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Frequency Distribution of Fasciolosis in Small Ruminants Population at District Sargodha

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Abstract: The present investigation described some epidemiological aspects of fasciolosis in small ruminant population of district Sargodha, Punjab, Pakistan. Coprological examination of randomly selected sheep (n=2172) and goats (n=2268) was performed in six tehsils of district Sargodha during October, 2011 to September, 2012. The prevalence of disease was significantly higher in female and younger goats as compared to male and adult sheep, respectively. Significant impact of season on the occurrence of disease was noted, being highest during November and lowest in April in sheep while, it was highest in July and lowest in January in goats. The magnitude of disease was significantly higher in grazers followed in order by ground and trough feeders. Prevalence of disease was higher in population provided with river water followed by pond water and tap water. This study will be helpful for the control of disease in small ruminant population of study area.

Key words: Epidemiology · Prevalence · Risk Factors · Small Ruminants · Fasciolosis · Sargodha

INTRODUCTION

Helminths are major obstacles in the growth and development of livestock and have great global economic importance in terms of retarded growth, lowered productivity and mortality [1, 2]. Among helminths, fasciolosis caused by *Fasciola* spp. (Platyhelminthes: Trematoda) is the most common and economically important helminth infection of livestock in Punjab, Pakistan [2]. Fasciolosis is important due to multispecies definitive hosts including livestock, human and wild animals [3]. The most important species includes *F. hepatica* and *F. gigantica* [4]. Among these, *F. hepatica* frequently termed as the "liver fluke" is an important pathogen to livestock around the world [5] that can manifest acute or chronic infections to animals. Resultantly, it can cause hypo-albuminaemia resulting in reduced total protein contents [4]. Chronic fasciolosis can reduce growth rates, feed conversion rate and weight gain and wool production [6]. Fasciola infections cause approximately US$ 3.6 billion economic losses throughout the world [7]. In Pakistan, Ahmad reported US$ 0.36 million economic losses due to liver condemnation and US$ 0.17 million due to weight reduction in small ruminants of district Sargodha [8]. Other factors associated with the economic losses include: decreased wool production, decreased milk yield and reduced fertility [9].

The agro-climatic conditions of Pakistan are presumed very favorable for the propagation of snails which act as the intermediate host for this parasite. The low lying and swampy areas of Punjab like Jhang, Toba Tek Singh, Lahore and Chiniot etc. have been reported highly susceptible to fasciolosis [2]. Variable prevalence of fasciolosis ranging from 17.68%-55.00% in different livestock species has been reported from Pakistan [2, 10-12]. The present investigation is in continuation with our previous studies [2, 8, 12,13] to explore different epidemiological aspects of fasciolosis along with managemental factors in small ruminants of Sargodha, one of the most risky districts of Punjab, Pakistan. The collected information will certainly be useful in future to formulate guidelines for controlling this disease in small ruminants of the study area.

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MATERIALS AND METHODS

Study Area: District Sargodha (32°10′00″N and 72°40′00″E) lying 187 m above the sea level, comprises flat, fertile plains and small hills which comprises of six tehsils (Sargodha, Silanwali, Shahpur, Kot Momin, Sahiwal and Bhalwal). The river Jhelum flows on the western and northern sides and the river Chenab lies on the eastern side of the city. The riverine areas are used as pasture for grazing of livestock. The soil contains alluvial deposits which results in the stagnation of water, being one of the suitable habitats of snails. According to Punjab Development Statistics, total goats and sheep population is 337,941 and 99,874, respectively [14].

Sampling of Animals and Coprological Examination: Selection of experimental population (sheep & goats) was routed through simple random sampling and proportional allocation by using the following formula [15].

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

n = required sample siz; P_{exp} = expected prevalence; d = desired absolute precision

Sample size (370 sheep/goats) from each of six tehsils was calculated by the method of Lauridsen [16] as under:

$$n_k = n\frac{N_k}{N}$$

N_k=Population of each stratum; n = required sample size; N= Total population; n_k= Sample size of each stratum

Faecal samples (n=4440) were collected directly from rectum of sheep and goats reared in six tehsils of district Sargodha during one year span (October 2011 to September 2012). The samples were preserved in wide-mouthed plastic container containing 10% formalin as preservative and labeled properly.

