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POINT PREVALENCE OF GASTROINTESTINAL PARASITES OF DOMESTIC SHEEP (*OVIS ARIES*) IN DISTRICT SIALKOT, PUNJAB, PAKISTAN

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ABSTRACT

In Pakistan, parasitic infections are among major constraints to animal production. Gastro-intestinal (GI) parasites cause huge economic losses (direct or indirect) to livestock. In Pakistan, distribution and effect of GI parasitism in sheep is not very well studied. The present study was conducted to determine the prevalence of GI parasites in sheep population of Sialkot district, Punjab, Pakistan. To this end, 384 faecal samples were collected directly from the rectum of sheep and examined for faecal egg counts by using a modified McMaster method. The overall prevalence of GI parasites in study district was 32.6%. Prevalence of GI parasites was found to be significantly higher ($P<0.05$) in ewes than rams; however, age and breed was found to be non-significant ($P>0.05$). The endoparasites identified in sheep included *Fasciola (F.) hepatica* (3.1%), *F. gigantica* (5.2%), *Haemonchus contortus* (23.4%), *Eimeria crandallis* (18.2%), *Gongylonema pulchrum* (7.5%), and *Trichostrongylus* sp. (12.2%). Among variables like age, sex and breed (Thalli, Kajli, Fat-tailed and Salt range), only sex was found significant in district Sialkot during autumn 2014. The degree (severity) of GI parasitic infection was also determined from the total faecal egg count and an insignificant difference ($P>0.05$) in the eggs per gram count was determined.

Keywords: Coprological examination, Sheep, Gastro-intestinal parasites, Prevalence, Sialkot.

INTRODUCTION

Pakistan is ranked 11th largest country of the world in sheep production. There are 26.5 million sheep in Pakistan and among these 6.4 million (24%) are raised in Punjab (Anonymous 2013). It is an established fact that parasitic diseases are one of the principal problems in the development of commercial livestock business, the climatic conditions and lack of knowledge of the owners, facilitates conditions for infestation with ecto and endo parasites (Tehmina *et al*. 2014; Raza *et al*. 2014). About 90% sheep population of Pakistan suffers some kind of parasitic disease (Terefe *et al*. 2012; Tehmina *et al*. 2014). Prevalence of gastrointestinal (GI) parasites in small ruminants has been recorded from 26.5 to 91.7% in distinct areas of Pakistan (Farooq *et al*. 2012; Tehmina *et al*. 2014; Raza *et al*. 2014). Among helminths, nematode and trematode parasites of ruminants have worldwide distributions (Rafique *et al*. 2009). The losses in ruminants in Pakistan run into billions of rupees in the form of retarded growth, milk, wool and hair production, death especially in young stock and parasite control measures (Tehmina *et al*. 2014).

The incidence of parasitic infections varies greatly area to area depending on the relative importance of many factors like nutrition status, pasture management, climatic condition, animal immunity and host preference (Radostits *et al*. 2006). However, majority of the animals infested with helminths do not show clinical signs owing to the chronic nature of the disease (Raza *et al*. 2014). For control of parasites in small ruminants especially kept by small farmers, it is better to identify the burden and types of helminths along with specific risk factors associated with helminthosis of the specific area (Ayana and Ifa 2015).

In Pakistan, livestock especially sheep population of certain regions needs to be screened for parasitic infection. No report is available on GI parasites of sheep in Sialkot district, Punjab, Pakistan. This study was, therefore, designed to investigate the magnitude and composition of parasites of sheep in Sialkot district, Punjab, Pakistan.

MATERIALS AND METHODS

Sampling of Sheep: The study was conducted in Sialkot district (32° 30'0" N / 74° 31'0" E) which has three administrative divisions (tehsils) named: (a) Daska, (b) Pasroor and (c) Sialkot. The study animals were included indigenous breeds of sheep prevalent in Sialkot district. The sample size of sheep population for screening parasitic burden was determined using following standard formulae for simple random sampling as given by Thrusfield (2007):

$$N = 1.96^2 P_{exp} (1- P_{exp})/d^2$$

Where; N = required sample size, P_{exp} = expected prevalence, d = desired absolute precision, 1.96^2 = value of 95% confidence interval.

Collection of Faecal Samples: Collection of faeces (n=384) was done during autumn season of the year 2014 using standard protocols given by Soulsby (1982). Briefly, 5 grams of faecal sample collected per rectum in plastic bottles containing formalin in the ratio of 3:1 (3 parts formalin 1 part sample). Plastic bottles were labeled properly with respect to age (young = < 6 months, Adult = > 6 months), sex, breed and location, and transported to the Department of Parasitology, University of Agriculture, Faisalabad (UAF) for further processing using standard protocols. The samples were refrigerated (4°C) till further processing.

