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Original Article

Epidemiology of gastrointestinal parasites of small ruminants in Mymensingh, Bangladesh

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ABSTRACT

Objective: The current study was conducted to explore the prevalence of gastrointestinal (GI) parasites in small ruminants (sheep and goats) in relation to species, age, sex, season, and body condition in Mymensingh, Bangladesh.
Materials and methods: A cross-sectional coprological survey was carried out at Mymensingh Sadar in Mymensingh from July 2015 to June 2016. In total, 433 fecal samples were screened for eggs/oocysts/cysts of parasite and counted by using standard qualitative and quantitative techniques. Eggs/oocysts/cysts were identified according to their characteristic features.
Results:
The study found 74.8% (n=324/433) prevalence of GI parasites in small ruminants. Species-wise prevalence indicated that 77.0% (n=268/348) goats and 65.9% (n=56/85) sheep harbored parasitic infection. Nine species of GI parasites were identified in the study area namely *Strongyloides* sp., *Haemonchus* sp., *Oesophagostomum* sp., *Trichostrongylus* sp., *Trichuris* sp., *Paraphistomum* spp., *Fasciola* spp., *Eimeria* spp. and *Balantidium* spp. The level of egg/oocyst/cyst per gram of feces (EPG/OPG/CPG) was ranged between 100 and 1200. Young small ruminants (78.4%) showed significantly (P=0.026) higher prevalence as compared to adult (68.8%). Between sexes, significantly (P=0.000) higher prevalence was found in female (83.6%) than male (64.7%). Infection was significantly (P=0.000) highest in poor body conditioned small ruminants (82.1%) as compared to moderate (72.2%) and good body conditioned (53.8%) small ruminants. In case of season, highest prevalence was found in rainy season (83.6%) followed by summer (78.6%) and winter (59.4%) with significant seasonal variations (P=0.000).
Conclusion: Finally, GI parasites are endemic among small ruminants in the study area. Knowledge on these parasites and related epidemiological parameters is important for outlining fruitful control strategies against GI parasites.

KEYWORDS

GI parasites; Mymensingh; Prevalence; Small ruminants

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INTRODUCTION

Gastrointestinal parasites cause production losses, weight loss and mortalities in small ruminants (sheep and goats) and thereby impede their production system. Small ruminants (sheep and goat) constitute the major portion of livestock in Bangladesh; about 80% rural people are involved with livestock farming (Siddiki et al., 2009). Generally, both sheep and goats have shared many common GI parasites. GI parasitism, especially paramphistomiasis, fascioliasis, hemonchosis, tricho-strongylosis, oesophagostomiasis impaired the growth and productivity of small ruminants (Speedy, 1992). Despite significant losses, GI parasitism was often neglected and disregarded as most of the infected animals show a little number of apparent clinical signs throughout their productive life (Raza et al., 2010). Also, the problem is passed over due to its chronic and insidious nature (Sanyal, 1998). Undoubtedly, the geo-climatic condition of Bangladesh is suitable for the growth, development and subsistence of various parasites (Hossain et al., 2004). Moreover, GI parasites and their snail intermediate host were more prevalent due to mild winter and the long summer including the rainy season in Bangladesh (Haq and Sheikh, 1968).

Several epidemiological studies have been carried out on GI parasites of small ruminants in different regions of Bangladesh (Poddar et al., 2017; Sangma et al., 2012; Hassan et al., 2011; Islam and Taimur, 2008; Mohanta et al., 2007) but, these studies were limited in species and sample size. In the torrid-zone, 60-95% of sheep and goats had helminthiasis; of which, *Haemonchus* and *Trichostrongylus* were the two most commonly involved genera (Raza et al., 2014; Mbuh et al., 2008; Gathuma et al., 2007; Mondal et al., 2000).

Sheep and goat are mainly reared for meat, wool and skin production (Hossain et al., 2004). Small ruminants production has recently got higher priority in Bangladesh, especially goats, which encouraged the rural women to consider livestock keeping as commercial enterprise. This study was undertaken to examine the prevalence of GI parasites in small ruminants with related risk factors (species, age, sex, body condition and season) in Mymensingh, Bangladesh, which will be used as baseline study for prevention and control of GI parasitism in small ruminants sector.

MATERIALS AND METHODS

Ethical statement, study area and period: The study was approved by the ethical committee of the Faculty of Veterinary Science, Bangladesh Agricultual University (Approval no: 05/AWEC/2017). The study was conducted within July 2015 to June 2016 at Mymensingh Sadar in Mymensingh district, Bangladesh. The study period was divided in accordance with seasons, rainy (July-October), winter (November-February), and summer (March-June).