Epidemiological Studies: The cross sectional study was initiated to investigate different epidemiological aspects of fasciolosis in district Sargodha. A complete record of the tehsil, host, breed, species, age, sex, climate and husbandry practices was maintained on a pre-designed questionnaire to determine frequency distribution of the possible determinants influencing the prevalence of fasciolosis [12]. The selected breeds included: Kajli, Lohi, Thalli and Cholistani of sheep (*Ovis aries*) and Beetle, Teddy, Dera Din Pannah and Desi breeds of goats (*Capra hircus*). Three types of feeding (Grazing, Ground, Trough feeding) and three types of watering system (River, Pond, Tap) were scrutinized for their association in the occurrence of disease in small ruminant population.

Statistical Analysis: Data were statistically analyzed by multiple logistic regression. Association between prevalence with its possible influencing determinants was measured by odd's ratio 95% level of confidence and at 0.005 level of significance using SAS statistical software [17].

RESULTS

Our results indicated an overall prevalence of fasciolosis as 33.33% which was significantly higher in goats than sheep. Among the study breeds, Kajli and Beetal breeds of sheep and goat, respectively, were found to be the most susceptible to fasciolosis than other breeds.

Age and sex of hosts were statistically associated with the distribution of fasciolosis in small ruminants of the study district. Female population of both species (Sheep and goat) had higher prevalence rate than male population. The prevalence of fasciolosis was highest in young age group, in both sheep and goats population, after which it decreased gradually with advancement in age in descending order.

Monthly variation of fasciolosis was also observed and found to be highest in November and lowest in April in sheep and highest in July and lowest in January in goat. Figure 1 showed the monthly prevalence of disease and comparison with metrological data of study area.

The nonsignificant trend of fasciolosis prevalence in the selected six tehsils of district Sargodha has been observed.

Tables 1 and 2 summarized the association of various determinants with the frequency distribution of small ruminant fasciolosis in district Sargodha. The higher trend of prevalence was observed in grazers followed by ground and trough feeders. It was observed that prevalence of disease was higher in population provided with river water followed by pond water and tap water.

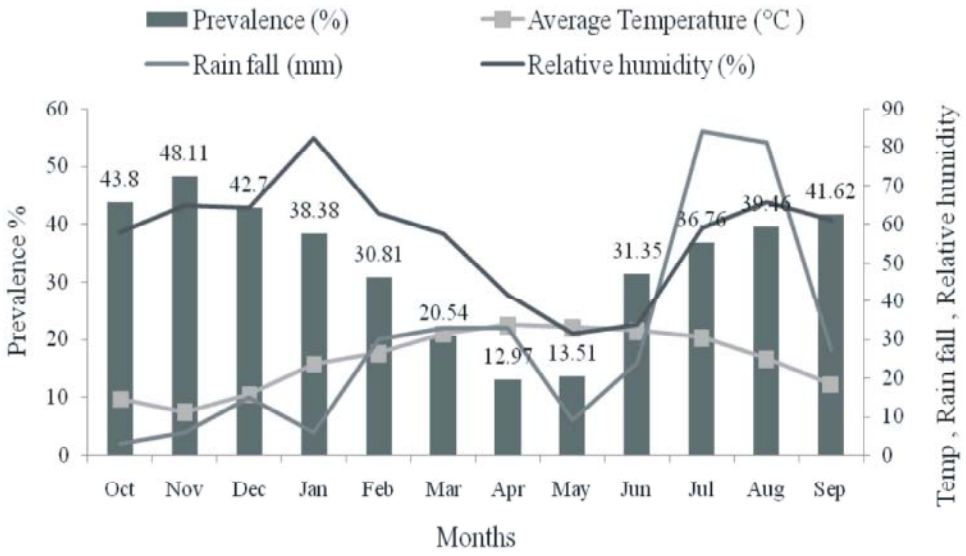

Fig. 1: Monthly Prevalence of Small Ruminant Fasciolosis in Association with the Metrological Data of Sargodha District, Punjab, Pakistan.

