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Research Article

Prevalence of gastrointestinal parasitic infections in sheep of a coastal belt under Noakhali district, Bangladesh

Hossain, M. M.[1], Hasib, F. M. Y.[1], Bayzid, M.[1], Hassan, M. M.[2], Hossain, M. A.[1] and Alim, M. A.[1*]

[1] Department of Pathology and Parasitology, Chattogram Veterinary and Animal Sciences University, Khulshi, Chattogram-4225.
[2] Department of Physiology, Biochemistry and Pharmacology, Chattogram Veterinary and Animal Sciences University, Khulshi, Chattogram-4225.

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** Corresponding Author :*
Cell: +8801712288554
E-mail: maalim85@gmail.com

ABSTRACT

Gastrointestinal (GI) parasitic infection is considered one of the major concerns in sheep production in Bangladesh. The current study was undertaken to determine the GI parasitic infections in sheep reared in bathan area and semi-intensive conditions of six (6) randomly selected areas of Subarnachar upazila under Noakhali costal belt. A total of 200 fecal samples were collected and examined to detect the ova of GI parasites using routine coproscopical tests (e.g. direct smear, sedimentation and flotation). Results demonstrated that the overall prevalence of GI infections in sheep was found 79.50%, where infections caused by trematodes were the highest in comparison to cestode and nematodes. The frequency of GI parasites were more common in all the study areas where the higher prevalence was recorded in Char Clark, Char Jabbar and Char Bata which ranged around 82-84% compared to other areas. Further, sheep reared in bathan areas (82.66%) were found to be more susceptible to GI parasitic infections compared to sheep kept on semi-intensive condition (77.60%). Furthermore, the occurrence of GI parasites was significantly higher in female sheep compared to male. The present study documented the occurrence of GI parasites which might reduce the production performance of the animals of that coastal belt. We recommend further extensive study for molecular detection of such parasitic infections including growing awareness among sheep owners to prevent and control of those infections.

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1. INTRODUCTION

Livestock is one of the most potential sub-sectors of agriculture in Bangladesh which plays an indispensable role in promoting human health and national economy of the country. Livestock not only assists to upgrade the financial condition but also makes a substantial contribution to human nutrition (Rajarajan and Palanivel, 2017). Small ruminants particularly sheep also constitute a significant portion of livestock. The present sheep population of the country is 34.68 million according to the Department of Livestock Services (DLS). They are mostly distributed in Bogra, Dinajpur, Gaibandha, Joypurhat, Kurigram, Naogaon and Sirajganj districts of Bangladesh. A significant proportion of them also found

in coastal areas of the country such as Barisal, Bhola, Bagerhat, Noakhali districts (Huque and Khan, 2017). In coastal belts, they are reared as free ranging animals in an open pasture with or without a shelter for night (bathan). Furthermore, people also keep sheep in their houses where feed supplements are provided with free range on pasture (semi-intensive) (Huque and Khan, 2017). These animals are mostly affected by various types of diseases including gastrointestinal (GI) parasitic infections (Yeasmin *et al.*, 2015). The geo-climatic conditions (e.g. low-laying and salty areas) of the region may favour the growth, development and survival of various parasites. It is thought that GI parasitic infections in these areas are one of the major constraints that hinders the development of sheep population as it adversely affects the health and productivity of sheep and even death (Cordero C.M, 1999).

Several research has been conducted on GI parasitic infections in sheep of different plane and hilly regions of Bangladesh (Samad *et al.*, 2004; Mondal et al. 2000), although there are limited number of studies in the costal belts. A proper understanding about the epidemiology of GI parasitism in these areas is a prerequisite for rational designing of the effective preventive and control measures against these diseases (Rajarajan and Palanivel, 2017). Therefore, the current study was designed to determine the prevalence of GI parasitic infections along with associated (e.g. age, sex) risk factors in sheep population of six unions of Subarnachar Upazila of Noakhali district.

2. MATERIALS AND METHODS

Study period and areas

The study was undertaken for a period of 12 months starting from January to December 2017 in six (6) randomly selected unions (Char Jabbar, Char Bata, Char Clerk, Char Wapda, Char Mohammadpur and Char Jubilee) of Subarnachar upazila under Noakhali district, Bangladesh. All the study areas are located in a coastal belt which represent low laying salty areas. Selection of study areas were based on the higher number of sheep population, probability of higher prevalence of gastrointestinal parasites in animals (e.g. cattle) and geographical location (Alim *et al.*, 2012).