Collection and examination of samples: In total, 433 small ruminants (348 goats and 85 sheep) were randomly selected for sampling. Rectal samples or freshly voided materials were collected for fecal sample examination. The age of the small ruminants was confirmed by examining teeth and counting the rings of horn (Rahman and Hossain, 1997). Age of small ruminants were categorized into two groups; young (7-18 months), and adults (>18 months). After collection, the samples were submitted to the Laboratory at the Department of Parasitology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensigh for analyses. Two smears were prepared for each sample. Fecal egg-count per gram (EPG) of helminths and oocyst/cyst per gram of protozoans (OPG/CPG) were determined by Stoll's Ova Dilution technique, as narrated by Soulsby (1982). A sample was considered as positive when minimum one GI parasite was detected under microscope.

Identification of egg of helminths: GI parasites were identified under compound microscope (10X) on the basis of morphology of helminth eggs, cysts and trophozoites of protozoa (Chatterjee, 1980; Soulsby, 1982).

Statistical analyses: Data were analysed by SPSS (Statistical Package for Social Science), version 24, using χ^2-test and z-test.

RESULTS AND DISCUSSION

Overall prevalence of GI parasites

Out of 433 small ruminants (348 goats and 85 sheep) examined, 324 (74.8%) were harbouring one or more GI parasites. The identified GI parasites were *Fasciola* sp., *Paramphistomum* sp., *Oesophagostomum* sp., *Strongyloides* sp., *Haemonchus* sp., *Trichostrongylus* sp., *Trichuris* sp., *Eimeria* sp. and *Balantidium* sp. (**Figure 1**). The current finding was in line with previous studies on overall prevalence of GI parasites in small ruminants described by Gadahi et al. (2009) and Dabasa et al. (2017) with the prevalence of 77.8 and 63.5% in Ethiopia and Pakistan, respectively. In this study, EPG/OPG/CPG was calculated that ranged from 100-1200. Higher parasitic load was detected for *Eimeria* sp. (197.4±12.2) whereas low parasitic load was detected for *Fasciola* sp. (100.0±0.0) in this study (**Figure 2**).

In this study, prevalence of GI parasite in goat was 77.0% (n=268/348) whereas in sheep it was 65.9% (n=56/85). GI nematode was more prevalent in goats (with prevalence prevalence 90.5%) whereas protozoa was more frequent in sheep (45.9%) (**Figure 3**). This result was similar to Islam and Taimur (2008) who also found higher prevalence in goats (91.22%) than sheep (65.9%) in Bangladesh. Similarly, a relatively higher prevalence was observed by Gebeyehu et al. (2013) in Korean native goats (98.4%). In Bangladesh, Hassan et al., (2011) found 63.4% prevalence in goat in Chittagong whereas Jugessur et al., (1998) reported 55.4% prevalence in goats. Alongside, Mazid et al. (2006) and Sangma et al. (2012) recorded 81.1 and 94.7% prevalence in sheep of Tangail and Mymensingh, Bangladesh, respectively.

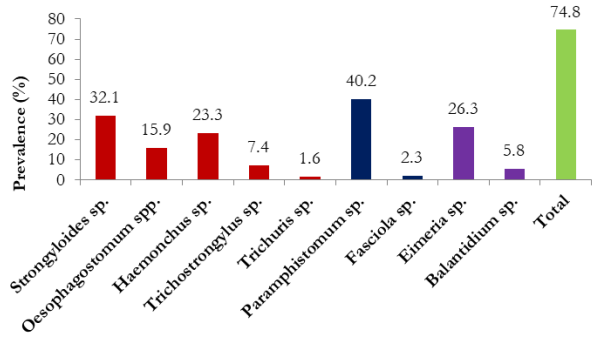

Figure 1: Overall prevalence of GI parasites in small ruminants in Mymensingh

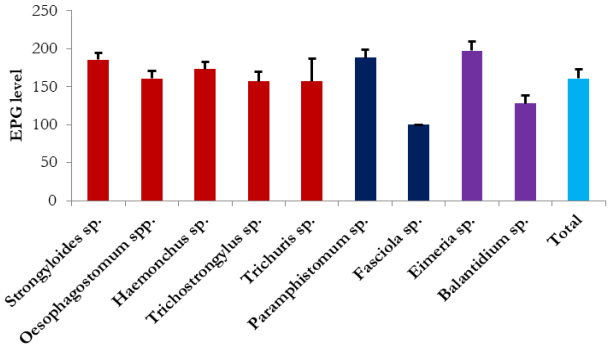

Figure 2: GI parasites intensity in small ruminants in Mymensingh.