Table 1: Prevalence and Associated Determinants of Fasciolosis Infesting Sheep (*Ovis aries*) of Sargodha District

Sheep screened for Fascioliasis (N=2,172)						
Infested animals (n/N) (689/2172)			Prevalence (%) = n/N×100 31.72%			
Associated determinants	Levels	Prevalence (%)	x^2 (P value)	95% C.I. Lower limit	95% C.I. Upper limit	Odds ratio
Sex	Female	52.48 (1140/2172)	23.5913 (<0.005)	47.49	57.71	1.17
	Male	47.51 (1032/2172)		42.58	52.89	
	Young	77.94 (1690/2172)	34.4023 (<0.005)	72.03	82.53	3.18
Age	Adult	22.19 (482/2172)		17.91	27.43	
Breed	Kajli	46.32 (1008/2172)	12.3196 (0.0064)	41.91	51.67	1.09
	Lohi	37.43 (813/2172)		32.67	42.14	
	Thalli	7.90 (172/2172)		2.88	12.91	
	Cholistani	8.24 (179/2172)		3.87	13.47	
Parasite species	*F. hepatica*	24.40 (530/2172)	70.6325 (<0.005)	20.06	31.79	1.71
	F. gigantica	7.32 (159/2172)		2.59	12.69	
Feeding system	Grazing	63.95 (1389/2172)	29.9996 (<0.005)	58.24	68.44	2.37
	Ground	33.79 (734/2172)		28.79	38.89	
	Trough	2.26 (49/2172)		0.69	9.39	
Watering system	River water	61.74 (1340/2172)	28.2102 (<0.005)	56.43	66.63	2.07
	Pond water	34.39 (746/2171)		29.89	39.16	
	Tap water	3.95 (86/2172)		0.87	10.12	
Tehsil	Bhalwal	39.16 (141/360)	14.7484 (0.0086)	34.79	44.82	1.83
	Sargodha	34.13 (127/372)		29.19	39.81	
	Silanwali	33.61 (121/360)		28.11	38.97	
	Sahiwal	32.56 (117/360)		27.75	37.89	
	Shahpur	27.51 (99/360)		22.79	32.54	
	Kot momin	24.16 (87/360)		19.68	29.34	

Table 2: Prevalence and Associated Determinants of Fasciolosis Infesting Goat (*Capra hircus*) of Sargodha District

Goat screened for Fascioliasis (N=2,268)						
Infested animals (n/N) (899/2268)			Prevalence (%) = n/N×100 39.63%			
Associated determinants	Levels	Prevalence (%)	x^2 (P value)	95% C.I. Lower limit	95% C.I. Upper limit	Odds ratio
Sex	Female	41.49 (941/2268)	33.4137 (<0.005)	36.89	46.01	1.39
	Male	30.99 (703/2268)		25.98	35.29	
Age	Young	49.69 (1127/2268)	25.8885 (<0.005)	44.63	54.93	2.89
	Adult	28.79 (653/2268)		23.89	34.13	
Breed	Beetle	46.65 (1059/2268)	24.3608 (<0.005)	41.31	51.07	2.03
	Teddy	37.43 (849/2268)		32.79	42.84	
	Dera Din Pannah	7.89 (179/2268)		2.98	12.81	
	Desi	7.98 (181/2268)		3.27	13.97	
Parasite species	*F. hepatica*	33.15 (752/2268)	55.6868 (<0.005)	28.76	38.49	1.71
	F. gigantica	6.48 (147/2268)		1.59	11.89	
Feeding system	Grazing	57.72 (1389/2268)	37.3378 (<0.005)	58.24	68.44	2.89
	Ground	38.26 (734/2268)		28.79	38.89	
	Trough	4.02 (49/2268)		0.69	9.39	
Watering system	River water	60.80 (1379/2268)	27.4580 (<0.005)	55.83	65.96	3.97
	Pond water	33.99 (771/2268)		28.69	38.22	
	Tap water	5.20 (118/2268)		0.68	10.89	
Tehsil	Bhalwal	40.53 (152/375)	8.7484 (0.016)	35.19	45.92	2.03
	Sargodha	41.73 (164/393)		36.97	46.41	
	Silanwali	45.63 (171/375)		40.16	50.79	
	Sahiwal	42.93 (161/375)		37.35	47.59	
	Shahpur	34.49 (129/375)		29.93	39.49	
	Kot momin	33.86 (127/375)		28.18	38.84	

