Effects of rearing system and herd size on the prevalence of haemonchosis in goats at Rajshahi, Bangladesh

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Abstract

Context: Haemonchosis is a predominant helminthic disease, has detrimental effects on productive and reproductive performance of goat in Bangladesh.

Objectives: The present study was conducted to evaluate the effects of rearing system and herd size on the prevalence of haemonchosis of goats.

Materials and Methods: The research activities were conducted at the laboratory of Animal Husbandry and Veterinary Science, University of Rajshahi during the period of one year from March, 2011 to February 2012. In this cross-sectional study, a total of 720 goats were randomly selected from the villages, farms, pastures, veterinary hospitals, abattoirs and examined for *Haemonchus* spp. infection. Goats were categorized into three according the rearing system such as intensive (N= 131), semi-intensive (N= 247) and extensive (N= 342). On the other hand, herd size of goats were grouped into small (1-5) (N=225), medium (6-10) (N=350) and large (>10) (N=145). About 363 faecal samples were collected, both direct smear and floatation methods were performed to identify the eggs of *Haemonchus* spp. A total of 357 abomasa were collected for the examination of contents of the abomasum and collection of adult worms to identify *Haemonchus* spp. Descriptive statistics was used to determine the prevalence of haemonchosis and Chi-square test (χ2) was used to look the significant difference between rearing system and herd size with haemonchosis of goats.

Results: The study revealed that, the occurrence of *Haemonchus* spp. was higher in extensive rearing system (71.6%) compared to intensive rearing system (15.3%) followed by semi-intensive (61.1%) system. Goats of extensive and semi-intensive systems were more susceptible to helminth infection than those of intensive system Goats with small (1-5) herd group had a significantly low *Haemonchus* spp. infection rate (38.2%) as compared to medium (6-10) herd group (64.2%), whereas the large (above 10) herd group showed the highest prevalence (72.4%) of *Haemonchus* spp. infection. The data analysis indicated that haemonchosis was significantly (P<0.001) influenced by the rearing system and herd size of goats.

Conclusion: The extensive rearing system and large herd size are the vital determinant in the occurrence of haemonchosis in goats. Further study can be carried out to determine the effect of haemonchosis in the production performance of goats.

Key words: Haemonchosis, prevalence, rearing system, herd size, goats.

Introduction

Bangladesh is densely populated, subtropical country with subsistence agro-based economy. It is the fourth largest agricultural country in the world (Habib, 2001). Livestock is very important sector which can remove poverty instantly. In Bangladesh, more than half of the total population is based on agricultural product and livestock for their livelihood (Shamsuddoha, 2009). The economy of Bangladesh largely depends on agriculture in which livestock is an important subsector. The numbers of livestock in Bangladesh are estimated to be 23.43 million cattle, 1.45 million buffalo, 25.61 million goats, and 3.15 million sheep up to February, 2014 (BER, Bangla, 2014). The total livestock population is about 536.60 (lacs) contributing 37.38 (lac ton) milk, 30.21 (lac ton) meat (BER, Bangla, 2014). Animal production contributes directly and indirectly to countries GDP (Gross Domestic Product) and to the income and purchasing power of the various operators in the production, processing and marketing chains, at both the national and international levels (FAO/OIE, 2012). Statistics show that about 1.78% of national GDP is covered by the livestock sector, and its annual rate of growth is 5.5% (BER, Bangla, 2014).

Historically the livestock sector was subsistence-oriented and dominated by smallholders, and even today livestock are considered a secure source of income for small farmers and landless poor, and a source of employment generation at the rural level (Gadahi *et al.,* 2009; Khajuria *et al.*, 2013). Goat is important livestock species all over the globe and especially in tropical and subtropical regions. It has a pivotal role in small scale farming and rural economy of developing societies by generating employment and supplementing house hold income. Goats plays vital role in rural economy through provision of meat, milk, blood, cash income, accumulating capital, fulfilling cultural obligations, manure, and contribute to the national economy through the export of live animals, meat and skin (Hassan *et al.,* 2011; Amenu, 2005). It provides one of the key source of income for the farmers of Bangladesh. It is a major contributor of protein and fat and often the goat enterprise can help farmers to overcome an unforeseen crisis, which demands immediate finance (Banglapedia, 2014).

