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An epidemiological investigation of gastrointestinal parasites of small ruminants in Tangail, Bangladesh

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Abstract

Gastrointestinal (GI) parasitism is an egregious problem in small ruminant production system due to its impact on growth and associated cost of control measures. An epidemiological study was conducted to investigate the prevalence of gastrointestinal parasites of small ruminants from different areas of Madhupur, Tangail. The stool samples were collected from a total of 426 goats and sheep from study areas. Specimens were subjected to Stoll's ova counting technique and the overall prevalence of gastrointestinal parasitic infection was found 63.4%. Overall prevalence of nematodes, cestodes, trematodes and protozoa was 52.11%, 2.11%, 36.62% and 10.33%, respectively. The prevalence of parasites were variable with *Fasciola* spp. (8.45%), *Paramphistomum* spp. (28.17%), *Moniezia* spp. (2.11%), *Haemonchus* spp. (31.22%), *Trichuris* spp. (1.17%), *Oesophagostomum* spp. (10.80%), *Strongyloides* spp. (4.93%), *Trichostrongylus* spp. (2.35%), *Bunostomum* spp. (1.64%), *Eimeria* spp. (24%) and *Balantidium* spp. (6.34%). Parasitic ova counts in male and female exhibited no significant variations ($p > 0.05$) between them. The infection was significantly higher (65.11%) in adult than in young (58.09%). No significant ($p > 0.05$) variation was observed in infection rates between goats (64.09%) and sheep (60.67%). Seasonal variation was found significant between rainy (72.44%), winter (56.72%) and summer (61.82%) seasons. Animals with poor body conditions (74.67%) were mostly affected compared to those with moderate (62.38%) and good (39.00%) body conditions. Further attempt is necessary for a structured surveillance and monitoring of GI parasites to formulate effective control measures.

Introduction

Small ruminants especially sheep and goats play an important role in the rural economy of Bangladesh and contribute to earnings of significant amount of foreign currency by exporting skins and other by-products (Kamaruddin, 2003). Goat rearing is becoming much exoteric in Bangladesh and nowadays special emphasis is also given to sheep production. In Bangladesh, parasitism has been contemplated as one of the important constraints of livestock production. Gastrointestinal parasites like helminths and protozoan are very common in sheep and goats. When heavy infections occur those parasites contribute to reduced milk and meat production (Murthy and Rao, 2014). Small ruminants under intensive and extensive production systems are extremely susceptible to the effects of wide range of helminths (Abede and Esayas, 2001). Helminth infestation lowers the immunity of the animals and render them susceptible to other pathogenic infections (Garedaghi *et al.*, 2011). Previous reports suggested that amongst the disease of small ruminants, the parasitic diseases are of prime importance in Bangladesh (Rahman, 1975). He reported the death of as high as 25.0% kids and lambs and 43.5% adult goats due to GI parasites in both rural and farm condition. According to Choubisa and Jaroli (2013), parasitic infections were found in 82.97% and 55.42% goats and sheep, respectively in India. In another report, Mazid *et al.* (2006) reported that about 81.1% and 94.7%

helminthiasis occurred in sheep and goats, respectively. Various risk factors related to host and environment play an important role in the onset of GI parasitic infections. Environmental factors include agro-ecological conditions, animal husbandry practices such as housing system, deworming intervals and pasture management; these largely determine the type, incidence and severity of various parasitic diseases (Badran *et al.*, 2012). Other risk factors such as the host species, sex of the animal, age, body condition and breed/genotype, parasite species and intensity of the worm population, have an effect on the development of gastrointestinal parasitic infections (Tariq *et al.*, 2010). Madhupur upazilla is very prospective for goat and sheep rearing due to its agro-ecological condition. Despite routine vaccination against major infectious diseases, small ruminants are still suffering from poor body condition state due to parasitism. However, there is limited information about the infection prevalence of GI parasites in small ruminants in the study area. Therefore, the present study was conducted to investigate the GI parasites prevalent in small ruminants in Madhupur upazila of Tangail district and identify associated risk factors such as age, sex, season, species and nutritional condition.

Materials and Methods

Site profile and Study period

The study areas were Madhupur upazilla under Tangail district. Samples were collected during the period from

July 2015 to June 2016. The study period covered rainy (July–October), winter (November–February) and summer season (March–June).

