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Original Article

Prevalence of gastrointestinal helminths of sheep in Sherpur, Bangladesh

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ABSTRACT

Objective: Gastrointestinal (GI) parasitic infection is a prime cause of failures in sheep production. This study was conducted to ascertain the prevalence of gastrointestinal (GIT) helminths of sheep in Sherpur district, Bangladesh. Besides, prevalence of helminthiasis in sheep also assessed considering age, sex, nutritional condition and rearing system.

Materials and methods: In total, 106 rectal fecal samples of sheep were randomly collected and were examined for the presence of ova by using direct smear and Stoll's ova counting techniques during July to October, 2016. Eggs were identified on the basis of its size, morphology and other landmark features.

Results: Out of 106 samples, 67.9% (n=72/106) revealed the presence of ova of different helminths. The prevalence of helminth infection was associated with *Fasciola gigantica* (11.3%; n=12/106), Paramphistomes (13.2%; n=14/106), *Schistosoma indicum* (3.8%; n=4/106), *Moniezia* sp. (3.8%; n=4/106), Strongyle-type (24.5%; n=26/106), hook worm (6.6%; n=7/106), *Strongyloides* sp. (12.3%; n=13/106) and *Trichuris* sp. (1.9%; n=2/106). Egg count per gram (EPG) was calculated which was ranged between 100 and 600. Parasitic counts in lambs, young and adult showed no significant variations (P=0.511) from one other. Infection was significantly (P=0.04) higher in poor body conditioned sheep (76.3 %) as contrasted to normal body conditioned sheep (57.4%). No significant variation (P=0.601) was noticed in infection rates between sexes. Females displayed a higher infection (70.0%) as compared to males (65.2%). In rearing system, the result was found statistically insignificant (P=0.247).

Conclusion: Utterly, GI helminths are endemic at great levels among sheep in the study area. Also, their infestation differs within various age groups, sexes, nutritional condition and rearing system of sheep.

KEYWORDS

EPG, GI Helminths, Prevalence, Sheep, Sherpur

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INTRODUCTION

Helminthiasis is a chief cause of monetary losses in ruminants worldwide (Ferre et al., 1995). GI helminths are considered as one of the utmost significant and underrated problems, which hinder sheep productivity (Perry and Randolph, 1999). In a survey, Perry et al. (2002) conclusively found that amongst GI helminths, nematode had great impact on survival and productivity of sheep in developing countries. While among flukes, liver flukes, particularly, *Fasciola* spp. was the major threat for sheep and goat production (Hansen and Perry 1994; Urquhart et al., 1996). Also, tiny liver flukes such as *Dicrocoelium* spp. and rumen flukes (*Paramphistomum* spp.) were comparatively less important for sheep because only few sporadic losses had been caused by them (Urquhart et al., 1996). Bansal et al., (2015) studied seasonal prevalence of GI helminths of sheep and goat in India and reported that Strongyle-type worms were the ascendant parasite amongst all three seasons with a high prevalence rate in rainy season (88.9%). They found highest prevalence of *Strongyloides* spp. (16.70 %) in rainy season whereas the prevalence of rumen fluke and liver fluke was highest during summer, and were 35.9% and 8.1 %, respectively. However, in Bangladesh, according to Sangma et al., (2012) and Mazid et al. (2006), about 81.1 and 94.7% helminthiasis occured respectively in sheep under both rural and farm conditions.

Researchers have conveyed various epidemiological studies to record prevalence of GI helminths in sheep in different areas of the country, but to prevent monetary losses in sheep production at farm level both treatment and management based control steps need to be ascertained. However, there is limited information or report about the infection prevalence of GI helminths in sheep in the study area. Hence, it is necessary to perpetrate a study to identify the GI helminths prevalent in sheep in different *upazila* (sub-district) of Sherpur district and also to ascertain various risk factors (age, sex, nutritional condition of sheep and rearing system) concurrent with GI helminths.

MATERIALS AND METHODS

Study areas and period: The study was propeled with the samples collected from different *upazila* (sub-district) of Sherpur district during July to October, 2016.