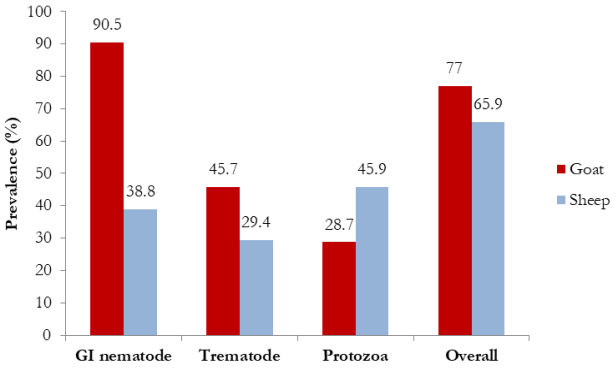

Figure 3: Species-wise prevalence of GI parasites in small ruminants in Mymensingh.

Moreover, Regassa et al. (2006), Yadav et al. (2006), Nwosu et al. (2007) and Gadahi et al. (2009) were also agreed with the current results. On the other hand, in Pakistan, higher prevalence was observed in sheep (72%) than in goats (63.7%) (Asif et al., 2008). Likewise, in Sudan, 94.9% sheep and 84.5% goats were found to be infected with GI parasites (Almalaik et al., 2008). This variation might be due to the differences in geo-climatic conditions of the study area, rearing and management of small ruminants along with nutritional status.

Age-wise prevalence of GI parasites

The current study showed higher prevalence of GI parasites in young (78.4%) as compared to adult (68.8%) with significant differences (P=0.026). (**Table 1**). This result coincides with Sangma et al. (2012) and Poddar et al. (2017) in sheep of Tangail (young: 92.7%, adult: 83.3%) and Mymensingh (young: 74.2%, adult: 62.2%), Bangladesh, respectively. Similarly, Raza et al. (2014) found higher prevalence in young (sheep: 79.3%, goats: 80.6%) than adult (sheep: 73.8%, goats: 72.8%) small ruminants in Pakistan. Also, Singh et al. (2015) recorded more prevalence in young (96.3%) as compared to adult (93.9%) in India. Additionally, Zvinorova et al. (2016) reported higher prevalence in young animal than adults. But some researchers noticed higher prevalence in adults in comparison with young small ruminants (Anene et al., 1994; Uddin et al., 2006; Hassan et al., 2011). Higher prevalence of infection in young could be attributed to underdeveloped immune system and susceptibility to the infection. Lower prevalence of infection in adults might be due to body resistance as they might have developed immunity due to repeated natural infections (Singh et al., 2015).

Sex-wise prevalence of GI parasites

In the current study, female (83.6%) had more prevalence than male (64.7%) with significant variations (P=0.000) (**Table 1**). This result was agreed with Sangma et al. (2012) who found female (83.3%) sheep were more prone to GI parasitic infection than male (79.3%) in Tangail, Bangladesh. Alongside, Mazid et al. (2006) in Mymensingh, Bangladesh recorded 100% prevalence in female and 78.6% in male sheep. In addition, Azrul et al., (2017) found higher prevalence rate in female goats (75.42%) than in the males (56.72%) in Bangkok, Thailand.

Likewise, Bashir et al. (2012) and Singh et al., (2017) recorded higher prevalence in female sheep and goat in Punjab of India, and Kashmir of Pakistan, respectively. Although, this observation disagreed with Yeasmin et al. (2015) who found male sheep (81.5%) were more infected with helminths as compared to female (72.7%) in

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

Risk factors		Prevalence (%)	Range	Mean ±SE	*P*-value	OR
Age	Young (273)	214 (78.4)	100-1200	160.2±13.4	0.026**	1.65
	Adult (160)	110 (68.8)	100-500	168.6±17.8		
Sex	Male (201)	130 (84.7)	100-700	165.3 ±15.7	0.000**	2.72
	Female (232)	194 (83.6)	100-1200	158.6 ±17.5		
Body condition	Poor (263)	216 (82.1[b])	100-1200	154.4±14.2	0.000**	Poor vs. good= 3.95
	Moderate (90)	65 (72.2[a])	100-1000	189.6±25.7		Poor vs. moderate= 1.77
	Good (80)	43 (53.8[b])	100-500	150.6±17.8		

Legend: SE=Standard error, OR=Odds ratio, **statistically significant ($P<0.05$), [a, b] Each superscript letter denotes a subset of body condition categories whose row proportions differ significantly from each other at the 0.05 level.

