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EFFECT OF AGE AND SEX ON SOME BLOOD BIOCHEMICAL PARAMETERS OF APPARENTLY HEALTHY SMALL RUMINANTS OF CENTRAL ODISHA, INDIA.

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ABSTRACT

To report and compare the hematological and serum biochemical profile of Black Bengal goat and Koraput sheep from Angul district in central odisha, India. One hundred and twenty five blood samples (97 Black Bengal goat and Koraput 28 sheep) were collected and their blood glucose, hemoglobin and serum biochemical parameters, cholesterol, aspartate transaminase (AST), alanine aminotransferase (ALT) and lactate dehydrogenase (LDH) were determined by using spectrophotometer. Parameters were compared between Black Bengal goat and Koraput sheep. It was observed that glucose (P=0.001), LDH (P=0.001) and ALT (P=0.001) concentrations differed significantly between Koraput sheep and Black Bengal goats. The studied parameters were compared between buck and Black Bengal goats and also between young Black Bengal goats (less than 12 months old) and adults (more than 12 months old). It was found that age and gender did not affect these hematological and serum biochemical parameters. It can be concluded that Koraput sheep have overall higher values than Black Bengal goats for studied hematological and serum biochemical parameters.

KEYWORDS: Hematology, Serum biochemistry Koraput Sheep, Black Bengal Goat, Age, Sex, Central Odisha.

INTRODUCTION

Odisha is the 10th largest State of Indian Union based on land area. It is situated in the eastern coast of India between 17°48' – 22°34' North latitude and 81°24 – 87°24' East longitude. Of the 15.67 million hectares of landmass 36.7 per cent is forest, 50.74 per cent cultivable area

and 4.41 per cent is permanent pasture. It is rich in natural resources and very rich in biodiversity.

The human population of the state was 36.7 million in 2001. There are 62 ethnic tribal groups (Adivasis) in the state who belong to Austro-Asiatic, Dravidian, Indo-Aryan and mixed groups. Odisha has a very high proportion of Scheduled Tribes (STs) and Scheduled Castes (SCs). They together, account for 38.3 per cent of the total population of the state; of which STs accounted for 22.1 and SCs 16.2 per cent of the total population. Of the total population, 72.3 per cent live in rural Orissa and 64.7 per cent of them are agricultural workers.

Livestock constitutes an integral part of livelihood systems. In many parts of Odisha livestock farming is traditional subsistence strategy compatible with local natural resources. It is an important source of income for poor and marginalised groups of farmers. Improvement of livestock breeds, therefore, is one of the major thrust areas to increase production, maintain sustainability and improve economic growth.

Seventy percent of population is rural in Odisha province and livestock is the major source of income. The role of livestock in rural economy may be realized from the fact that 30–35 million rural population is engaged in livestock raising, having household holdings of 2–3 cattle/buffalo and 5–6 sheep/goat per family which helps them to derive 30–40 percent of their income from it.[1],[2] In semi-arid and arid areas, goat and sheep provide the main means of survival and security. In these situations, the sale of animals, milk and manure accounts for about 27.2%–30.7%, 19.7%–84.8% and 1.0%–4.5% of total farm income, respectively.[3]

Blood is an important and reliable medium for assessing the health status of individual animal.[4] Variations in blood parameters of animals are due to several factors such as altitude, feeding level, age, sex, breed, diurnal and seasonal variation, temperature and physiological status of animals.[5] Hematological and serum biochemical tests are widely used for the diagnosis of serious animal diseases which can lead to economic losses in animals like reduced fur, wool and milk production.[6]

As limited information is available regarding the hematological and serum biochemical profile of small ruminants in, India, the aim of the present study was to provide and compare the data regarding hematology and serum biochemical profile of Koraput sheep and Black

Bengal goat from Central Odisha, India and to report the effect of age and sex, if any, on hematological and serum biochemical profile of Black Bengal goats.

MATERIALS AND METHOD

One hundred and twenty five blood samples (97 Black Bengal goats and 28 Koraput sheep) were collected from randomly selected herds located in Angul district of Odisha,. No diseased animal was intentionally included in the study. Blood was collected from the jugular vein of the animals by using disposable syringe with needle. The collected blood was immediately preserved in 10 mL Eppendorf tubes containing 100 µL of 0.5 M ethylene diamine tetraacetic acid (EDTA). Preserved blood samples were brought to Laboratory at the Dept. of Zoology, Angul Mahila Mahavidyalaya, Angul, where they were further processed.