Selection of animals and study design

Non-descriptive indigenous sheep (cross breed) reared under semi-intensive condition (free range grazing and concentrate supplement feeding) and bathan areas were considered as target animals. To determine the age susceptibility of GI parasitic infections, sheep were categorized into two sub-groups as young ($\leq$1.5 years) and adult ($\geq$1.5 years). A total of 200 sheep samples were collected from semi-intensive (n=125) and bathan areas (n=75) which comprises 120 female and 80 male animals. A prototype questionnaire was used to record the information such owner's name and address, animal identification, age, sex, feeding and deworming history etc.

Sample collection and examination

Individual animal was considered as a sampling unit. Approximately, 3-5 g of fecal samples were collected directly from the rectum or freshly voided faces following standard procedure (Hendrix and Robinson, 2006). Samples in plastic specimen container with 10% formalin were preserved at refrigerator (4°C). All laboratory examinations were performed at Parasitology laboratory of Department of Pathology and Parasitology of Chattogram Veterinary and Animal Sciences University. Three different types of tests, namely direct smear, flotation and sedimentation were used to examine the fecal samples according to previously described procedure (Hendrix and Robinson, 2006). Briefly, individual fecal sample were first homogenized with tap water (15 mL) and filtered with a tea strainer to remove the undigested fecal materials. Direct smear technique was performed by taking one drop of fecal suspension on a glass slide following putting a coverslip on it and observed under microscope. For flotation technique, 5 mL of fecal suspension was taken into a 20 mL test tube and remaining volume was filled with sugar salt flotation fluid and a cover slip was placed at the top of the convex meniscus. After 15 minutes, the coverslip was taken and placed on a slide and examined. Simple sedimentation technique was done by taking the rest of the fecal suspension (10 mL) in a beaker and allowed it to stand for 15 minutes. After discarding the supernatant, a drop was taken on to a glass slide and observed under microscope. At least, two smears were prepared from each sample for each technique to identify the morphological characteristics of helminths' eggs (Hendrix and Robertson 2006; Urquhart *et al.*, 1996 and Soulsby, 1982).

Statistical analysis

Statistical analysis was performed using STATA/IC-13.0 (Stata Corporation College Station) and GraphPad Prism 7.03 software was used to prepare the graphs. Chi-square test was performed to find out the significant variation among the variables. The level of significance indicated as *P$\leq$0.05, **P$\leq$0.01, ***P$\leq$0.001 and ****P$\leq$0.0001.

3. RESULTS

Prevalence of gastrointestinal parasitic infections

In this current investigation, we determined 1 genus of cestode, 2 genera of trematodes and 2 genera of nematodes including Trichostrongyloids (e.g. *Haemonchus, Trychostrongylus, Ostertagia* or other species). The overall prevalence of GI parasitic infections was 79.5%. Infection caused by trematodes was the highest (39.25%) followed by nematodes (37.38%) and cestode (34%) in the studied animals. The highest prevalence of GI parasites in sheep was 46% which was contributed by *Stronglyloide* spp (Figure 1). Infection caused by *Trichuris* spp was the lowest and the occurrence of *Monizia* spp, *Fasciola* spp, *Paramphistomum* spp and Trichostrongylids were range 34-39% (Figure 1).