Examination of samples

A total of 426 fecal samples with epidemiological data from sheep (88) and goats (338) were gathered randomly from Madhupur upazilla, Tangail. Fecal samples were collected fresh in glass/plastic vials containing 10% formalin and transported to the laboratory of the Department of Parasitology, Bangladesh Agricultural University (BAU). Two different age groups of small ruminants were selected, namely young (7–18 months) and adult (>18 months). Fecal samples were processed and tested under microscope through Stoll's ova dilution technique. At least, two smears were prepared from each sample for each test to identify the morphological characteristics of eggs, cyst, oocysts (Soulsby, 1982). Faecal egg counts were determined following the modified Stoll's ova counting technique (Soulsby, 1982).

Identification of egg of helminths

Eggs of different helminth worms were observed under a compound microscope (10× objective) and identified by their characteristic morphological features (Soulsby, 1982).

Statistical Analyses

Statistical analyses were carried out by Statistical Package for Social Science (SPSS version 22.0, SPSS Inc., Illinois, USA) using F test. To identify the risk factors univariate analysis was performed.

Results and Discussion

Overall prevalence of gastrointestinal parasites (GI) in small ruminants

Our study revealed a variable prevalence of gastrointestinal parasitic infection in small ruminants of Madhupur upazila of Tangail District. The present study revealed that 63.4% (270/426) small ruminants were infested with a number of GI parasites, namely, *Haemonchus* spp., *Oesophagostomum* spp., *Strongyloides* spp., *Trichostrongylus* spp., *Trichuris* spp., *Bunostomum* spp., *Moniezia* spp., *Fasciola gigantica*, *Paramphistomum* spp., *Eimeria* spp., *Balantidium coli* (Fig. 1). These observations were found consistent with previous reports who recorded 65.6%, 63.3%, 63.5% prevalence in Bangladesh, Lahore and Islamabad, respectively (Ijaz *et al.*, 2008; Gadahi *et al.*, 2008; Hasan *et al.*, 2011). However, this finding was comparatively lower than that reported by Poddar *et al.* (2017) who indicated 67.4% overall prevalence in Sherpur District of Bangladesh. Notable that in the study areas, pineapple are prevalent and this pineapple are sometime ingested by ruminants. While it is well known that pineapple contain anthelmintic compound (bromelain) (Domingues *et al.*, 2013), this could be linked with lower prevalence of GI parasites in

Madhupur area of Tangail compared to other areas in Bangladesh. The most prevalent helminths were *Haemonchus* spp. (31.2%) in small ruminants as reported by other investigators. However the findings varied from some other reports indicating a higher prevalence of 51.7% in Chittagong and 57.8% in Rajshahi (Hassan *et al.*, 2011; Nahar *et al.*, 2015). Variation in occurrence of such infection in small ruminants might be due to free living nature and different bionomics of the parasites (Urquhart *et al.*, 1996 and Soulsby *et al.*, 1982). Prevalence of *Oesophagostomum* spp. infection in this study was 10.8% which varied from the findings of Molla and Bandyopadhyay (2016) who recorded prevalence of *Oesophagostomum* spp. infection as 21.48% in India. In this study, *Oesophagostomum* spp. infection rate was low which might be due to the relatively long life cycle and low resistance to desiccation of the pre-infective stages of this genus (Pfukeny *et al.*, 2007). The only cestode identified in this study was *Moniezia* spp. and the prevalence was 2.1%. Singh *et al.* (2015) observed 3.1% infection in India which supported the findings of this study. Lower prevalence of *Moniezia* spp. might be due to less dissemination of eggs in the faces from the gravid segments (Radostits *et al.*, 1994). The highest prevalence of trematode was *Paramphistomum* spp. (28.1%) and the infection rate of this study varied from the observation of Uddin *et al.* (2006) and Uddin *et al.* (1998) who recorded 65.3% and 56.7% prevalence in different regions in Bangladesh. Lower prevalence of *Paramphistomum* spp. infection in this study might be due to unavailability of vector snail, geoclimatic conditions or improved husbandry practices (Alim *et al.*, 2011). EPG count was the highest in case of *Moniezia* spp. (100–6100) and lowest in case of *Trichuris* sp. (100).