DISCUSSION

Overall 33.33% prevalence of fasciolosis was recorded in small ruminant population which could directly be related to the geography of the study district. Presence of low lying and swampy areas (suitable habitat of snail population)was most important cause of higher prevalence rate in Sargodha district. Furthermore, unhygienic measures adopted by farmers were another reason for higher prevalence of fasciolosis in Sargodha [2]. The overall prevalence in this study was higher than others reports recorded in Punjab province [18-21]. In various countries of the world, lower prevalence was also reported [22, 23] which might be attributed to variation in agro-ecological conditions; those were less favorable for disease propagation.

Abattoirs based prevalence of small (40.51%) and large (43.63%) ruminant fasciolosis was reported by Ahmad [8] and Rehman [12], respectively, in the same study area. Higher prevalence was also observed in different parts of the world [21, 24 - 26]. This higher prevalence might be associated with non-adoption of control measures, development of resistance against flukicides (Personal communication), indiscriminate animal trade and availability of favorable agro-climatic conditions which help in disease propagation [27].

The probable reason for highest prevalence in winter might be the availability of optimal environmental conditions for the growth, transmission and development of parasitic life cycle stages including temperature humidity which helps in maximal growth of parasite and snail [2, 21].

Host species is an important determinant for disease occurrence. Some species are more proned to get infection due to their different grazing habits. Our results indicated higher prevalence in goats than sheep which is similar to Ahmed, Yadav, Ahmadi and Meshkehkar [28-30]. Contrary to our findings, reports are available mentioning higher prevalence in sheep than goats [18-20, 31- 33].

In present study the highest prevalence of sheep fasciolosis was determined in Bhalwal tehsil and lowest in Kot momin tehsil while in case of goat fasciolosis the

highest prevalence was determined in Silanwali tehsil and lowest in Kot momin tehsil. In the same study area Ahmad reported highest prevalence in Shahpur tehsil 52.0% and lowest in Sahiwal tehsil 27.5%. This difference in tehsils wise prevalence might be attributed to difference in microclimatic condition and methodology [8].

In present study the females showed higher prevalence rate than male. These results appeared to be in line with Khan *et al.* [21], Mazid *et al.* [24], Maqbool *et al.* [34], Ahmed *et al.* [35] and alukde *et al.* [36], which also reported higher prevalence in female than males. Some previous reports by Khan and Chanie and Begashaw calculated sex as non significant determinant for the occurrence of disease. The higher prevalence in female might be due to long rearing of animal for milk production, change in physiological state which posed stress on animals [2, 26].

Prevalence of *Fasciola* was highest in young age group than in adult in both sheep and goat. Few reports of higher prevalence in young animals was only limited to areas where fasciolosis was hyper-endemic and animals get infection shortly after birth. Dagnachew *et al*. [33] reported higher prevalence in young animals. The results were different from the finding of Ahmad [8], Hassan *et al*. [23] and Mbaya *et al*. [37]. The higher prevalence in adult age group was due to long subclinical phase of disease in host which takes 4-6 months for the completion of complete life cycle and manifestation of clinical disease in animals. Another reason of higher prevalence in adults might be due to compromised immunity.

Current study revealed that grazing practice and provision of river water were strongly associated husbandry practices with the prevalence of ovine/caprine fasciolosis in the study area. Small ruminants often pasture throughout the year. Some months of year have reduced pasture availability that forces the animals to graze in swampy areas (Personal observation) thus exposing them to heavily infected pasture with metacercariae of *Fasciola* [2, 38].

CONCLUSION

The above mentioned observations revealed that fasciolosis was infecting small ruminants of study area, with significant economic importance. Associated risk factors and unhygienic husbandry practices also influenced the disease transmission, suggesting that more attention should be paid to these associated risk factors for the control of the infection in endemic areas like Sargodha. Grazing practice and provision of river water were strongly associated husbandry practices with the prevalence of ovine/caprine fasciolosis in the study area. Continuous education and extension programs are need of the day for awareness regarding the transmission dynamics of fasciolosis. This kind of multidimensional approach can provide better sustainable control.

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