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Studies on the mixed blood parasites infection of sirohi and beetal goats and its associated risk factors for hemato biochemical changes

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Abstract

Scattered mortality, loss of weight, lethargy and dry skin were reported from a goat unit of Sirohi and Beetal, 65 in number, in an organized livestock farm, in Jamdoli, Jaipur. Based on the clinical signs, 36 adult goats were subjected for blood smear examination and hemato biochemical studies. The blood smear examination revealed mixed infection of Theileria and Babesia species in all 36 examined goats. The blood smear examination of all the 36 blood samples revealed Theileria and Babesia Sp infection and these samples revealed low levels of hemoglobin values, WBC count, hematocrit values, platelets and elevated MCV & MCH values. Biochemical studies of the infected blood samples revealed elevated SGOT and SGPT values. The alterations in blood parameters occurred in the infected goat population varied. The associated risk factors for the causation of this mixed parasitic infections and changes in the hematology and biochemical parameters could be due to changes in the climates or seasonal variations, pathogenicity of the blood parasites attacked the goat population, and the vector population in the roaming areas or in the pasture lands.

Keywords: Mixed infection-babesia-theileria-hemato bio-chemical

Introduction

The changing pattern of demand for livestock and its products are in increasing trend in India. The rural poor benefitted to a larger extent by rearing goat, since the investment for the establishment of goat units limited. Goat milk is easily digestible, hence in use for children in rural pockets in India. Goat meat is preferred since there is no religious taboos against its consumption in India. The disease problems in the small ruminants are a major hurdle in better economic return in livestock industry and it needs better intervention in management by controlling infectious and contagious diseases including tick borne diseases. (Aravind Kumar *et al* 2010) [5]. The livestock sector *i.e* cattle, sheep and goats remains an extraordinary food source for the rapidly growing human population in all countries (Snorre Stuen 2020) [24]. Sheep and goats are raised for meat, milk, hide and wool purposes with particular resistance to extreme and drought (Akinmoladun *et al.*, 2019; Devendra, 2001) [4, 11]. Ticks and tick borne have been considered as one of the major health challenges for the small ruminant production in the tropics and subtropics (de la Fuente *et al* 2008; Uilenberg, 2006) [12, 27]. Incidence of these infections has been influenced by climatic changes, the movements of tick vectors, international migration and globalization (Miriam Pfalle *et al* 2013) [19]. Soosaraei *et al* (2020) [25] reported a prevalence rate of 39% in Iran in sheep and goat population. Mohammed and Idoko (2012) [18] reported that 24.7% of the goats were positive for hemoparasites in Nigeria. Maryam Rahravani *et al* (2023) [15] reported the prevalence of Theileriosis and Babesiosis in Iran in sheep and goats with mixed infection status of *T. ovis* and *A. ovis* with body temperature and mixed infection of *T. ovis* and *B. ovis* with increased heart rate. Scattered mortality among goat population reported from this farm and hence a detailed study was carried out to ascertain the associated risk factors for the causation of the infection of the goat populations in this organized goat farm.

Materials and Methods

Goats blood sample collection

A total number of 36 goats' *i.e* 18 Sirohi and 18 Beetal, out of 65 goats were screened for their blood parasite infections in Jaipur city in an organized goat farm. Both breeds were in one locality and are reared in one flock. All the goats maintained in partial semi intensive system of rearing. The animals were vaccinated for H.S, BQ and FMD and dewormed regularly. Attempt to confirm the prevalence of ticks were unsuccessful.

Clinical examination of the goats

All the goats were subjected to careful clinical examination and majority of the goats revealed temperature, anorexia, pale mucus membrane of the eyes, lymphadenopathy, dry skin, and were lethargic.

Blood smear examination and biochemical studies of the ailing goats

Blood smear examination and biochemical parameters were carried out for the blood samples.

Results

The blood smear examination revealed the mixed infection for Theileria and Babesia Sp. (Fig1-3) in all the 36 goat blood samples. The hematology and biochemical studies revealed changes in blood parameters and in biochemical values (Table). In hematology decreased values of Hb, WBCs, hematocrit, platelets, RBC count, and elevated MCV and MCH were observed. In biochemical studies SGPT and SGOT levels were elevated.