Quantitative analysis of hematological (glucose, hemoglobin) and plasma biochemical [lactate dehydrogenase (LDH), alanine aminotransferase (ALT), aspartate aminotransferase (AST), cholesterol] parameters was done by Metertek SP-8SO spectrophotometer (Korea) and by using kits manufactured by Randox LTD Laboratories (UK) following Shahnawaz *et al*[38], Zulfiqar *et al*[40] and Khan *et al.*[22]

Statistical package Mini Tab (Version 16) was used for statistical analysis. All the values were expressed as mean ± standard deviation (SD). One way ANOVA was applied to compare various hematological (glucose and hemoglobin) and serum biochemical parameters (ALT, AST, LDH and cholesterol) between goat and sheep. These parameters were also calculated to determine the effect of age and gender on them in goat blood samples.

RESULT

Blood and serum parameters, including glucose, hemoglobin, cholesterol, ALT, AST and LDH, in Koraput sheep and Black Bengal goat blood samples were measured. The comparison of these hematological and serum biochemical parameters of Koraput sheep and Black Bengal goat was given in (Table 1). Glucose concentrations highly significantly (P=0.001) varied between Koraput sheep and Black Bengal goats with Black Bengal goats having higher blood glucose level than Koraput sheep. LDH and ALT levels between Koraput sheep and Black Bengal goats also showed statistically significant differences. Comparison of all other parameters between these Black Bengal goats and Koraput sheep revealed statistically non significant differences (Table 1).

Table 1. Comparison of blood/serum biochemical parameters between Bengal goat and Koraput sheep samples.

		Bengal Goat(n==97)		Koraput sheep (n=28)	
Parameters	**Mean±SD**		**Range**	**Mean±SD**	**Range**
Glucose (mg/dL)	70.6±8.6		49.0-91.0	63.08±14.0	42.0-77.0
Cholestrol (mg/dL)	72..0±21.0		40.1-127.3	98.58±14.8	68.1-98.5
Haemoglobin (g/dL)	7.9±1.0		5.6-9.9	8.18±1.6	5.3-9.0
LDH (U/L)	304.2±143.0		152.0-1 006.0	583.89±83.6	479.0-705.0
AST (U/L)	123.38±21.8		78.0-178.0	103.29±28.0	82.0-144.0
ALT (U/L)	77.1±74.2		15.0-313.0	30.48±18.0	12.0-57.0

***: P<0.001 compared toBlack Bengal goat.

Table: 2. Effect of gender and age on blood/serum biochemical parameters in Black Bengal goats.

Parameters	**Male (n=29)**		**Female (n=69)**		**Upto 12 months (n=36)**		**More than 12 months (n=62)**	
	MeanS±D	**Range**	**Mean±SD**	**Range**	**Mean±SD**	**Range**	**MeanS±D**	**Range**
Glucose (mg/dL)	76.8± 6. 6	68.0-91.0	68.1±8.1	49.0-85.0	73.0±7.8	60.0-91.0	69.38±.8	49.0-85.0
Cholestrol (mg/dL)	70.1±26.0	40.2-127.3	73.01±9.2	41.6-126.6	79.722±.8	55.5-127.3	68.1±19.2	40.2-122.9
Haemoglobin (g/dL)	8.1±1.2	5.6-9.9	7.81±.0	6.0-9.7	7.90±.9	5.6-8.9	7.9±1.1	5.9-9.9
LDH (U/L)	281.28±79.8	156.0-427.0	313.3±161.5	152.0-1006.0	317.39±6.5	180.0-516.0	297.3±163.7	152.0-1006.0
AST (U/L)	122.03±0.6	78.0-178.0	123. ±818.1	93.0-170.0	127.52±3.5	78.0-178.0	121.02±0.9	80.0-170.0
ALT (U/L)	84.310±3.6	16.0-313.0	74.5±62.5	20.0-306.0	92.7±98.7	15.0-313.0	69.359±.3	20.0-306.0

The differences in the values of theses parameters between male and female Black Bengal goats, goats upto 12 months and more than 12 months are not statistically significant.

Black Bengal Goat samples were divided, on the basis of their gender, into two groups and blood parameters were compared between Black Bengal buck and Black Bengal goats. The values of various parameters were different between them but the differences did not reach the statistical significance (Table 2).

Black Bengal Goats (*n*=97) were also divided into two groups on the basis of their age in order to compare the blood parameters between young (less than one year old) and adult

(more than one year old) animals. Comparison of these parameters between two age groups revealed that the differences, although present, were statistically non-significant (Table 2).