Coprological Examination: The collected samples were processed to identify the endo-parasites through standard direct parasitological techniques (flotation and sedimentation) as suggested by Hayat and Akhtar (2000) and Soulsby (1982). Quantitative faecal examination for the assessment of concentration of eggs was performed through "Modified McMaster test". Eggs were identified by ova identification keys. The animals were then categorized as lightly, moderately and highly infected according to their eggs per gram (EPG) counts of faeces. Egg counts from 50-799, 800-1200 and over 1200 per gram of feces were considered as light, moderate and high infection, respectively (Soulsby 1982; Urquhart *et al*. 1996).

Data Analyses: Differences between independent variables (location, breed, sex and age group) with respect to prevalence of GI parasites were explored using Chi-square test (categorical variables). Data was analyzed using SPSS 17.0 software (SPSS Inc. Chicago, USA). Relative prevalence of different parasitic species was calculated as follows:

Prevalence (%) = [Number of positive samples / Total number of samples examined] x 100

RESULTS

The overall prevalence of GI parasites was 32.6% (125/384). Prevalence of GI parasites was found to be significantly higher (P<0.05) in ewes than rams; whereas, age and breed were not significantly associated with the GI parasites in sheep of Sialkot district. Prevalence of GI parasites in all tehsils of district Sialkot was found to be statistically non-significant; whereas, highest prevalence was recorded 35.9% (37/103) in Sialkot tehsil, followed in order by 32.3% (43/133) in Pasroor and 30.4% (45/148) in Daska (Table 1). In all tehsils, variables like age, sex and breed were found non-significant except sex in tehsil Daska. The frequency distribution of GI parasites in district and tehsils of Sialkot has been given in Fig. 1. *Fasciola (F.) hepatica* (3.1%), *F. gigantica* (5.2%), *Haemonchus (H.) contortus* (23.4%), *Eimeria crandallis* (18.2%), *Gongylonema pulchrum* (7.5%), and *Trichostrongylus* sp. (12.2%) were identified from the microscopically scanned faecal samples. In present study, 75.20% of the study population harbour mixed infections. The degree (severity) of GI parasitic infection was determined from the total faecal egg count. A total of 125 faecal samples were subjected to EPG count by using McMaster egg counting chamber. An attempt was also made to see the existence of significant difference in degree of GI parasitic infection with the variation of age, sex and breeds of sheep. However, no significant differences (P>0.05) were found in the EPG count with respect to the given variables (Table 2).

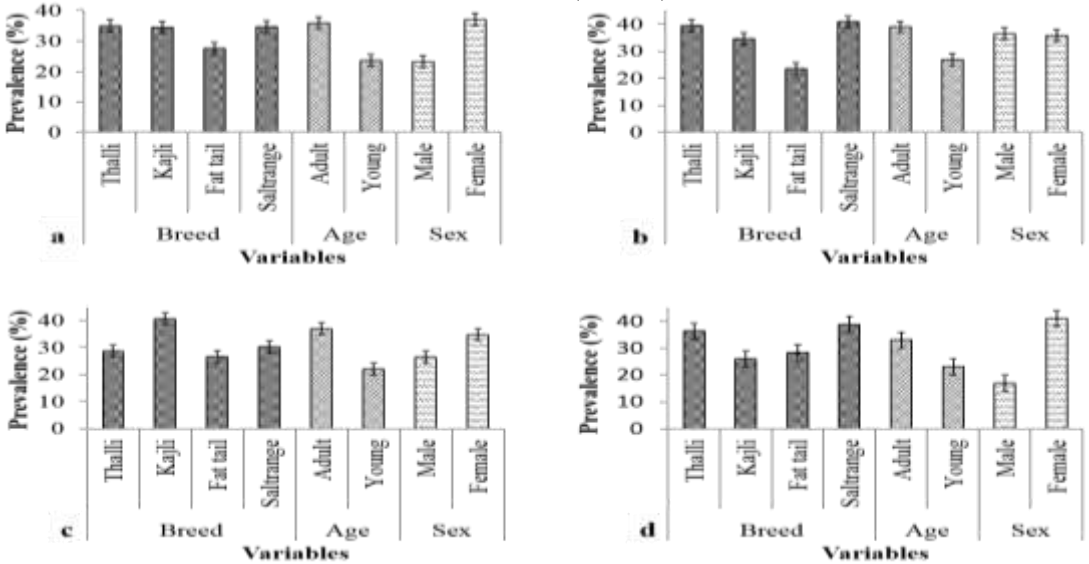

Figure 1. Prevalence of GI parasites in district and tehsils of Sialkot during autumn 2014. a = frequency distribution of GI parasites in district Sialkot. b = frequency distribution of GI parasites in tehsil Sialkot. c = frequency distribution of GI parasites in tehsil Pasroor. d = frequency distribution of GI parasites in tehsil Daska.