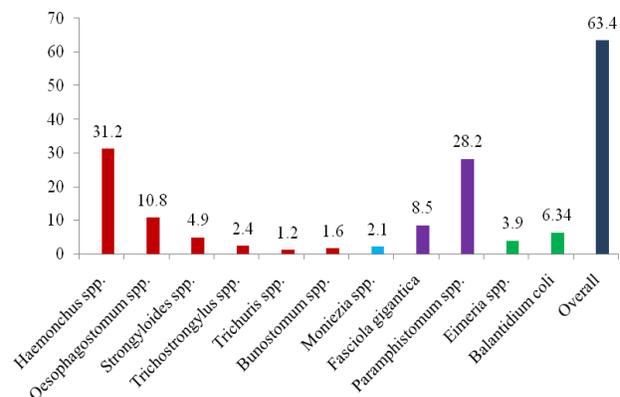


Fig. 1. Overall prevalence (%) of GI parasites in sheep and goats

Age related prevalence of GI parasites in small ruminants

In the present study, age had a significant effect on the prevalence of gastrointestinal parasitism in small ruminants ($p < 0.05$). Age-wise analysis exposed higher infection in adult (65.1%) than young small ruminants (58.1%) (Table 1). Biu *et al.* (2009); Uddin *et al.* (2006)

and Soulsby *et al.* (1982) reported that small ruminants of more than 2 years of age showed more susceptibility to endoparasitism, which showed consistency with the result of this study. Uddin *et al.* (2006) also observed that gastrointestinal parasitism was significantly influenced by the age of the small ruminants. Hassan *et al.* (2011) also observed age as a risk factor where older small ruminants (>24 months) were more susceptible to gastro-intestinal parasites than younger ones (<24 months), which supports the findings of the study.

Sex related prevalence of GI parasites in small ruminants

It was found that, the sex of small ruminants had no significant ($p>0.05$) effect on gastrointestinal parasitism. The infection rate was higher in females (65.7%) compared to males (60.1%) (Table 1). In both males and females, the highest prevalence was observed with

Haemonchus spp., about 31.1% and 31.0%, respectively. According to Shahiduzzaman *et al.* (2003), Uddin *et al.* (2006) and Biu *et al.* (2009) higher prevalence of parasites occurred in female small ruminants. Likewise, Mazidet *et al.* (2006) also recorded higher prevalence of helminthiasis in female sheep (100%) than in male (78.6%) in Bangladesh. This study was found inconsistent with that of Yeasmin *et al.* (2015) who reported that male sheep (81.5%) were more infected with helminths as compared to female (72.7%) in Bangladesh. In this study, variation in occurrence of such parasites in male and female animals might be due to the variation in sample size, lowered resistance of female animals temporary loss of acquired immunity near parturition (Garcia *et al.*, 2007), stress, genetic resistance of host and insufficient/imbalanced feed against higher needs (Raza *et al.*, 2010).

Table 1. Prevalence of GI parasites in small ruminants with related risk factors

Risk factors		Prevalence (%)	Range	Mean \pm SE	p-value
Age	Young	61 (58.1)	100-300	126.7 \pm 7.0	0.042*
	Adult	209 (65.1)	100-6100	182.9 \pm 73.1	
Sex	Male	107 (60.1)	100-400	119.4 \pm 9.7	0.351 ^{NS}
	Female	163 (65.7)	100-6100	221.8 \pm 113.1	
Species	Sheep	54 (60.67)	100-200	112.9 \pm 6.9	0.272 ^{NS}
	Goat	216 (64.1)	100-6100	176.7 \pm 65.6	
Body condition	Poor	168 (74.7)	100-6100	253.1 \pm 141.1	0.021*
	Moderate	63 (62.4)	100-300	113.8 \pm 6.9	
	Good	39 (39.0)	100-200	116.6 \pm 10.3	

Legend: SE= Standard error, * $p<0.05$, statically significant, NS= Not significant

Species wise prevalence of GI parasites in small ruminants

In this study, it was noted that species did not have significant effects on the prevalence of gastrointestinal parasites ($p>0.05$). Overall prevalence of gastrointestinal parasitic infections was higher in goats (64.1%) and lower in sheep (60.7%) (Table 1). The findings of the present study supports the study of Islam and Taimur (2008), Gadahi *et al.* (2008) and Yadav *et al.* (2006) who reported that the prevalence of gastrointestinal parasitic infections was higher in goats than in sheep. Variation of such parasitism in goats and sheep might be due to their grazing habits. This also may be due to the gastrointestinal physiology of sheep, or sheep may be genetically more resistant to GI parasites than goats (Islam and Taimur, 2008).