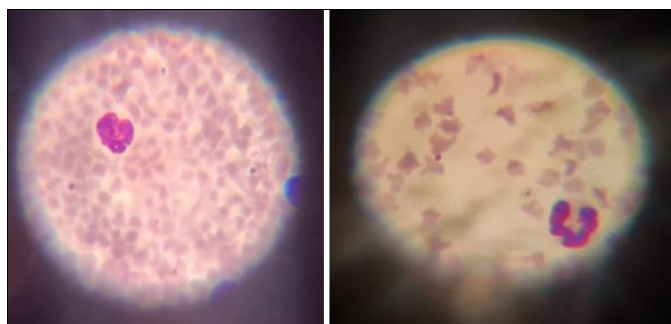


Fig 1, 2: Babesia Sp. Extra erythrocytic



Fig 3: Theileria Sp. intra & extra erythrocytic

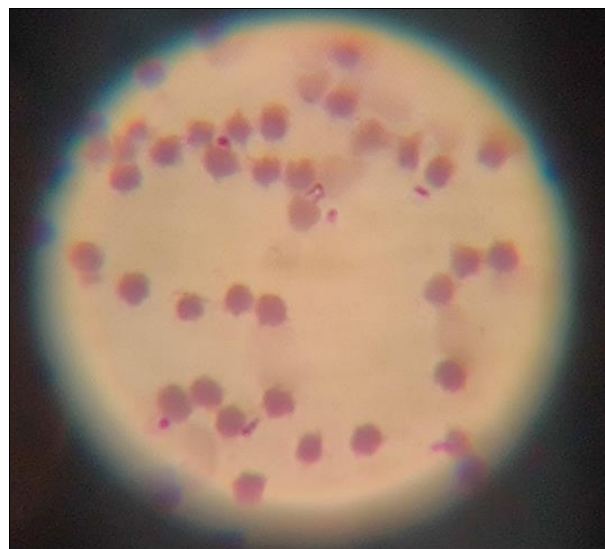


Fig 4: Mixed infection of Theileria & Babesia Sp.

Hematology

Blood parameters studied	Infected goat	Normal values
Hemoglobin (Hb)	2.3	10.1-16.1 g/dl
White Blood Count (TLC)	5100	5.6-12.1 thou/mm ³
Hematocrit (HCT)	2.5	27-43%
Red Cell Count (TRBC)	0.58	6.0-10.4 million/mm
Mean corpuscular volume (MCV)	43.8	37-59 fl
Mean corpuscular hemoglobin (MCH)	39.3	13.7-18.2 pg
Platelets count	891000	117 – 256 thou/mm ³

Biochemical tests

Liver function tests

Total bilirubin	0.10	0.1-6.2 mg/dl
SGOT	67.08	5-40 U/L
SGPT	70.12	7-56 U/L
Total protein	5.78	5.6-7.6 g/dl
Albumin	2.63	2.6-4.1 g/dl
Globulin	2.20	2.6-4.0 g/dl
A/G ratio	0.43	

Renal function tests

BUN	15.11	11-27 mg/dl
Serum creatinine	0.87	0.4-2.2 mg/dl
Serum uric acid	0.13	0.1-0.6 mg/dl
Sodium	130.11	128-142 mmol/L
Potassium	3.03	2.9-4.6 mmol/L
Chloride	104.10	98-109 mmol/L
Phosphorus	2.01	1.5-4.7 mg/dl

Associated risk factors

Mohammed and Idoko (2012) [18] reported that the goats under peri-domestic free roaming system infected more because of tick vectors. Dipeolu *et al* (1983) [13] reported the infection rates of blood parasites varies according to the climatic variations and suggested more infection rates in rainy season and low infection rates in dry seasons. Akande *et al* (2010) [3] reported more blood parasites infection in goat population in association with gastrointestinal parasites. Bishop *et al* (2004) [8] reported mild pathology with *T.ovis* infection in goat population than the infection with *T.lestouardi*, a most pathogenic one in small ruminants.

