Indian Journal of Animal Sciences **92** (4): 440–442, April 2022/Short communication
https://doi.org/10.56093/ijans.v92i4.124050

Prevalence of haemoparasites in sheep and goats in tropical climate of Tamil Nadu

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Received: 19 April 2020; Accepted: 27 December 2021

Keywords: Anaplasmosis, Prevalence, Small ruminants, Theileriosis

Sheep and goat rearing are an important source of income for landless poor and the farming community. Uncertain agrarian climate, unpredictable weather, drought, floods, migration of flocks during fodder scarcity and stress leads to increased prevalence of diseases (Saminathan *et al*. 2016). The small ruminants are highly susceptible to tick infestation and tick borne haemoparasitic diseases (TBHD) such as anaplasmosis, babesiosis and theileriosis, however, they are often manifested as sub-clinical infections (Shabana *et al*. 2018). Severe infection results in fever, anaemia, jaundice, anorexia, depression, weight loss, infertility and death (Demessie and Derso 2015). The poor knowledge of farmers on TBHD in small ruminants and their effect on health and reproductive performance is mainly due to sub-clinical infections (Bello *et al*. 2019). Distribution of blood protozoan infection in livestock varies with prevailing climatic conditions, vector population and management practices (Binod *et al*. 2016). Proper understandings of the regional epidemiology of parasitic diseases are essential to implement effective intervention measures (Velusamy *et al*. 2015). There has been paucity of information on the prevalence of haemoparasites in small ruminants, hence the present study was undertaken to investigate the prevalence of haemoparasites in sheep and goats in the tropical climate and their impacts.

Peripheral blood smears (135) were collected, from 95 goats and 40 sheep with clinical signs such as pyrexia, anorexia, pale and icteric conjunctival mucous membrane, haemoglobinuria and lymph node enlargement along with tick infestation for a period of one year from October 2017 to September 2018 in Small Ruminant Medicine Referral Clinic, Veterinary College and Research Institute, Orathanadu. Whole blood and serum were also collected. The peripheral blood smears were stained with Giemsa stain for 30 min after methanol fixation for 1 min and screened for the blood parasites. Haematological analysis was performed by a manual method (Benjamin 2010). Biochemical analysis was carried out by the Auto-analyzer using commercial kits.

In the present study, out of 135 blood smears examined, 61 were positive for haemoprotozoan diseases and formed an overall prevalence 45.18%. This was higher than the previously reported prevalence of 14% in small ruminants in Western parts of Tamil Nadu (Velusamy *et al*. 2015). Out of the 95 goat blood smears screened, 31 (32.63%) were positive for haemoparasites; among these goats, 27 (28.42%) harboured *Anaplasma* spp. and 4 (4.2%) had *Theileria* spp. The prevalence of Anaplasmosis in goat was concomitant with the report of Rajasokappan and Selvaraju (2016), who reported a prevalence of 26.15% in Ramanathapuram district of Tamil Nadu. Among 40 sheep blood smears examined, 28 (70%) showed *Theileria* spp. and 2 (5%) were positive for *Anaplasma* spp. In this study, the prevalence of Theileriosis in sheep was higher than the reported prevalence of *Theileria* spp. in sheep (28% and 13.9%) by blood smear studies in Karur district of Tamil Nadu and Lahore, Pakistan, respectively (Naz *et al*. 2012, Rekha *et al*. 2017). This result showed the high endemicity of theileriosis in sheep in the Cauvery delta region and calls for early interventions.

In this study, the prevalence of haemoprotozoan diseases was higher during monsoon season (65.2%) followed by summer (50%), winter (16%) and autumn season (15.7%) (Table1). Our observations correlate with the previous studies of haemoprotozoan diseases in cattle (Maharana *et al*. 2016, Krishnamurthy *et al*. 2016), who reported that most of the animals suffered during the monsoon and summer season which could possibly be due to the high abundance of vector and stress to animal during these seasons. The prevalence of Anaplasmosis in goats was gradually increasing from January month and peaked around July. Similarly, Theileriosis in sheep was gradually increasing from May and peaked around August and thereafter declined (Fig. 1). A similar trend of Anaplasmosis in cattle was reported by Dharanesha *et al*. (2017) in Mysuru and the surrounding district of Karnataka.

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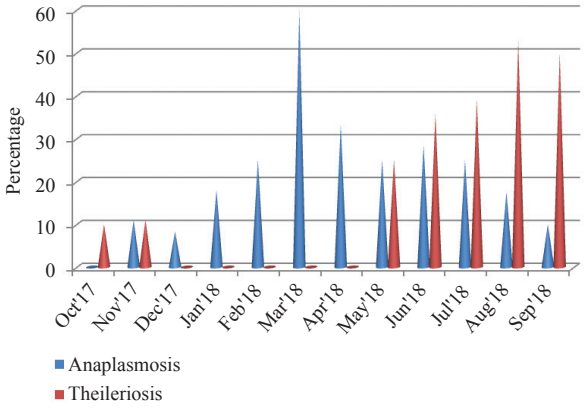

Fig. 1. Month wise prevalence of Anaplasmosis in goat and Theileriosis in sheep.