Nutritional status related prevalence of GI parasites in small ruminants

During this study, it was observed that the body condition had significant effects on the prevalence of GI parasites ($p<0.05$). Prevalence was relatively higher in goats and sheep with poor body condition (74.7%) followed by the animals with moderate (62.4%) and good body condition (39.0%) (Table 1). This finding is consistent with that of Biswas *et al.* (2014) who reported that parasitic infection is usually higher in animals with

poor body condition. The present study also accede with Etter *et al.* (1999) who reported that in immune compromised animals, fecundity of parasites is usually increased. It appears that malnutrition in animals increases their susceptibility to the parasitic infection. It may also happen that, the animals becoming poor and weak due to any other causes are not able to resist the challenge of infection and subsequently become more weak and lose condition.

Season related prevalence of GI parasites in small ruminants

The seasonal effect on gastrointestinal parasitism in small ruminants was found significant ($p<0.05$) throughout the year. In all seasons (winter, summer and rainy season), small ruminants were infected with gastrointestinal parasites. Seasonal prevalence and intensity was highest in rainy (72.4%) followed by the summer (61.8%) and winter season (56.7%) (Fig. 2 and Fig. 3). The present finding is similar to the previous reports of Yadav *et al.* (2006) who reported that the higher prevalence was in rainy season (88.5%), but contradictory to the report of Biswas *et al.* (2014) who reported that the higher prevalence was in summer (84.6%), followed by rainy season (83.6%) and in winter season (81.2%) in Bhola district, Bangladesh. The present result varied with the report of Azhar *et al.*

(2002) who reported a higher prevalence in spring (20.0%) followed by winter (13.0%), while the lower (9.0%) was recorded during summer in Pakistan. This might be due to the fact of variation in the geographical location of the study areas, season of survey and also the methods of study.

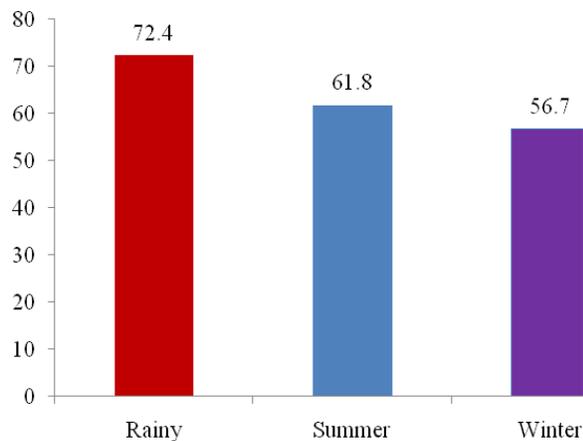


Fig. 2. Seasonal prevalence (%) of GI parasites in sheep and goat

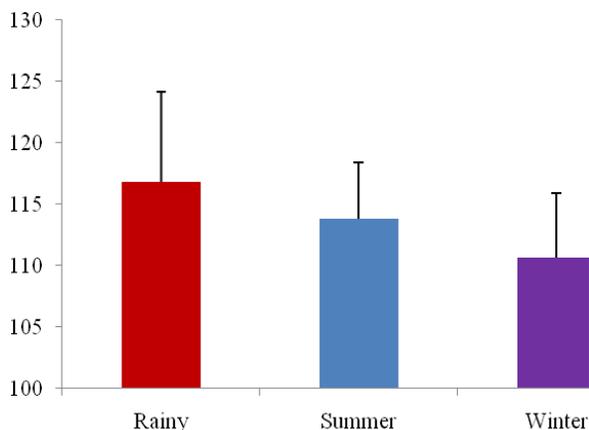


Fig. 3. Seasonal intensity (fecal EPG) of GI parasites in sheep and goats

Conclusion

The study was conducted to determine the prevalence and risk factors of gastrointestinal parasitic infection in small ruminants. Through coproscopy, an overall 63.4% infection was detected in sheep and goats. Higher prevalence of gastrointestinal parasites was found in goats compared to sheep indicating possibility of some degree of resistance in sheep. Further study with large sample size and use visceral examination can highlight the actual prevalence of GI parasites. Epidemiological features described during this study will be useful for future researchers to formulate effective control measures.

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