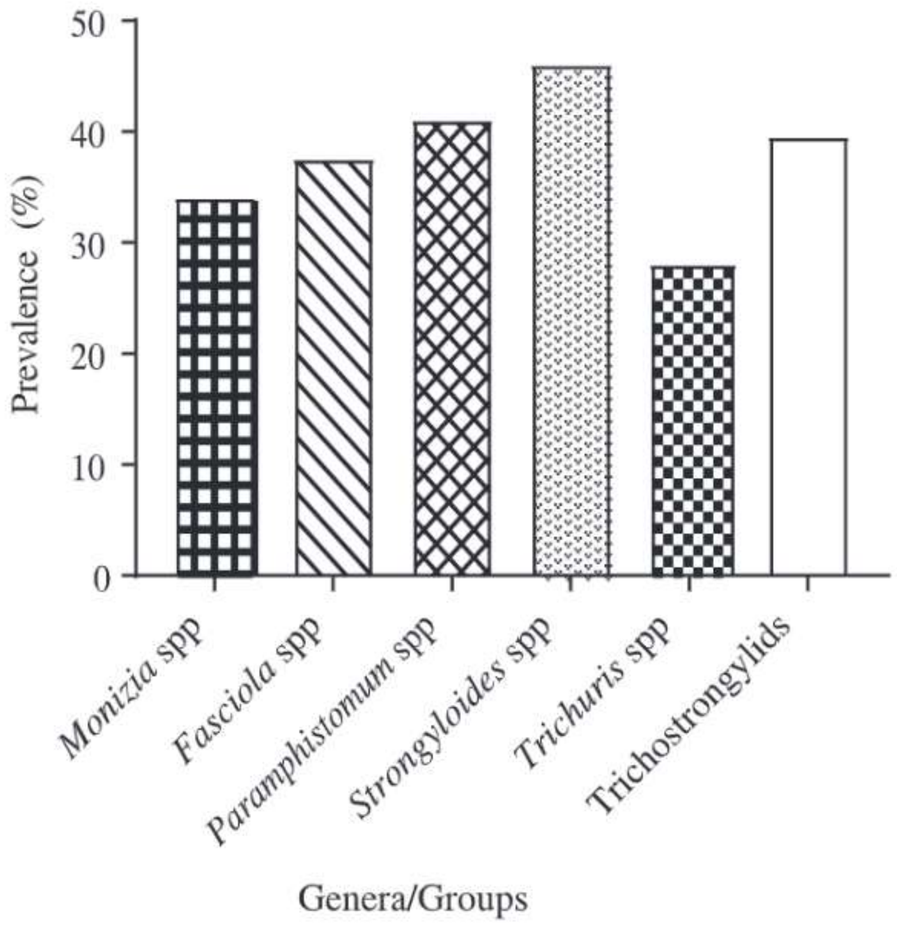

Figure 1. Prevalence of gastrointestinal parasites in sheep

Area-wise prevalence of gastrointestinal parasitic infections

The area-wise prevalence of GI parasites in sheep was the highest in Char Clark followed by Char Jabbar, Char Bata, Char Mohammadpur, whereas the lowest prevalence was recorded in Char Jubilee, Char Wapda, and Char Jubilee (Figure 2). Furthermore, sheep from the bathan (82.66%) area were found to be more susceptible to GI parasitic infections in comparison to sheep kept in semi-intensive condition (77.60%).

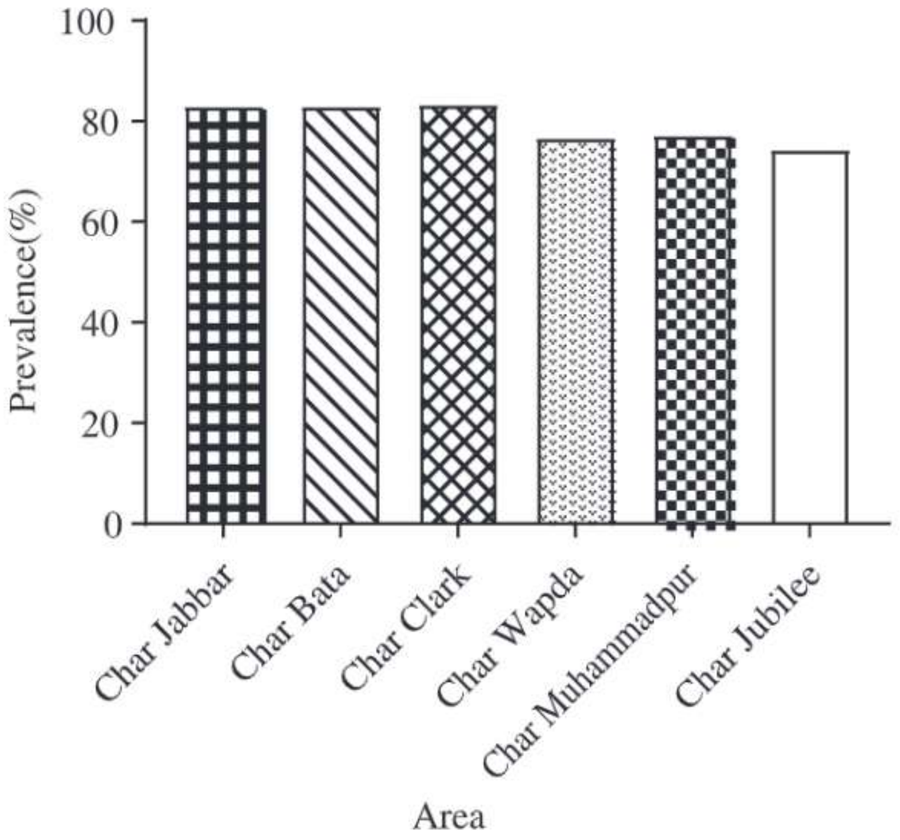

Figure 2. Area-wise prevalence of gastrointestinal parasites in sheep

Age-specific prevalence of gastrointestinal parasitic infections

The overall age-specific prevalence of GI parasitic infections was higher in young sheep (90%) compared to adult sheep (70.90%). Infections caused by *Moniezia* spp, *Fasciola* spp, *Paramphistomum* spp, *Strongyloide* spp, *Trichuris* spp and Trichostrongylids were significantly higher in young animal compared to adult (Figure 3).