Collection and examination of samples: In total, 106 rectal fecal samples from apparently healthy sheep were collected randomly from Sherpur district. Fecal samples were placed in glass/plastic vials containing 10% formalin with labeling and quickly transported them under 4°C to the laboratory at the Department of Parasitology, Bangladesh Agricultural University (BAU), Mymensingh for analyses. Three different age groups of sheep were selected such as lamb (≤1 year), young (>1 to <2 years) and adult (≥2years). Age was determined by questioning the farmers or by dentition of sheep (Rahman and Hossain, 1997). The nutritional state of sheep was sorted into poor health and healthy according to eye inspection and body condition (Rahman and Hossain, 1997). Selected sheep were fostered either in semi-intensive or free-range pasturage system. Fecal samples were processed and tested under microscope through Stoll's ova dilution technique. In the least, two smears were prepared from each sample. Fecal egg counts per gram (EPG) were determined following the Modified Stoll's egg counting technique, as narrated by Soulsby (1982).

Identification of egg of helminthes: Eggs of different helminths were identified under compound microscope (10×) by their characteristic morphological features (Soulsby, 1982; Rahman and Hossain, 1997).

Analysis of data: Data obtained were analysed using *chi*-square (χ^2) and χ-test through Statistical Package for Social Science (SPSS version 22.0, SPSS Inc., Illinois, USA).

RESULTS AND DISCUSSION

Overall prevalence of helminth parasites of sheep at Sherpur

The present study revealed that 67.9% (n=72/106) sheep were infested with various types of GI helminths (**Table 1**). These results accorded with the reports of Khajuria et al. (2013) in Jammu province who reported 67.2% sheep were infected with helminths. According to Gadahi et al. (2009) and Emiru et al. (2013), about 84.3, 59.1 58.7 and 53.3% of sheep were infested with single or multiple helminths, respectively. The present finding is lower than the prior findings of Mazid et al. (2006) in Mymensingh (94.7%) and Sangma et al. (2012) in Tangail (81.1%), Bangladesh. This variation might be due to the distinction in geographical locations, climatic state, rearing and management of sheep and the variation in the sampling methods.

The prevalence of infection with different GI helminths was identified; namely, *F. gigantica* (11.3%), Paramphistomes (13.2%), *Schistosoma indicum* (3.8%), stongyle-type (24.5%), hook worm (6.6%), *Strongyloides* sp. (12.3%), *Trichuris* sp. (1.9%). *Moniezia* spp. eggs were the only cestodes found in 3.8% of examined samples. The most prevalent eggs of GI helminths were Strongyle-type

Table 1: Overall prevalence of helminths of sheep at Sherpur (n=106)

Helminths	Prevalence (%)	Range	Mean±SE
Fasciola gigantica	12 (11.3)	100-400	233.3±28.4
Paramphistomes	14 (13.2)	100-500	285.7±31.2
Schistosoma indicum	4 (3.8)	100-200	150.0±28.9
Moniezia sp.	4 (3.8)	100-400	200.0±70.7
Strongyle-type	26 (24.5)	100-600	247.0±28.6
Strongyloides sp.	13 (12.3)	100-400	276.9±25.7
Hook worm	7 (6.6)	100-300	200.0±30.9
Trichuris sp.	2 (1.9)	-	100.0±0.00
Overall	**72*(67.9)**	**100-600**	**211.6±30.5**

**Total no. of infected is less than the summation of individual infection because same animal was infected by more than one type of helminth, SE=Standard Error.*

Table 2: Age related prevalence of helminths of Sheep at Sherpur (n=106)

