentage was found to be higher than most domestic animals. The platelet count in the blood picture was recorded to be higher than most domestic animals. In biochemical analysis under liver function tests, albumin, direct and indirect bilirubin were lower than most domestic animals. Amylase and lipase which were the basic markers of pancreatitis were within normal range. The reported values of serum cardiac biomarkers can be used for assessment of myocardial injury. The result of this study will assist veterinarians in management and conservation of this rare species.

Keywords: Indian sloth bear, ECG, haematological, biochemical, anaesthesia

1. Introduction
The Sloth bear (*Melursus ursinus ursinus*) is an insectivorous bear species, mostly found in Indian subcontinent (Garshelis *et al.*, 2011) [4]. It is evolved from the ancestral brown bear during the Pleistocene and through convergent evolution. The Indian Sloth Bear can easily be recognized by its shaggy black coat, long muzzle, protruding lip and by a white V-shaped patch on the chest. It is listed as Vulnerable on the IUCN Red list, mainly due to habitat loss and degradation (Dharaiya *et al.*, 2016) [3]. In Indian conditions, bears reared in semi-captivity are exposed to a variety of biotic and abiotic stress factors. Thermal stress is one of the most pertinent abiotic stressors leading to disturbance of homeostasis in animals (Parida *et al.*, 2020a) [7]. The correlation between stress and cardiovascular diseases has been shown to be independent of cardiovascular risk factors (Steptoe and Kivimaki, 2012) [11]. Mohapatra *et al.*, 2021 [6] reported injury to myocardium, liver and kidney of cattle during heat stress. Previous studied conducted by Parida *et al.*, 2020b [8] also reported the derogatory effects of heat stress on caprine cardiac cells. To cope with high environmental conditions, bears develop various cardiovascular adaptations. This calls for appropriate maintenance of cardiac health in semi-captive Sloth bears.
Electrocardiography (ECG) is a recording of the electrical activity of heart. It is a non-invasive and easily applied technique used in the determination of cardiac hypertrophy, dilatation, arrhythmias and diagnosis of conduction abnormalities (Mohapatra *et al.*, 2015) [13]. There are also reports on variable influence of two different anaesthetic combinations on cardiac function in mice (Hart *et al.*, 2001) [5]. Since it is not possible to record ECG in active bears, breed specific electrocardiographic values under specific anaesthetic combination need to be established for accurate interpretation of ECG in Sloth bears. As per our knowledge there are no reports available for interpreting normal ECG variables in Indian Sloth bears.

The aim of this study was to report the baseline electrocardiographic and haematobiochemical values in an adult healthy Indian Sloth bear, which can be used clinically for effective diagnosis and treatment of cardiac and hematological disorders in Indian Sloth bears which will be helpful for the conservation of this IUCN Red listed wild animal.

2. Materials and Methods

2.1 Ethical approval

Electrocardiography is a non-invasive technique and the study was conducted during routine clinical examination of Indian Sloth bear which is living in a semi-captive state at Wildlife SOS, Bannerghatta Bear Rescue Center, Bengaluru, India. None of the animals were sampled solely for the purpose. The results were obtained by compiling and analysing available ECG and haemato-biochemical reports. So, the study does not mandate ethical approval.

An apparently healthy male Indian Sloth bear aged about nine years was immobilized using a ketamine-xylazine combination, ketamine hydrochloride (5 mg/kg body weight; Ketamil, Troy Laboratories Pty Ltd., Smithfield, NSW, Australia) and xylazine hydrochloride (Xylazil, 2 mg/kg body weight; Troy Laboratories Pty Ltd.). A twelve-lead standard ECG recorder Technocare Medisystems model DP2020 digital single channel ECG recorder was used to record ECG in Indian Sloth bear**.** The electrocardiograph was set with a paper speed of 50 mm/sec and sensitivity of 1 (20 mm = 1 mV). The Sloth bear was positioned in right lateral recumbency (Figure 1) and dorsal recumbency (Figure 2) on an insulated table and the clips of the electrodes fitted to alligator clips were attached to the olecranon and the patella. To minimize the variables associated with anaesthetic depth, the ECG evaluation was conducted once a surgical anaesthetic plane was attended based on lack of pedal reflexes.

Blood sample was collected from jugular vein after immobilisation using a 20 gauge needle in vacutainers (Becton Dickinson, Franklin Lakes, New Jersey, USA) with and without Ethelyne Diamine Tetraacetic acid (EDTA) for haematology and serology respectively. Samples were immediately stored on cool packs at 4-8 degree centigrade and transported from field location to laboratory. Standard haematological and biochemical parameters were analysed within 24 hours of collection using a haematological analyser Vitros 250. Statistical analysis was performed using Microsoft Excel 2007 and relationships were deemed statistically significant when $p<0.05$ (Student's paired t test).

