

Prevalence of Theileriosis in Small Ruminants in Lahore-Pakistan

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ABSTRACT

Theileriosis is an important hemoparasitic disease in small ruminants in Pakistan. A total of 529 animals were selected to determine the prevalence of theileriosis in Lahore, Pakistan. On microscopic examination, 59/529 (11.2%) samples were positive for theileria. The prevalence of *Theileria* spp. was found to be 8.2% and 13.9% in goats (21/256) and sheep (38/273). Age, sex and season had no effect on theileria infection in goat ($p > 0.05$). The prevalence of theileriosis in sheep was affected by age and season ($p < 0.05$) with a trend noticed for gender ($p = 0.013$). Pyrexia was noticed in about 85.71% sheep and 78.95% goat. Further prevalence studies are needed to establish the effect of the risk factors on sheep and goats.

Key Words: Theileria, Sheep, Goat, Prevalence, Epidemiology, Risk Factors

INTRODUCTION

Ovine theileriosis, caused by *Theileria lestoquardi* (*hirci*), *T. ovis* (*recondita*), *T. separate*, is an economically important disease of small ruminants in tropics and subtropics (Jianxung and Hong, 1997; Guo et al., 2002; May and Hasso, 2002). Among these, *Theileria lestoquardi* causes malignant theileriosis in sheep and goats, a severe lymphoproliferative disease with high mortality and morbidity (Maitra et al., 1982; Yin et al., 2003). *T. lestoquardi* is transmitted by ticks belonging to the family *Ixodidae* causing fever, lymphadenopathy, wasting, anemia and jaundice. Acute form of disease is more usual but subacute and chronic form also exists. The disease is enzootic from the North Africa through the Middle East to the India (May and Hasso, 2002; Rao et al., 1991; Sasmal et al., 1981).

Babesiosis and theileriosis are the main tick-borne haemoparasitic diseases of cattle and small ruminants in Pakistan (PARC, 1994-95). In cattle, theileriosis (*T. annulata*) has been extensively studied; however, very

limited information exists regarding ovine theileriosis in small ruminants in Pakistan. Diagnosis of theileriosis is primarily through clinical symptoms and the microscopic examination of blood smears. Therefore, present study was designed to determine the prevalence of *Theileria* in goats and sheep in and around Lahore and also to access the various risk factors responsible for occurrence of disease.

MATERIAL AND METHODS

A total of 529 animals (256 goats and 273 sheep) were selected from herds maintained at different locations in and around Lahore and animals brought for treatment to Diseased Investigation Section, Veterinary Research Institute, Lahore, Pakistan. The study was conducted from November 2005 to October 2006. The animals were clinically examined and their blood samples were microscopically evaluated to determine the prevalence of theileria in stained smear. Body of each animal was searched thoroughly for the presence of ticks.

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Blood sample was collected from ear vein of each animal. Thin blood smear was prepared on grease free glass slide, air-dried, fixed in methanol for 2–3 minutes, stained with Giemsa at a dilution of 5% in PBS for 30 minutes. The stained smears were observed under oil-immersion lens (100x) for the presence of theileria based on morphology as described earlier (Soulsby, 1982; Urquhart et al., 1996; William, 2001). Data obtained was assorted on the basis of age, sex, season and clinical symptoms.

Statistical Analysis

The data collected was assorted in two category based on age (less than 6 month and more than 6 months), sex (male and female), species (sheep and goat), tick infestation (presence or absence). The data regarding the season was divided into four groups, dry hot, wet hot, winter and spring). Association between the presence (positive and negative blood samples) of theileria and various variables as risk factors was assessed by using Chi square (SPSS, Inc, USA). The probability of significance was predetermined at $p < 0.05$.

RESULTS AND DISCUSSION

A total of 529 blood samples (256 from goats and 273 from sheep) were examined for the presence of *Theileria* spp. Blood smears were made and stained with Giemsa and examined under light microscopy for the presence of piroplasm in the erythrocytes of the infected animals.

The prevalence of *Theileria* spp. was found to be 8.2% and 13.9% in goats and sheep, respectively (Table 1). The prevalence of parasite was more ($p < 0.01$) in sheep compared with goat that might be due to the nature of skin. Durrani et al. (2012) also noted that sheep were found to be more susceptible to *T. ovis* than goats. The higher prevalence rate of this parasite in sheep may be attributed to the nature of skin. The goat

has thin skin that seems to be more resistant for the tick compared to sheep. The ticks may easily get entangled in wool of sheep and subsequently may cause infestation. This hypothesis has been also advocated by the fact that no theileria was found in animals that were free of any ticks (Table 2).

In the present study, the prevalence of theileriosis was low (13.9%) in sheep as compared to the prevalence study conducted by Rehman et al. (2010) who reported 16.5% prevalence of theileriosis in the District Okara. This difference might be due to the different geographic location of the both districts. Durrani et al. (2012) also observed that geographical distribution of animals affected the prevalence of the theileria in sheep. An association between the gender and age was observed in the current study. However, Durrani et al. (2011) did not observe any effect of gender and age on the occurrence of theileria in sheep and goat. The overall prevalence rate in both sheep and goats has been found to be 11.20% in the current study. Durrani et al. (2011) also reported 22% and 35% prevalence by microscopic examination and PCR respectively in the same geographical area (Lahore City).