Age group	Helminths	Prevalence (%)	Range	Mean±SE	Odds ratio	χ^2 value	*P*-value
Lamb (n=26)	*Fasciola gigantica*	3 (2.8)	100-400	266.7±88.2	Lamb vs Young = 1.28	**1.34**	**0.511^{NS}**
	Paramphistomes	2 (1.9)	100-200	150.0±50.0			
	Schistosoma indicum	2 (1.9))	100-200	150.0±50.0			
	Moniezia sp.	2 (1.9)	-	100.0±0.0			
	Strongyle-type	4 (3.7)	200-300	233.3±33.3			
	Strongyloides sp.	3 (2.8)	100-300	200.0±57.7			
	Hook worm	2 (1.9)	100-300	200.0±100			
	Trichuris sp.	2 (1.9)	-	100.0±0.0			
	Subtotal	**18 (69.2)**	**100-400**	**175.0± 53.3^a**			
Young (n=35)	*Fasciola gigantica*	3 (2.8)	200-300	233.3±33.3	Young vs Adult = 1.75		
	Paramphistomes	6 (5.7)	200-500	316.7±40.1			
	Schistosoma indicum	2 (1.9)	100-200	150.0±50.0			
	Moniezia sp.	1 (0.9)	200-200	200.0±0.0			
	Strongyle-type	10 (9.4)	200-600	340.0±74.8			
	Strongyloides sp.	5 (4.7)	200-400	280.0±37.4			
	Hook worm	2 (1.9)	200-300	250.0±50.0			
	Subtotal	**26 (74.2)**	**100-600**	**252.9±47.1^a**			
Adult (n=45)	*Fasciola gigantica*	6 (5.7)	100-400	216.7±40.1	Lamb vs Adult = 1.37		
	Paramphistomes	6 (5.7)	200-500	300±51.6			
	Moniezia sp.	1 (0.9)	400-400	400			
	Strongyle-type	12 (11.3)	100-300	200±23.6			
	Strongyloides sp.	5 (4.7)	200-400	320±37.4			
	Hook worm	3 (2.8)	100-200	166.7±33.3			
	Subtotal	**28 (62.2)**	**100-500**	**267.3±37.2^a**			

a=values with same superscript do not differ significantly, NS=Not significant (P>0.05), SE=Standard Error.

Table 3: Sex-wise prevalence of helminths of sheep at Sherpur (n=106)

Sex	Helminths	Prevalence (%)	Range	Mean ±SE	Odds Ratio	χ^2 value	*P*-value
Male (n=46)	*Fasciola gigantica*	4 (3.8)	100-300	175±47.8	Female Vs Male = 1.24	**0.27**	**0.601^{NS}**
	Paramphistomes	5 (4.7)	300-500	400.0±44.7			
	Schistosoma indicum	1 (0.9))	200-200	200.0±0.0			
	Moniezia sp.	1 (0.9)	-	100.0±0.0			
	Strongyle-type	11 (10.4)	200-600	300.0±63.3			
	Strongyloides sp.	2 (1.9)	300-400	350.0±50.0			
	Hook worm	5 (4.7)	100-200	160.0±24.5			
	Trichuris sp.	2 (1.9)	-	100.0±0.0			
	Subtotal	**30 (65.2)**	**100-600**	**223.1± 37.9**			
Female (n=60)	*Fasciola gigantica*	8 (7.6)	200-400	262.5±32.4			
	Paramphistomes	9 (8.5)	100-300	222.2±22.2			
	Schistosoma indicum	3 (2.8))	100-200	133.3±33.3			
	Moniezia sp.	3 (2.8)	100-400	233.3±88.2			
	Strongyle-type	19 (17.9)	100-400	218.2±26.4			
	Strongyloides sp.	11 (10.4)	100-400	263.6±27.9			
	Hook worm	2 (1.9)	300-300	300.0±0.0			
	Subtotal	**42 (70.0)**	**100-600**	**233.2±32.8**			

NS=Not significant (P>0.05), SE= Standard Error.