3. Results and Discussion

3.1 Electrocardiographic parameters

The ECG variables obtained in the Indian Sloth bear positioned in right lateral recumbency and dorsal recumbency are represented in table 1. The amplitude of P wave was recorded higher in dorsal recumbent position whereas duration of P wave was similar in both positions. The Q wave amplitude value was more in right lateral recumbency. R wave amplitude was more in right lateral recumbency where as R wave duration was more in dorsal recumbency. Higher S wave was obtained in dorsal recumbency. Amplitude and duration of T wave was greater in right lateral recumbency. PR interval and QT interval were more in right lateral recumbency whereas RR interval, PR segment and ST segment were more in dorsal recumbency. Heart rate was higher in right lateral recumbent position. The values obtained for ECG variables in the present study were different from those obtained by Cihan *et al.,* 2016 [2] in Brown bears of Turkey. This shows that breed does play an important role in determining the reference range of ECG parameters.

3.2 Haemato-biochemical parameters

The haemato-biochemical parameters in the Indian Sloth bear are represented in table 2. The haematobiochemical parameters reported by Reece *et al.,* 2015 for domestic animals were taken as reference. The hemoglobin concentration, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration and hematocrit level were comparatively higher in Indian sloth bear than reported for most domestic animals. However, in differential count, eosinophil percentage was found to be higher than most domestic animals. The platelet count in the blood picture was recorded to be higher than most domestic animals. Moreover, the values of hematological parameters were within the range obtained by our previous studies on Indian Sloth Bear (Shanmugam *et al.,* 2008) [10].

In biochemical analysis concerning liver function tests, albumin, direct and indirect bilirubin were lower than most domestic animals. Under kidney function test, creatinine values were in agreement with Veeraselvam *et al.,* 2014 [12]. Values obtained for electrolytes in current study are higher than values obtained by Chandra *et al.,* 2018 [1] for Indian Sloth bear. Amylase and lipase which were the basic markers of pancreatitis were within normal range. The values of serum cardiac biomarkers were reported for the first time in this study which can be used for assessment of myocardial injury in bears during cardiac diseases.

Fig 1: ECG of an adult Indian Sloth bear taken in right lateral recumbency

Fig 2: ECG of an adult Indian Sloth bear taken in dorsal recumbency

Table 1: Lead II ECG variable in Right Lateral Recumbency and Dorsal Recumbency position of an adult Indian Sloth bear

Lead II	Right Lateral Recumbency	Dorsal Recumbency
P amplitude (mV)	0.15	0.20
P duration (sec)	0.08	0.08
Q amplitude (mV)	0.20	0.00
R amplitude (mV)	1.00	0.60
R duration (sec)	0.04	0.08
S amplitude (mV)	0.05	0.20
T amplitude (mV)	0.35	0.30
T duration (sec)	0.10	0.08
PR interval (sec)	0.28	0.12
QT interval (sec)	0.28	0.24
RR interval (sec)	1.28	1.40
PR segment (sec)	0.20	0.24
ST segment (sec)	0.16	0.28
Heart Rate (bpm)	46.87	42.85

Table 2: Serum haematological and biochemical parameters of an adult Indian Sloth bear

Complete Blood Count	
Hb (g/dl)	19.8
RBC (million per mm^3)	7.33
HCT (%)	55.4
MCV (fl)	75.6
MCH (pg)	27.0
MCHC (g/dl)	35.7
RDW (%)	16.3
TLC (million per mm^3)	10.6
Differential Leucocyte Count	
Neutrophil (%)	73.0
Lymphocyte (%)	17.0
Eosinophil (%)	10.0
Monocyte (%)	0
Basophil (%)	0
Platelet (thousand/microlitre)	263.0
Liver Function Tests	
Total Protein (g/dl)	6.7
Albumin (g/dl)	2.7
Globulin (g/dl)	4.0
A:G (Albumin: Globulin) ratio	0.68
AST/SGOT (U/L)	103.0
SGPT/ALT (U/L)	46.0
ALP (U/L)	27.0
GGT (U/L)	34.0
Bilirubin Total (mg/dl)	0.12
Bilirubin Direct (mg/dl)	0.08
Bilirubin Indirect (mg/dl)	0.04
Kidney Function Tests	
Urea (mg/dl)	15.0
Creatinine (mg/dl)	1.24
Uric acid (mg/dl)	1.53
Electrolytes	
Sodium (mg/dl)	126.0
Potassium mmol/L	6.1
Chloride mmol/L	98.0
Biochemical markers of pancreatitis	
Amylase (U/L)	10.05
Lipase (U/L)	24.00
Serum cardiac biomarkers	
c- Reactive Protein (mg/L)	0.20
Lactate Dehydrogenase (U/L)	693.00
Triglyceride (mg/dl)	294.00
Troponin I (qualitative)	Negative

4. Conclusion

The study reports baseline reference values of electrocardiographic and haemato-biochemical parameters in an adult Indian Sloth bear. The values may be referred by veterinary while interpreting concerned test results.

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