Table 1. Association of various risk factors with the distribution of GI parasites in sheep population in tehsils of district Sialkot, Punjab, Pakistan during autumn 2014.

Tehsils	Variable	Level	Positive/ Examined	χ^2	P-value	CI
Daska	Age	Adult	36/109	0.745	0.388	24.69-42.26
		Young	9/39			11.88-38.14
	Sex	Male	11/65	5.482	0.019	09.23-27.50
		Female	34/83			30.78-51.77
	Breed	Thalli	8/22	0.720	0.868	18.53-57.59
		Salt range	7/18			18.86-62.25
		Fat tailed	23/81			19.39-38.92
		Kajli	7/27			12.11-44.68
Pasroor	Age	Adult	34/92	1.565	0.210	27.57-47.16
		Young	9/41			11.27-36.48
	Sex	Male	10/38	0.463	0.495	14.21-41.91
		Female	33/95			25.68-44.71
	Breed	Thalli	8/28	0.819	0.845	14.24-47.14
		Kajli	15/37			25.72-56.79
		Fat tailed	4/15			09.10-52.53
		Salt range	16/53			19.00-43.49
Sialkot	Age	Adult	30/77	0.604	0.436	28.57-50.17
		Young	7/26			12.61-46.14
	Sex	Male	8/22	0.001	0.973	18.53-57.59
		Female	29/81			25.94-46.66
	Breed	Thalli	13/33	0.801	0.849	23.95-56.63
		Kajli	9/26			18.38-54.11
		Fat tailed	4/17			07.96-47.50
		Salt range	11/27			23.62-59.76
District Sialkot	Age	Adult	100/278	2.853	0.091	30.49-41.75
		Young	25/106			16.24-32.36
	Sex	Male	29/125	3.909	0.048	16.43-31.20
		Female	96/259			31.34-43.08
	Breed	Thalli	29/83	0.972	0.808	25.27-45.64
		Kajli	31/91			24.89-44.24
		Fat tailed	31/113			19.81-36.20
		Salt range	34/98			25.77-44.51

Table 2. Degrees of gastrointestinal parasitic infection in relation to age, sex and breed of the sheep population of Sialkot district, Punjab, Pakistan.

Variable	Level	Light	Moderate	High	χ^2	P-value
Age	Adult	38 (38.00%)	43 (43.00%)	19 (19.00%)	0.320	0.852
	Young	08 (32.00%)	12 (48.00%)	05 (20.00%)		
Sex	Male	06 (20.69%)	19 (65.52%)	04 (13.79%)	2.078	0.354
	Female	32 (33.33%)	49 (51.04%)	15 (15.63%)		
Breed	Thalli	08 (27.59%)	13 (44.83%)	08 (27.59%)	4.369,	0.627
	Salt range	05 (16.13%)	20 (64.52%)	06 (19.35%)		
	Fat tailed	10 (32.26%)	14 (45.16%)	07 (22.58%)		
	Kajli	11 (32.35%)	17 (50.00%)	06 (17.65%)		

DISCUSSION

The prevalence of GI parasites recorded in this study was lower than those recorded by Pandit *et al*. (2003) and Raza *et al*. (2007) and similar to those recorded by Nwosu *et al*. (2007) and Lashari and Tasawar (2011). The differences in the prevalence of GI helminths in the present study might be due to seasonal difference and variation in agro-ecology of the study

area. The prevalence of parasites can be influenced by a variety of factors such as: standards of management, grazing habits (e.g. combined grazing of male, female, young and adult animals), economic capacity of the farmers, level of education and irrational use of anthelmintics (Gadahi *et al*. 2009; Lashari and Tasawar 2011).

The results of the present study regarding the sex are in agreement with other reports including Maqsood *et al*. (1996), Urquhart *et al*. (1996) and Dagnachew *et al*. (2011), who found significantly higher infections in females than males. However, some scientists found higher prevalence in rams than in ewes (Raza *et al*. 2007; Tasawar *et al*. 2010). In some studies, male and female animals were found to be equally susceptible to infection with GI parasites (Regassa *et al*. 2006; Ayana and Ifa 2015). Genetic predisposition and variable susceptibility due to hormonal control may also be the factors related to gender which influence the susceptibility of animals to GI parasitic infections. Normally it is assumed that the females are more prone to parasitic infections due to hormonal differences during pre-parturient period and pregnancy (Maqsood *et al*. 1996; Urquhart *et al*. 1996). Testosterone has been reported as an immunosuppressive (Seli and Arici 2002), which presumably, makes males more susceptible for a variety of infectious diseases (Roberts *et al*. 2001).