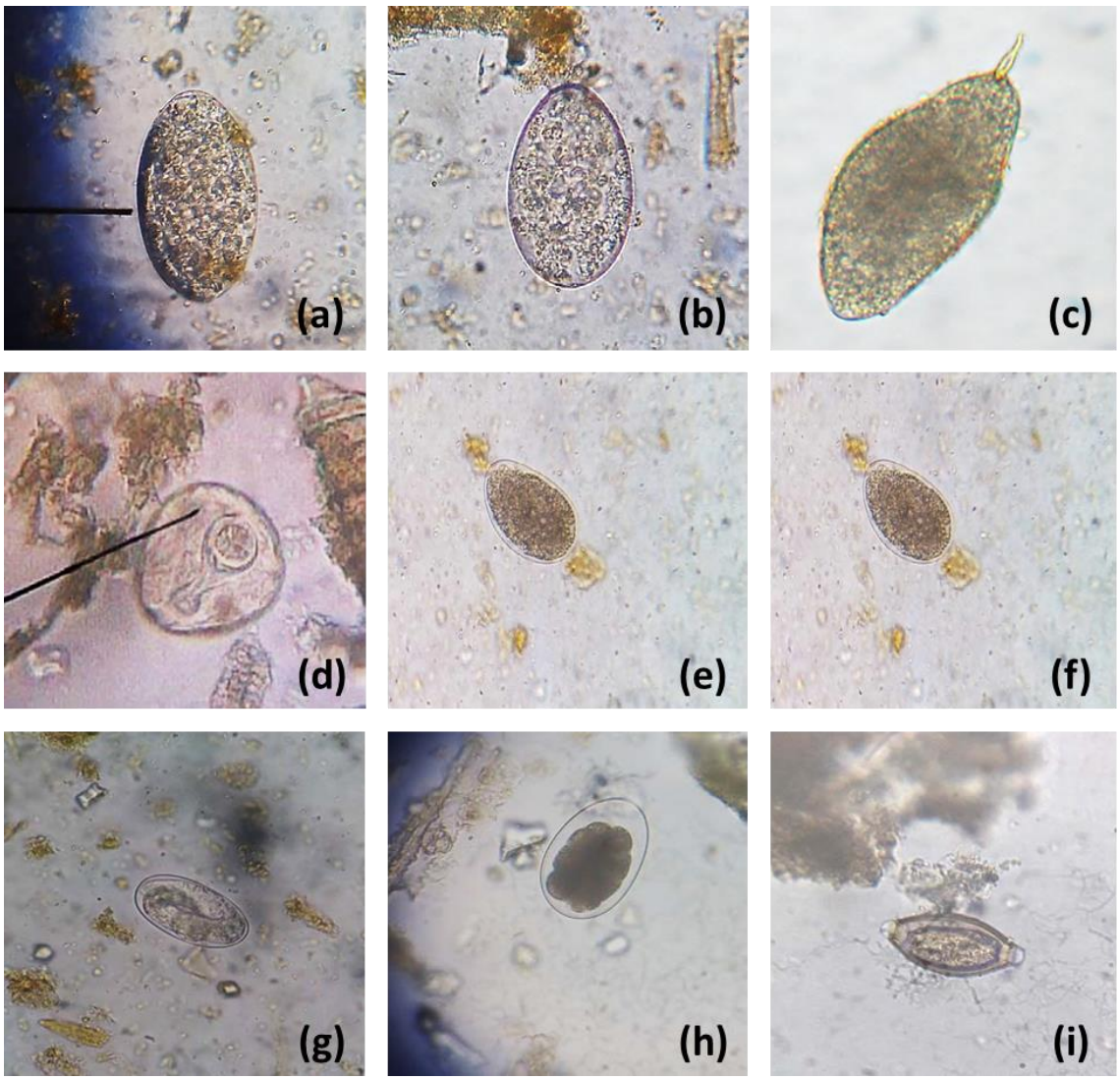

Figure 1. Eggs of parasites (40X). (a) egg of *Fasciola gigantica*, **(b)** egg of Paramphistomes, **(c)** egg of *Schistosoma indicum*, **(d)** egg of *Moniezia* sp., **(e)** egg of Strongyle-type, (f) egg *of Strongyloides* sp., **(g)** egg *of Strongyloides* sp., **(h)** egg of Hookworm**, (i)** egg of *Trichuris* sp.