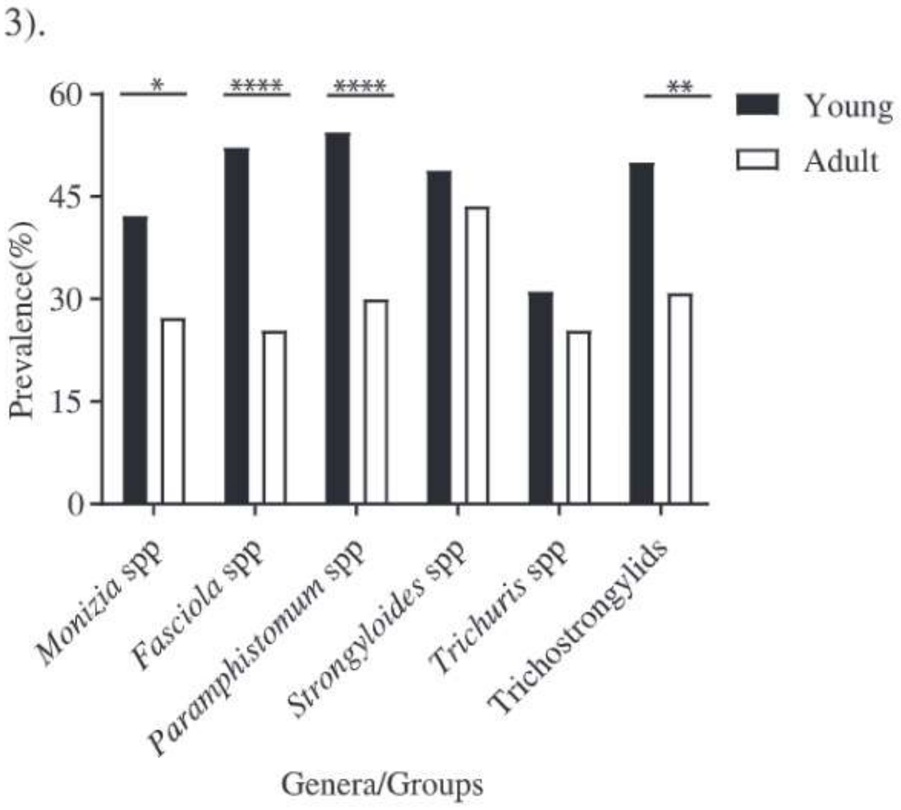

Figure 3. Age-wise prevalence of gastrointestinal parasites in sheep

Gender-specific prevalence of gastrointestinal parasitic infections

The overall gender-specific prevalence of GI parasitic infection was higher in female sheep (80%) compared to male (71.25%). Infections caused by *Moniezia* spp (female, 37.50 *vs* male, 28.75,%), *Fasciola* spp (40.00 *vs* 33.75,%),

Paramphistomum spp (43.37 *vs* 37.50,%), *Strongyloides* spp (49.17 vs 41.25,%), *Trichuri* spp (30.00 *vs* 25.00,%) were higher in female sheep compared to male, although they didn't reach significance. Whereas the frequency of Trichostrongylids infections were observed almost equal in both female (39.50%) and male (40%) sheep.

4. DISCUSSION

Gastrointestinal parasitic (GI) infection is considered one of the major impediment in sheep production in Bangladesh. In this investigation we have demonstrated a higher prevalence of GI parasitic infections in a coastal belt under Subarnachar upazila of Noakhali. It was observed that GI parasitic infection was more common in female sheep and aged under 1.5 years.

The present study revealed that overall prevalence of GI parasitic infection in sheep was 79.5%. This observation is similar with the findings of the previous report (Nuruzzaman *et al.*, 2012). Prior researches reported a slightly lower prevalence (62-63%) of GI parasitic infection in sheep of Jammu province of India (Khajuria *et al.*, 2012) and Chattogram region of Bangladesh (Hassan *et al.*, 2011). Whereas, Mazid and colleaguesreported a higher prevalence of GI parasites in Mymensingh district (94.7%) of Bangladesh (Mazid *et al.*, 2006). This variation could be due to the geographical locations, climatic state, rearing and management system of sheep and variation in the sampling methods.

