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Short Communication

HAEMATOLOGICAL PARAMETERS OF CAPTIVE LIONS (*PANTHERA LEO PERSICA*) IN CHHATTISGARH

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SUMMARY

The present study was carried out to evaluate the baseline haematological parameters of captive adult lions (n=12) housed at three different zoos of Chhattisgarh *viz*. Maitri Bagh Zoo, Bhilai (MBZ); Nandanvan Zoo and Jungle Safari, Nava Raipur (NVJS) and Kanan Pedari Zoo, Bilaspur (KPZ) to establish baseline data values for this species. The blood samples were collected from adult lions aged between 4 to 8 years from tail vein after adequate physical restraint inside squeeze cage during winter season (December, 2020 to February, 2021). The study revealed that PCV was significantly (P<0.05) higher in captive lions of NVJS as compared to MBZ and KPZ. The value of TEC in captive lions of NVJS was significantly (P<0.05) higher than MBZ and KPZ whereas TEC values in captive lions of MBZ was significantly (P<0.05) higher than KPZ. Neutrophils (%) in captive lions of MBZ was significantly (P<0.05) higher than NVJS and KPZ. The values of basophil (%) in captive lions of NVJS was significantly (P<0.05) higher than MBZ.

Keywords: Captive lions, Haematology, Pantheraleopersica, Zoo

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Conservation efforts have brought the lion population back from the brink of extinction and increased their numbers (Bauer *et al.*, 2016). The lion population has steadily increased since 2010 and it was estimated at 523 individuals during the 14th Asiatic Lion Census (Singh, 2017) which increased to 650 in 2017 (Kaushik, 2017). Haematology is an efficient method for assessing the physiological status of an individual animal and is often regarded as the first indicator of any disease (Miller *et al.*, 1999). Knowledge of clinical baseline data in various geographical regions, climatic and physiological conditions is essential for absolute diagnosis and treatment in captive lions (Behera *et al.*, 2013). There are scant reports of haematological studies being carried out in captive lionsin India (Christi *et al.*, 1998). The present study was carried out to generate baseline values of hematological parameters in healthy adult lions housed in captivity at three different zoos of Chhattisgarh.

Blood samples were drawn from a total of 12 captive lions for one occasion during month of January, 2021 (n = 4 from adult lions aged between 4 to 8 years from each zoo) after restraining them in a squeeze cage. About 8ml of blood was collectedaseptically from tail vein using 22 gauze scalp vein attached to 10 ml disposable syringe. Two ml of blood was transferred immediately into EDTA vial for haematological study while rest 6 ml blood was transferred to another vial for collection of serum to be used in other studies.

Blood smears were prepared in triplicate, air dried and fixed with methanol at the site of collection (Schalm *et al.*, 1975). Fixed blood smear was stained for different leucocyte count by using Giemsa stain and viewed under oil immersion lens (100X). Haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leucocyte count (TLC) were measured using Automated haematology analyzer (Idexx Vet Auto read haematology Analyzer, USA) while differential leucocyte count (DLC) was carried out manually (Schalm *et al.*, 1975).

One Way Analysis of variance (ANOVA) was performed to compare the values from different groups (Snedecor and Cochran, 1994). Probability less than 0.05 ($p<0.05$) was considered as statistically significant. Allstatistical analyses were performed with SPSS 16.0 for Windows (SPSS Inc. Chicago, IL USA). Mean ± SE value of haematological parameters in captive lions housed in 03 different zoos are presented in Table 1.

There was no significant ($p>0.05$) difference between the values of Hb in captive lions of MBZ, NVJS and KPZ. The overall mean Hb value (15.47±0.50 g/dl) of lions in present study was higher than those reported by Larsson *et al.*, 2015 (14.11±1.63 g/dl) and Hawkey and Hart, 1986 (13.8 ± 0.9 g/dl), however, the valuesin our study were lower than those reported by Currier and Russeli (1982) and Christi *et al.* (1998) in captive lions who have reported Hb values in lions to be 17.8 g/dl and 16.35±0.8 g/dl, respectively.

The value of PCV was significantly ($p<0.05$) higher in captive lions of NVJS as compared to the values of MBZ

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Table 1

Haematological parameters in captive lions housed in 03 different zoos of Chattisgarh, INDIA (Mean ± S.E.)

a, b, c – Values with different superscripts differ significantly ($p<0.05$) between different zoos

Zoo	Hb (g/dl)	PCV (%)	TEC ($\times10^6$/µl)	TLC ($\times10^3$/µl)	Neutrophil (%)	Lymphocyte (%)	Eosinophil (%)	Monocyte (%)	Basophil (%)
MBZ	15.33±1.13	40.10±0.86^a	7.25±0.62^a	10.93±1.03	73.50±1.93^a	19.25±2.28	2.75±0.25	2.50±0.28	3.00±0.41^a
NVJS	16.22±0.36	42.9±0.38^b	8.87±0.31^b	11.96±1.26	66.25±2.01^b	23.75±2.28	3.00±0.41	2.25±0.25	4.25±0.25^b
KPZ	14.87±1.02	39.25±0.77^a	6.2±0.10^c	10.20±0.81	64.25±0.85^b	25.50±0.64	3.25±0.63	2.25±0.25	3.75±0.25^{ab}
Overall Mean	15.47±0.50	40.75±0.59	7.44±0.38	11.03±0.59	68±1.49	22.83±1.27	3±0.25	2.33±0.14	3.67±0.22
p Value	0.584	0.013	0.027	0.520	0.009	0.109	0.748	0.748	0.055

and KPZ. The present findings of overall mean PCV value (40.75±0.59 %) of captive lions are lower than those reported by Currier and Russeli (1982) (41.8 %), Christi *et al.* (1998) (42.7±4.77 %) and Larsson *et al.* (2015) (42.38±4.73 %).