Table 4: Nutritional condition related prevalence of helminths of sheep at Sherpur (n=106)

Health status	Helminths	Prevalence (%)	Range	Mean ±SE	Odds Ratio	χ^2 value	*P* value
Poor (59)	*Fasciola gigantica*	8 (7.6)	100-400	237.5±42.0	Poor vs Normal = 2.4	4.26	0.04**
	Paramphistomes	8 (7.6)	200-500	337.5±42.0			
	Schistosoma indicum	1 (0.9)	200-200	200.0			
	Moniezia sp.	3 (2.8)	100-400	233.3±88.2			
	Strongyle-type	17 (16.0)	100-600	264.3±32.5			
	Strongyloides sp.	10 (9.4)	100-400	290.0±31.4			
	Hook worm	6 (5.7)	100-300	200.0±36.5			
	Subtotal	**45 (76.3)**	**100-600**	**251.8± 45.1**			
Normal (47)	*Fasciola gigantica*	4 (3.8)	200-400	262.5±32.4			
	Paramphistomes	6 (5.7)	100-300	222.2±22.2			
	Schistosoma indicum	3 (2.8))	100-200	133.3±33.3			
	Moniezia sp.	1 (0.9)	100-400	233.3±88.2			
	Strongyle-type	9 (8.5)	100-400	218.2±26.4			
	Strongyloides sp.	3 (2.8)	100-400	263.6±27.9			
	Hook worm	1 (0.9)	300-300	300.0±0.0			
	Trichuris sp.	2 (1.9)	-	-			
	Subtotal	**27 (57.4)**	**100-300**	**171.9±25.8**			

*** Statically significant (P<0.05), SE= Standard Error.*

Table 5: Rearing system related prevalence of helminths of sheep at Sherpur (n=106)

Rearing system	Helminths	Prevalence (%)	Range	Mean ±SE	Odds Ratio	χ^2 value	*P* value
Free Range (n=59)	*Fasciola gigantica*	6 (5.7)	100-400	216.7±40.1	Semi Intensive vs Free Range = 1.6	**1.34**	**0.247^{NS}**
	Paramphistomes	7 (6.6)	100-500	300.0±48.8			
	Schistosoma indicum	3 (2.8)	100-200	166.7±33.3			
	Moniezia sp.	3 (2.8)	100-400	233.3±88.2			
	Strongyle-type	18 (17.0)	100-600	275.0±37.2			
	Strongyloides sp.	4 (3.8)	200-400	275.0±47.9			
	Hook worm	4 (3.8)	100-300	200.0±40.8			
	Subtotal	**38 (63.3)**	**100-600**	**238.1± 48.0**			
Semi Intensive (n=47)	*Fasciola gigantica*	6 (5.7)	100-400	250.0±42.8			
	Paramphistomes	7 (6.6)	200-500	271.4±42.1			
	Schistosoma indicum	1 (0.9))	100	100.0			
	Moniezia sp.	1 (0.9)	100	100.0			
	Strongyle-type	8 (7.5)	100-200	180.0±20.0			
	Strongyloides sp.	9 (8.5)	100-400	277.8±32.4			
	Hook worm	3 (2.8)	100-300	200.0±57.7			
	Trichuris sp.	2 (1.9)	100-100	100.0±0.0			
	Subtotal	**34 (73.9)**	**100-500**	**184.9±32.5**			

NS= Not significant (P>0.05), SE= Standard Error.

(24.5%), whereas *Trichuris* sp. (1.9%) was the lowest. EPG count was the highest in Strongyle-type (100-600) and lowest in *Trichuris* sp. (100). Meanwhile, a low parasitic load was detected for *Schistosoma* sp. and *Trichuris* sp. as 150±28.87 and 100±0.00, respectively **(Table 1**).

Age related prevalence of helminths of sheep at sherpur

This study exhibited insignificant relationship (*P*=0.511) between age of sheep and helminthiasis. Age-wise analysis revealed higher infection in young sheep (74.2%) followed by lamb (69.2%) and adult (62.2%) (**Table 2**).