Age and sex wise, the animals were divided into three groups, viz. 3-6 months, 7 months to 2 yrs and 3-5 yrs. Higher prevalence of Anaplasmosis in female goat and Theileriosis in male sheep was recorded between 7 months to 2 yrs of age (Tables 2, 3). The disease prevalence gradually increased upto 2 yrs and then declined; it might be due to the development of immunity to these parasites in endemic areas (Fig. 1). Haematological analysis showed decreased levels of haemoglobulin, packed cell volume and total erythrocyte counts. There were no biochemical changes except for the elevation of Asparate transaminase enzyme (AST) (Table 4). The elevated level of liver enzyme (AST) was observed in *Theileria* spp. infected sheep only. These results were concomitant with the report of Alam and Nasr (2011), who stated that the elevated AST in Theileriosis infected cattle, was due to liver damage induced by *Theileria* spp. during multiplication.

In conclusion, higher prevalence of Anaplasmosis in goats and Theileriosis in sheep was observed during monsoon season followed by summer months. This study could be useful to predict the occurrence of disease and to forecast and adopt tick control measures to prevent direct and indirect losses associated with tick infestation and tick borne diseases in small ruminants.

Table 1. Seasonal prevalence of haemoprotozoan diseases in small ruminants

Season	Month	No. of samples screened	Anaplasmosis	Theileriosis	No. of samples Positive
Autumn	October	10	-	1	1
	November	9	1	1	2
	Total	19	1	2	3 (15.7%)
Winter	December	12	1	0	1
	January	11	2	-	2
	February	8	2	-	2
	Total	31	5	-	5 (16%)
Summer	March	5	3	-	3
	April	3	1	-	1
	May	8	2	2	4
	Total	16	6	2	8 (50%)
Monsoon	June	14	4	5	9
	July	28	8	10	18
	August	17	3	9	12
	September	10	2	4	6
	Total	69	17	28	45 (65.2%)
	Overall	135	29	32	61 (45.18%)

Table 2. Species wise seasonal prevalence of haemoprotozoan diseases in sheep and goats

Species	Season	Anaplasmosis (%)	Theileriosis (%)	No. of samples positive	Total samples examined	Seasonal prevalence (%)
Goat	Autumn	1 (5.26)	2 (10.52)	3	19	15.78
	Winter	5 (16.12)	-	5	31	16.12
	Summer	6 (46.15	-	6	13	46.15
	Rainy	15 (46.87)	2 (6.25)	17	32	53.12
Total Prevalence (%)		27 (28.42)	4 (4.21)	31	95	32.63
Sheep	Autumn	-	-	-	-	-
	Winter	-	-	-	-	-
	Summer	-	2	2	3	66.6
	Rainy	2 (5.40)	26 (70.27)	28	37	75.67
Total Prevalence (%)		2 (5)	28 (70)	30	40	75

Table 3. Age and sex prevalence of haemoprotozoan diseases in sheep and goats

Sex	3-6 months	7 months – 2 years	3-5 years	Total
Age and sex prevalence of Anaplasmosis in goat				
Male	4 (13) 4.2%	6 (19) 6.3%	3 (9) 3.15%	13 (41) 13.6%
Female	6 (17) 6.3%	8 (25) 8.4%	4 (12) 4.2%	18 (54) 18.9%
Total	10 (30) 10.5%	14 (44) 14.7%	6 (21) 7.3%	31 (95) 32.5%
Age and sex prevalence of Theileriosis in sheep				
Male	6 (8) 15%	12 (16) 30%	5 (6) 12.5%	23 (30) 57.5%
Female	2 (3) 5%	4 (5) 10%	1 (2) 2.5%	7 (10) 17.5%
Total	8 (11) 20%	16 (21) 40%	6 (8) 15%	30 (40) 75%

Table 4. Haemato-biochemical changes in haemoparasitaemic animals

Parameter	Mean ± S.E
Haemogram	
Haemoglobulin (g/dl)	7.0 ± 0.3
Packed cell volume (%)	22 ± 0.8
Total erythrocyte count × 10^6	4.7 ± 0.3
MCV (Pg)	46.8 ± 2.2
MCH (fl)	14.8 ± 1.5
MCHC (g/dl)	31.8 ± 1.8
Serum biochemistry	
Total Protein (g/dl)	6.6 ± 0.2
Albumin (g/dl)	2.7 ± 0.1
Blood urea nitrogen (mg/dl)	29 ± 5.4
Creatinine (mg/dl)	0.7 ± 0.3
Aspartate transaminase (AST) U/L	315 ± 37
Glucose (mg/dl)	85 ± 5.6

S.E, Standard error.

SUMMARY

A total of 135 (95 goat and 40 sheep) Giemsa stained peripheral blood smears were screened for the hemoparasites, of which 61 (45.18%) were positive for haemoprotozoan diseases. Out of 95 goats blood smear screened, 31 (32.63%) were positive for haemoparasites, among this 27 (28.42%) harboured *Anaplasma* spp. and 4 (4.2%) had *Theileria* spp. Among 40 sheep examined, 28 (70%) and 2 (5%) were positive for *Theileria* spp. and *Anaplasma* spp. respectively, and these were highly prevalent during monsoon season (65.2%) followed by summer (50%), winter (16%) and autumn season (15.7%) between 7 months to 2 years of age.

ACKNOWLEDGEMENTS

The authors are thankful to the Dean, Veterinary College and Research Institute, Orathanadu and the Tamil Nadu Veterinary and Animal Sciences University, Chennai, Tamil Nadu for providing the facilities.

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