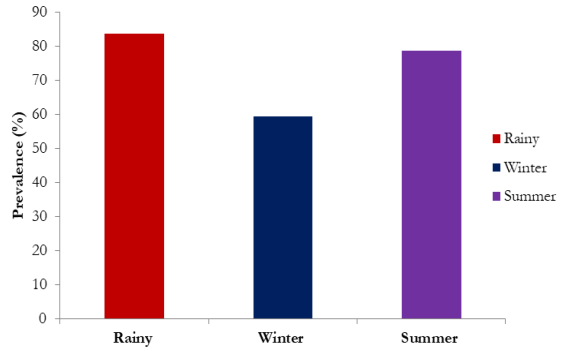

Figure 4: Season-wise prevalence of GI parasites in small ruminants in Mymensingh (**P=0.000)

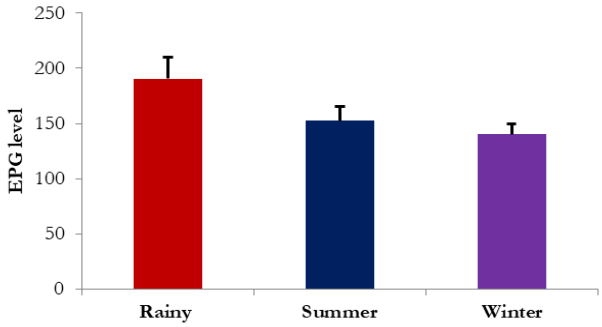

Figure 5: Seasonal intensity of GI parasites in sheep and goat

Bangladesh. Additionally, Asif et al. (2007) and Raza et al. (2014) also found inconsistent result with the present finding in Pakistan.

High prevalence in female might be due to stress and low immune status during pregnancy, parturient paresis and lactation periods (Dabasa et al., 2017). Likely, higher level of prolactin and progesterone hormones also increased the susceptibility of female to any infection (Lloyd, 1983).

Body condition related prevalence of GI parasites

In this study, body condition showed significant difference (P=0.000) on the prevalence of GI parasites. Highest prevalence of GI parasites was observed in poor body conditioned small ruminants (82.1%) followed by moderate (72.2%) and good body conditioned (53.8%) small ruminants (**Table 1**). This result was corresponded to Biswas et al. (2014) and Admasu and Nurlign (2014), who found higher parasitic infection in poor body conditioned host over moderate and good condition. On the other hand, Dabasa et al. (2017) found more prevalence with good body conditioned animal likely than poor and medium body conditioned animals.

Indeed, malnutrition and other concomitant parasitic infection will lead to poor immunological response in host to infective stage of the parasites (Watson et al., 1994). Meanwhile, Etter et al. (1999) found increased fecundity of parasites in case of immuno-compromised animals.

Seasonal prevalence of GI parasites

In this study, seasonal prevalence and intensity of GI parasitic infection was significantly (P=0.000) higher in rainy searon (83.6%) followed by summer (78.6%) and winter (59.4%) seasons (**Figure 4-5**).

Likewise, Yadav et al. (2006) reported highest prevalence in Jammu Province, Kashmir during rainy season (88.5%) in comparison with summer (83.2%) and winter (76.0%) seasons. Singh et al. (2015) recorded maximum prevalence during monsoons (98.0%) while minimum was recorded in winter (91.7%) in Madhya Pradesh, India. Also, Singh et al. (2015) recorded highest seasonal variation during rainy (90.10%), as compared to winter (83.84%) and summer (78.35%) in Punjab, India. Moreover, Gebeyehu et al. (2013) from Korea, Talukdar (1996) from Assam (India), and Faizal et al. (1999) from Sri Lanka also reported higher prevalence during rainy season. However, Biswas et al. (2014) reported the highest prevalence in summer season (84.6%), followed by rainy (83.6%) and winter seasons (81.2%) in Bhola district, Bangladesh. Higher GI parasitism during rainy season might be due to suitable environmental conditions for growth and development of GI parasites and their stages.

Geographical location and climatic condition of the experimental area might be responsible for this variation. Bangladesh has a subtropical monsoon climate with three seasons characterized by hot and rainy summer and dry

winter (Bammi, 2010). Hence; this study period covered three seasons of a year in Bangladesh, while in other regions of the world, mostly four seasons existed that is summer, rainy, spring, and winter.

CONCLUSION

GI parasitic infections are prevalent in sheep and goats in Mymensingh, Bangladesh. However, a number of immune and molecular based diagnostics may show some promise and further understanding of the GI parasites in terms of epidemiology.

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CONFLICT OF INTEREST

The authors declared that they had no conflict of interest regarding the research, authorship, and/or publication of this article.

AUTHORS' CONTRIBUTION

MZA, ARD design the experimental study and analyzed the data. MSI, MSH and ARD executed the experiments. MSI, MAA, SA and MZA prepared the manuscript.

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