Likewise, Singh et al. (2013) and Asif et al. (2007) recorded similar findings in sheep from Rajasthan, India and Islamabad, Pakistan, respectively. However, Swarnkar et al. (1996) recorded higher prevalence of GI helminths in adults, followed by hoggets and weaners in India. Also, Mazid et al. (2006) reported higher infection in adult (100%) compared to young sheep (76.1%) in Mymensingh, Bangladesh. However, lower occurrence in adults might be due to acquired immunity of adults to GI helminths making them less susceptible. This hypothesis has been commissioned experimentally by some other researchers (Rajapakse et al., 1994; Colditz et al., 1996; Knox, 2000). On the contrary, several researchers have exhibited increased helminthiasis in young age also (Starke et al., 1983; Roberts et al., 1996).

Sex-wise prevalence of helminthiasis of sheep at Sherpur

It was observed that, sex of sheep expressed no significant (*p* =0.601) effect on helminth infection. The rate of infection was higher in females (70.0%) as likened with males (65.2%). For male, prevalence was the highest in case of Strongyle-type (10.4%) whereas in female, it was the stomach worm (17.9%) (**Table 3**).

In Kashmir- Pakistan, higher prevalence of GI helminths was found in female sheep than in males, but the difference was insignificant (Wani et al., 2011). Similarly, Mazid et al. (2006) in Bangladesh also recorded higher prevalence of helminthiasis in female sheep (100%) than male (78.6%). This study was found inconsistent with Yeasmin et al. (2015) who reported male sheep (81.5%) were more infected with helminths as compared to female (72.7%) in Bangladesh. This result also differred from report in Nigeria by Okafor et al. (1988) who concluded that prevalence was not related to sex.

Basically, many authors accepted sex as the chief factor for influencing parasitic prevalence (Valcárcel and García 1999). Factually, females are more vulnerable to parasitic infections during parturient and peri-parturient period due to stress and reduced immune status (Urquhart et al., 1996). Mostly, all males were grazed more compared to females as the latter did not graze during parturient period, so that, infection is chiefly found in male than female (Gulland and Fox, 1992).

Nutritional condition related prevalence of helminth parasites of sheep at Sherpur

Nutritional condition of sheep exhibited significant variations (*P*=0.04) on helminthiasis. The infection rate was more in poor body conditioned sheep (76.3%) as compared to normal body conditioned sheep (57.4%). Both poor and normal body conditioned animals had highest prevalence (16.0% and 8.5%) with Strongyle-type worm (**Table 4**). This finding is in correspondence with the results of Gizachew et al. (2014) who also reported

higher parasitic infection in poor body conditioned animal than normal.

Rearing system related prevalence of helminth parasites of sheep at Sherpur

Rearing system of sheep did not exhibit any significant effect (P=0.247) on helminthiasis. Higher prevalence was observed in sheep reared in semi-intensive grazing system (73.9%) as compared to the sheep of free range system (63.3%). In free range sheep, prevalence was the highest in case of Strongyle-type (17.0%). In contrast, semi-intensive sheep expressed the highest prevalence for *Strongyloides* sp. (8.5%) (**Table 5**). The cause of this variation may occur from difference in pasture, fodder and environmental factors.

CONCLUSION

This study provides the baseline information about the stance of GI helminths of sheep in Sherpur, Bangladesh. Further study may be propelled to identify species of parasite and to minimize the monetary wastage owing to parasitic diseases of sheep and to find out the fruitful avenue against it.

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CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHORS' CONTRIBUTION

PRN perpetrated the prevalence of GIT helminths of sheep by examining fecal sample and identifying ova of different GI helminths. NB, MAA and ARD outlined the study design and helped to confirm specific ova of particular helminths. PRN also drafted the manuscript. SSL and MSH were involved in writing up of manuscript with PRN and NB as well as refined English of the draft. Finally, the manuscript was read and commissioned by all authors.

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