Season has been found as one of the important risk factors that affects the prevalence of this parasite. Our results showed that summer and spring seasons are important risk factors for the prevalence of *Theileria* spp. in sheep and goats (Tables 2 and 3). The prevalence of *Theileria* spp. was variable during different seasons of the year. The prevalence was low during winter season in goat (5.4%; $p = 0.12$) and sheep (2.1%; $p < 0.05$) (Tables 2 and 3). The increase in prevalence during hot seasons could be attributed to tick infestation rate which is influenced by temperature, rainfall and relative humidity (Gosh et al., 2007).

In the current study, the rate of prevalence of the theileria in sheep has been influenced by

age and sex. The tick infestation as a risk factor for the occurrence of this parasite was only found in goat only. This lack of presence of ticks as a risk factor might be due to less number of positive samples. The parasite was equally distributed ($p > 0.05$) in kids and adults in goats, while it was more ($p > 0.05$) in kids than adult sheep (Tables 2

and 3). The prevalence of the parasites was more ($p < 0.05$) in male compared to female in sheep, while gender was not found to be a risk factor in goat (Tables 2 and 3). Similar findings have been reported by Rehman et al., (2010) who recorded the prevalence of 15.8% and 16.6% in *Theileria* spp. in male and female sheep respectively.

Table 1 Prevalence of *Theileria* in sheep and goat

Species	No. of positive	Prevalence %	P value	OR (95% CI)
Sheep (n = 273)	38	13.92%	0.037	1.810 (1.031-3.177)
Goat (n = 256)	21	8.20%		
Total (n = 529)	59	11.20%		

OR= Odds ratio, CI= Confidence interval

Table 2 Prevalence of *Theileria* based on sex, age and seasons in goat

Risk factors	Classification	No. of Positives	Prevalence (%)	P value	OR (95% CI)
Age	<6Month (n = 121)	9	7.44	0.425	0.824(0.334-2.029)
	>6Month (n = 135)	12	8.89		
Sex	Male (n = 165)	13	7.88	0.486	0.887(0.353-2.228)
	Female (n = 91)	8	8.79		
Season	Dry Hot (n = 60)	11	18.33	0.12	
	Wet Hot (n = 75)	16	21.33		
	Winter (n = 37)	2	5.41		
Tick infestation	Spring (n = 74)	9	12.16	0.027	0.900(0.861-0.942)
	Positive (n = 211)	21	9.95		
	Negative (n = 45)	0	0.00		

OR= Odds ratio, CI= Confidence interval

Table 3 Prevalence of *Theileria* based on sex, age and seasons in sheep

Risk factors	Classification	No. of Positives (Prevalence %)	P value	OR (95% CI)
Age	<6Mon. (n = 149)	9(6)	0.001	0.211(0.95-2.465)
	>6Mon. (n = 124)	29(23.4)		
Sex	Male (n = 127)	18(14.10)	0.013	1.04(0.524-2.067)
	Female (n = 146)	20(13.6)		
Season	Dry hot (n = 71)	11(15.5)	0.04	-
	Wet hot (n = 92)	18(19.6)		
	Winter (n = 48)	1(2.1)		
	Spring (n = 63)	8(12.70)		
Tick infestation	Positive (n = 265)	38(14.33)	0.245	0.857(0.815-0.900)
	Negative (n = 8)	0(0.00)		

Mon. = Months, OR= Odds ratio, CI= Confidence interval

Table 4 Frequency of clinical signs observed in goats and sheep

Clinical Signs	Sheep		Goats		P value	OR (95% CI)
	n=28	Prevalence (%)	n=19	Prevalence (%)		
Enlarged superficial lymph nodes	15	53.57	5	26.32	0.05	5.30 (1.56-17.96)
High temperature	24	85.71	15	78.95	0.009	5.20 (1.42-18.94)
Dyspnea	16	57.14	5	26.32	0.002	6.13 (1.80-20.83)
Nasal discharge	6	21.43	4	21.05	0.485	1.63 (0.40-6.57)
Ocular discharge	3	10.71	4	21.05	0.686	0.72 (0.14-3.56)
Salivation	5	17.86	4	21.05	0.716	1.30 (0.31-5.47)
Reduced appetite	24	85.71	13	68.42	0.002	6.92 (1.90-25.22)
Paleness of mucus membranes	22	78.57	10	52.63	0.001	6.60 (2.01-21.66)
Rough body coat	15	53.57	6	31.58	0.013	4.23 (1.31-13.61)

OR= Odds ratio, CI= Confidence interval.

Low prevalence of these parasites in lambs below six month of age could be attributed to transfer of maternal immunity to lambs. This effect could not be observed in goats. However, Jianxung and Hong (1997) reported higher prevalence rate (78-85%) in lambs compared with adults. Clinical signs observed in the animals in the current study were pyrexia, emaciation, dyspnea and swelling of the superficial lymph nodes (Table 4) which are in accordance with study of Hoosmand-Rad and Hawa (1973).

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