The value of TEC in NVJS was significantly ($p<0.05$) higher than the value of MBZ and KPZ. However, the value of TEC in MBZ was significantly ($p<0.05$) higher than the value of KPZ. The present findings of overall mean TEC value (7.44±0.38 x106/µl) of lion are higher than those reported by Christi *et al.* (1998) (6.06±0.38×106/µl). However, TEC value is lower than those reported by Currier and Russeli (1982) (10.25 × 106/µl), Hawkey and Hart (1986) (8±0.8 × 106/µl) and Larsson *et al.* (2015) (8.97±1.43 × 106/µl).

The variation in hematocrit values (Hb, PCV and TEC) observed in our study could be caused by splenic concentration in response to excitement during handling of lions inside squeeze cage. Such variations in hematocrit have also been reported by Currier and Russeli (1982) in Mountain lions. The higher value of TEC may possibly be due to the general trend as the RBC size decreases as the numbers increase in adult animals (Schalm *et al.*, 1975).

There was no significant ($p>0.05$) difference among the values of TLC in MBZ, NVJS and KPZ. The present findings in respect to overall mean TLC values in captive lions (11.03±0.59 × 103/µl) are in accordance with those reported by Hawkey and Hart (1986) whereas these values are higher than those reported by Currier and Russeli (1982) and Larsson *et al.* (2015).

The value of neutrophils of MBZ was significantly ($p<0.05$) higher than the values reported in NVJS and KPZ, whereas, the values of neutrophils in NVJS were non-significantly ($p>0.05$) higher than the values in KPZ. The overall mean value of neutrophils (68±1.49 %) in present study is in accordance with the findings of Christi *et al.* (1998). The value of mean neutrophils (%) in our study is higher than those reported by Currier and Russeli, 1982 (60.7%), whereas, the values of neutrophil are lower than those reported by Hawkey and Hart (1986), Kinge *et al.* (2010) and Larsson *et al.* (2015).

There was no significant ($p>0.05$) difference among the values of lymphocyte in captive lions of MBZ, NVJS and KPZ. The overall mean values of lymphocytes obtained in present study (22.83±1.27 %) are in accordance with the value of Christi *et al.* (1998). However, the values are higher than those reported by Hawkey and Hart (1986), Kinge *et al.* (2010) and Larsson *et al.* (2015). In contrast to our findings, the values of lymphocytes (%) in lions have been reported by Currier and Russeli, (1982).

There was no significant difference ($p>0.05$) among the values of eosinophil in captive lions of MBZ, NVJS and KPZ. The overall mean values of eosinophils (3±0.25 %) in captive lions of 03 different zoos are in accordance with the values reported by Larsson *et al.* (2015). However, the values are higher than those reported by Currier and Russeli, (1982), Hawkey and Hart (1986) and Kinge *et al.* (2010). The values of eosinophils (%) recorded in present study are lower than those reported by Christi *et al.* (1998).

There was no significant ($p>0.05$) difference among the values of monocytes in captive lions of MBZ, NVJS and KPZ.The overall mean value of monocytes in captive lions of 03 different zoos was 2.33±0.14 % which is higher than those reported by Currier and Russeli (1982), Hawkey and Hart (1986) and Christi *et al.* (1998). However, the value of monocyte in present study is lower than those reported by Kinge *et al.* (2010).

The mean value of basophils in captive lions of NVJS was significantly ($p<0.05$) higher than the value of MBZ but non-significantly ($p>0.05$) higher than the mean value of KPZ. The overall mean value of basophils in captive lions of 03 different zoos was 3.67±0.22 %. The values of basophils in present study are similar to those reported by Larsson *et al.* (2015).

An overall analysis of DLC revealed that the higher value of neutrophil and lower value of lymphocyte in captive lions under study might be due to stress in these animals during blood collection. However, the leucocytes showed slight variation in parameters. Similar, findings in relation of DLC values have been reported by other workers in captive lions (Dunbar *et al.*, 1997). The slight changes observed in haematological values of present study as compared to earlier reports might be due to influence of varying levels of stress, physical exertion, dehydration and differences in health status of animals under study.

CONCLUSION

The findings of present study have provided a preliminary baseline data on haematological parameters in captive lions which can prove to be useful indiagnostic investigations in captive lions in future. Future studies need to be conducted with some additional parameters and large sample sizes to arrive at more specific ranges for captive lions and also to eliminate any other differences arising out of physiological or ecological conditions.

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