Black Bengal goat breed female (Doe) and male (Duck).


Koraput /Dharamagada Sheep (EWE). **Koraput Sheep (RAM).**

DISSCUSSION

Hemoglobin is the iron-containing oxygen-transporting protein in the red blood cells of vertebrates. The deficiency of hemoglobin in the red blood cells decreases blood oxygen-carrying capacity leading to symptoms of anemia.[10] Blood hemoglobin level was slightly higher in sheep (8.1±1.6) than goat (7.9±1.0) but the difference was not statistically significant (P=0.36). Similar observations were reported by Ramprabhu *et al*[37] and Devendran *et al*[13] who have reported higher hemoglobin values in Coimbatore sheep (9.53±0.36 g/dL) than in Kanni goat (8.45±0.03 g/dL). Jawasreh *et al*[12] have reported higher hemoglobin concentration in Awassi sheep (10.4±0.2 g/dL) than our reported values but several factors including animal strains, gender, geographical distribution, parasitic infestation and health conditions can affect the hemoglobin levels.[4] Hemoglobin values were almost the same for bucks (8.1±1.2 g/dL) and goats (7.8±1.0 g/dL). Similar observation was

reported by Egbe-Nwiyi *et al*[15] There was also no effect of age on hemoglobin values in the present study. This finding is in agreement with Piccione *et al*[35] and Perez*et al.*[34]

The value of blood glucose (mg/dL) was higher in case of Black Bengal goat (70.6±8.6) than that of Koraput sheep (63.0±14.0) and the difference was statistically significant. Ramprabhu *et al*[37] have reported lower blood glucose values in Kanni goat (47.00±0.53 mg/dL) while Perez *et al*[34] reported higher blood glucose concentration in wild goat (126.1±66.0 mg/dL) than the values reported in the present study. The difference in glucose concentration is because of levels of nutrition and the metabolic activity of individual animal.[12]

ALT is an enzyme found in the highest amount in liver and typically used to detect liver injury.[16] ALT values for Black Bengal goat were higher (77.1±74.2 U/L) than those of Koraput sheep (30.4±18.0 U/L) and the difference was highly statistically significant. Our values are higher than those reported by Daramola *et al*[10] (8.9±0.9 U/L) for Black Bengal goats. Lower ALT values, than one we presented, were reported by Miloslav *et al*[27] in west African sheep (10.0±1.1 U/L) while studies reported by Mostaghni *et al*[28] in wild sheep (29.15±3.20 U/L) and by Perez *et al*[34] in wild goat (48.4±52.3 U/L) demonstrated higher/or comparable ALT concentration to the present study indicating a great variation in ALT levels among different small ruminants having different geographical distribution.

AST is an enzyme abundantly found in liver and heart muscles and plays an important role in amino acid metabolism[20] There was no significant difference in AST levels among Black Bengal goats (123.3±21.8 U/L) and Koraput sheep (103.2±28.0 U/L) during the present study. AST values have been reported in Koraput sheep and Black Bengal goats by several other studies with variable levels indicating that this enzyme concentration varies with the species and strains of small ruminants. Daramola *et al*[10] reported (20.9±1.2 U/L) of AST in west African dwarf goat which is lower than those reported by us, while Perez *et al*[34] have reported (235.3±212.4 U/L) AST in wild goats which are significantly higher than our reported values.

Cholestrol concentration (mg/dL) was higher in case of Koraput sheep (98.5±14.8) than in Black Bengal goat (72.0±21.0) but the difference was not statistically significant. Similar high cholesterol in sheep was reported by Devendra *et al*[13] in Coimbatore sheep (81.81±5.17) and Jawasreh *et al*[12] for Awassi sheep (87.00±3.40). Comparable results in

goat are reported by Ramprabhu *et al*[37] (59.50±1.30) in Kanni goats and by Perez *et al*[34] in wild goat (53.00±21.80).

LDH is an enzyme that catalyzes conversion of lactate into pyruvate which is an important step in energy production in cell. Increased activity of LDH is probably due to vascular thrombosis, hemorrhage and tissue breakdown especially in liver and kidney of infected animals.[21] The value of LDH is higher in case of Koraput sheep (583.8±83.6) than those of Black Bengal goats (304.2±143.0) and this difference is statistically highly significant (*P*=0.001). Similar observation was made by Mostaghni *et al*[28] in wild sheep. There was no effect of age or gender on serum LDH levels and these results are in agreement with Perez *et al.*[34]

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