The higher incidences of GI parasitic infections in adults are in agreement with Tariq *et al*. (2008), Garedaghi *et al*. (2013) and Ayana and Ifa (2015). The higher prevalence in adult animals may be due to the decreased immunity with increased age coupled with the poor management of the animals (Radostits *et al*. 2006). However, the results of Gupta *et al*. (1976), Raza *et al*. (2007) and Tasawar *et al*. (2010) are in contrast with our findings. In some studies it has been found that the adult animals are less susceptible to GI parasitic infections which might be attributable to the development of acquired immunity against parasites due to previous exposures (Knox 2000). Several authors (Tariq *et al*. 2010; Zeryehun 2012) reported that adult animals recover from parasitic infections more quickly than younger ones which might be attributable to the higher immunity of former than later (Dagnachew *et al*. 2011). Ayana and Ifa (2015) reported higher infection in sucklings than in younger and adult animals which might be attributed to a weaker immunological response of younger animals.

A non-significant relationship among breeds of sheep was found by Ayana and Ifa (2015) with a higher prevalence in Kacchi as compared to Lohi breed. Mushtaq and Tasawar (2011) observed higher prevalence in Kacchi breed than Lohi. Tasawar *et al*. (2011) observed higher infection in Lohi breed than Awassi and Hisardale. In Gulf Coast region of the United States Suffolk breed was found to be more susceptible for parasitic infection as compared to gulf coast native breed (Li *et al*. 2001; Wildeus and Zajac 2005). However, in some studies, resistant breeds of sheep were also reported e.g. Hair sheep breed and Bhakarwal breed were found to be more resistant to GI parasites as compared to Wool breeds and local Kashmiri breed (Amarante *et al*. 2004; Tariq *et al*. 2008). The susceptibility of breeds for parasitic infection varies and is genetically determined (Urquhart *et al*. 1996).

Previous studies indicated that different climatic conditions in different locations are important factors for development, multiplication and survival of nematode parasites (Woldemariam 2005) and these could be translated to differences in the risk of acquiring the parasites between animals managed in different locations. In our study, absence of association between location and prevalence in sheep could be due to relative similarity in agro-ecology among study locations and a relatively similar management systems practiced by farming communities as reported earlier by Ayana and Ifa (2015).

The helminths identified in sheep population in the present study were also reported by various scientists from different localities of Pakistan (Raza *et al*. 2007; Gadahi *et al*. 2009; Tasawar *et al*. 2010; Lashari and Tasawar 2011) and other parts of the world (Biu*et al*. 2009: Nigeria; Mohanta *et al*. 2007: Kenya; Dagnachew *et al*. 2011: Ethiopia). The most prevailing parasite determined in the present study was *H. contortus*, which agrees with the findings from Himachal Pradesh, India (Katoch *et al*. 1999), Bokova, Cameroon (Mbuh *et al*. 2008) and Jatoi, Pakistan (Raza *et al*. 2012). The higher prevalence could be related to the fact that *H. contortus* has a comparatively short generation time and lays up to 10,000 eggs per day for several months. Additionally, this parasite is able to develop resistance against anthelmintics faster than other helminth species (Katoch *et al*. 1999). The low coprological prevalence of fasciolosis could be due to the lower number of metacercariae intake by the animals owing to low ambient temperature which is not favourable for the snail which acts as intermediate host of Fasciola (Andrews 1999).

The rate of mixed infection reported in this study is in agreement with the findings of other researchers (Regassa *et al*. 2006; Raza *et al*. 2007; Gadahi *et al*. 2009; Tefera *et al*. 2011; Ibrahim *et al*. 2014). Poly-parasitism has been suggested to be an important cause of morbidity and loss of production in small ruminants (Ibrahim *et al*. 2014). Moreover, the presence of interaction and compromised immune system of the host by poly-parasitism has been described to increase their susceptibility to other diseases or parasites (Wang *et al*. 2006).

Conclusions: Epidemiology is the basis on which control of parasitic infection has to be based. In Sialkot, pastoralist flocks of small ruminants are heavily infested

with a variety of GI parasites including those which potentially entail substantial economic losses. Especially female animals carry a severe parasitic burden, which indicates that particular attention should be paid to their management. The findings of this study are indicative for other small ruminant herds under similar management for the control of parasites.

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