Overall prevalence of *Strongyloides* spp infection of this study was somewhat consistent with the report of Hassan *et al.* (2011) where 51.74% prevalence was recorded in the sheep of Chattogram, Bangladesh. Further, prevalence of *Strongyloides* spp infection showed somewhat discrepancy with the report of Varadharaojan and colleagues and Poddar and others where the prevalence of such parasitic infections was 13.79% in Tamil Nadu, India and 12.13% in Sherpur, Bangladesh (Varadharaojan *et al.*, 2009); Poddar *et al.*, 2017. (Varadharaojan *et al.*, 2009). Prevalence of *Trichuris sp* infection of this study was consistent with a previous report (13.20%) in sheep of Tamil Nadu, India (Varadharaojan *et al.*, 2009). The occurrence of *Trichuris* spp infection was higher than the previous reports where the authors observed very low prevalence (1-2%) of such parasitic infections in Kashmir valley of India and Sherpur district of Bangladesh (Poddar *et al.*, 2017). The prevalence was 1.37% and 1.90% in Kashmir valley and Sherpur, Bangladesh, respectively. The frequency of *Fasciola* spp infection of this experiment was comparable with the findings of prior reports where they recorded 11.3% in sheep of Sherpur (Poddar *et al.*, 2017), 20.74% in Comilla and Brahmanbaria district of Bangladesh (Kabir *et al.*, 2010).

These variations in the occurrence of such parasitic infections might be due to geo-climatic conditions where our study areas were located in costal belts with low and salt water. However, we did not determine the availability of intermediate hosts (e.g. snail vector of *Fasciola* spp) which could be another possible reason of such variation. Higher prevalence of such species indicates that those parasites could better survive in those swampy area compared to plane and hilly areas. Rearing pattern could be another possible reason of variation where we studied on the sheep kept on bathan and semi-intensive conditions. In this study we have observed higher prevalence of GI parasites in bathan area (82.66%) compared to the sheep of semi-intensive grazing system (77.60%). These observations are inconsistent with the report of Poddar and colleagues where they observed higher prevalence in sheep reared in semi-intensive system (73.90%) than the sheep of free range grazing system (63.30%) in Sherpur district, Bangladesh (Poddar *et al.*, 2017). The reasons of the higher occurrent in free range grazing sheep in bathan areas may be due to mixed grazing with other animals, contaminated pasture, low swampy areas and no or poor management of the sheep.

In the current investigation, we observed that age was an important predictor where age group under 1.5 years sheep (Young) were more prone to GI parasitic infections compared age group higher than 1.5 years (Adult). Previous research also observed similar types of findings where young sheep (90.00%) were more infected by GI parasites than older ones (70.90%) (Asif Raza *et al.*, 2007; Singh *et al.*, 2013). However, some research found opposite trend of GI parasitic infections (Singh *et al.*, 1997; Mazid and Rahman, 2006). Lower prevalence of GI parasitic infection in adults might be due increased acquired immunity by the previous exposures (Starke *et al.*, 1983; Rajapakse *et al.*, 1994; Colditz *et al.*, 1996a; Roberts *et al.*, 1996; KNOX, 2000).

The gastrointestinal parasitic infections were significantly more in female sheep (85.0%) than male (71.25%) in this current study. This findings were in line with the observations of previous studies (Shahiduzzaman *et al.*, 1999; Valcárcel and Romero, 1999; Rahman *et al.*, 2013; Rahman *et al.*, 2017). However, there were some reports where the authors observed female sheep were more susceptible compared to male (Yeasmin *et al.*, 2015). Higher prevalence of GI parasitic infections

in sheep could be explained by the reduced immune status and variation in hormones (Colditz *et al.*, 1996b). Furthermore, higher prevalence were also found parturient and peri-parturient period which could be another reason of higher frequency of GI parasitic infections in female sheep of this study.

5. CONCLUSIONS

The investigation documented a higher prevalence of GI parasites in sheep of some coastal areas under Subarnachar upazila of Noakhali, Bangladesh. We further observed sheep reared in bathan areas in particular female sheep were found more prone to GI parasitic infections compared to sheep kept on semi-intensive condition. Our data suggested that the higher prevalence of such parasitic infections might hamper the growth and production performance of the animals even may lead to death. We recommended further extensive studies to identify the occurrence of various diseases including GI parasites in those areas which will ultimately assist to build up an effective preventive and control measures.

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