Discussion

Changes in climate and the environment have led to the expansion of the tick vectors, increasing the risk of tick borne diseases with veterinary significance. (Bouchard *et al* 2019)^[9]. Livestock are highly susceptible to a number of tick borne diseases which inflict several harsh consequences such as anemia, emaciation, loss of weight and productivity, abortion and death (Nighat Perveen *et al* 2021)^[16]. In this study also sporadic death of 4 goats were recorded within a month period due to severe anemia, emaciation and loss of weight and out of 36 goats tested for clinical signs, majority were observed with emaciation, fever, pale mucus membrane of the eyes, dryness of the skin and weight loss. Aravind kumar *et al* (2010)^[5] reported decreased values of Hb, PCV, TEC, MCV, MCH and platelets and were attributed to higher infection rate by ticks and the biochemical parameters showed elevated total protein, globulin, albumin, A/G ratio, glucose, bilirubin and AST. Hadadazadeh *et al* (2002)^[14] and Abdalla *et al* (2020)^[11] reported decreased red cell count, hematocrit, and MCV and Hb concentration in infected sheep.

Maryam Rahravani *et al* (2023)^[15] reported altered WBC count with *T. ovis* and *A. ovis* infection, and altered RBC count with *T. ovis* and *B. ovis* infection and further reported altered MCV, MCH and Hb levels in all hemoparasites infection of small ruminants in Iran. Rajendran and Hafeez (2003)^[23] and Padmaja *et al* (2006)^[20] reported decreased levels of total serum protein, albumin, glucose, bilirubin, and AST. Dalpati *et al* (1997)^[10] reported decreased glucose, serum protein, calcium, phosphorus levels in tick infected goats.

Adejinmi *et al* (2004)^[2] reported more than 50% of the infected sheep population with severe anemia associated with mixed infections involving Anaplasma, Eperythrozoon and Babesia spp in Nigeria and reported that the PCV, Hb concentrations, RBC, and WBC counts were observed to be significantly low in animals with mixed hemoparasitic infection. This information coincides with the observations of this study. The blood smear examination of all the 36 blood samples revealed Theileria and Babesia Sp infection in this study and these infected blood samples revealed low levels of hemoglobin values, WBC count, hematocrit values, & elevated MCH, MCV, platelets values. Bath P M, & Butterworth RJ (1996)^[6] reported the increased production of platelets in cattle theileriosis due to megakaryocytic hyperplasia attributed to regenerative thrombocytopenia which is in agreement with the present finding. Biochemical examination of the infected blood samples revealed elevated values for SGOT and SGPT in this studies. Radostits *et al* (2008)^[22] reported low level of RBC, Hb, PCV, and TEC due to toxic metabolites of Theileria infection. Bakheit and Latif (2002)^[7] reported that the rate of WBC reduction was lower in Kenana cattle of Sudan due to their capacity to limit the macro-schizont replication which occurs in the Theileria infected lymphoid tissues. Nilima *et al* (2022)^[17] reported elevated values of AST due to liver damage and muscular necrosis in Theileria infected cattle. Talkhan *et al* (2010)^[26] reported increased levels of ALT and AST in *Babesia bigemina* infection in cattle due to hepatic cell degeneration.

The alterations in blood parameters occurred in this infected caprine population varied which were reported by many authors as stated above. The attributed reasons for the causation of this mixed parasitic infections and changes in the hematology and biochemical changes could be due to changes in the climates or seasonal variations, pathogenicity of the

blood parasites attacked the goat population, and the vector population in the roaming areas or in the pasture lands.

Conclusion

Mixed infection of Theileria and Babesia Sp was diagnosed in a goat unit of Sirohi and Beetal in an organized farm by hematology and biochemical studies. This study emphasizes the need for detailed studies on the harmful effects of ticks on goat population and their economic impact, thereby to minimize the economic loss incurred by the goat farming community.

Conflict of Interest

Not available

Financial Support

Not available

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