Parasitism is claimed to be one of the main obstacles in livestock rearing in Bangladesh (Jabbar *et al.,* 2003). The agro-ecological and geo-climatic conditions of Bangladesh are highly favourable for growth and multiplication of parasitic diseases in goat (Huq and Sheikh, 1968). Kuchai *et al.* (2013) reported that grasslands are one of the main sources of gastro-intestinal parasitic diseases to animals. Goats are much susceptible to gastrointestinal nematode infections due to their specific feeding habits, underfed, unplanned farming and poor management practices adapted by farmers (Al-Shaibani, 2009). Parasitisms are important limiting factors that are responsible

for deteriorating the health and productivity of livestock. Parasitic infestations exert adverse effects on the health and productivity of animals (Rehman *et al.*, 2009). Parasites may reduce voluntary feed intake, efficiency of feed utilization and increase the endogenous loss of protein in the gastrointestinal tract (Alexandre and Mandonnet, 2005). These effects are varied and more pronounced in sheep and goats compared to those seen in other species of livestock (Iqbal *et al.*, 1993).

Many species of parasites are seen in sheep and goats including *Haemonchus, Oesophagostomum, Ostertagia, Nematodirus, Trichuris, Moniezia* and *Fasciola*. One of the most important of these is *Haemonchus contortus* (Husnain and Usmani, 2006). *Haemonchus contortus* is a major pathogen in the abomasa of sheep and goats and other ruminant worldwide (Troell *et al.*, 2003). It is an important blood sucking parasite of the small ruminants and causes an insidious drain on production (Asanji and Williams, 1987; Ijaz, *et al.*, 2008), weight losses and even mortality in young animals (Husnain and Usmani, 2006). There are several research work carried out on different aspects of helminth infestation (Rahman *et al.*, 2015; Nahar *et al.*, 2012; Hassan *et al.*, 2011) in different feeding system (Rabbi *et al.*, 2011) in goats of Bangladesh. Nuruzzaman *et al.* (2012) reported the prevalence of abomasal nematodes in goats of Thakurgaon district, Bangladesh. Badran *et al.* (2012) studied the epidemiology of *Haemonchus* spp. (40.8%) for extensive and intensive rearing system, respectively. Unfortunately, no studies have been conducted to determine the relationship between parasitic infections and different feeding systems in northern area of Bangladesh. More extensive study should be needed regarding factors related to prevalence of haemonchosis in goat. Taken together, get more precise information, the present study was undertaken to investigate the effects of rearing system as well as herd size of goats on the prevalence of *Haemonchus* spp. Infection in goats of Rajshahi, Bangladesh.

Materials and Methods

Study area and geographical distribution

The Rajshahi district is situated between latitude 24 and 40°N and longitude 88 and 50 °E. Annual average temperature of this district is maximum 37.8°C, minimum 11.2°C. Annual rainfall is 1862 mm. The area of Rajshahi district is 2407.01 sq km and city is 96.69 sq km with a population of 646716.

Management of animals

Under intensive rearing condition, goats were confined exclusively in sheds and were fed on leaves (Jackfruit, mango and banana) or cutting grass from fields and concentrates such as wheat, maize and pea etc. Under semi-intensive management, goats were allowed to go out of the shed for a few hours daily. This method represents varying degrees of compromise between extensive and intensive production. Extensive system was adopted where grazing land was available and goats were allowed to browse on free range and provided with shelter during night.

Study design and selection of animals

The present study was designed to assess the effects of different management factors on the epidemiology and/or prevalence of haemonchosis in goats of Rajshahi, Bangladesh.

The research activities were conducted at the laboratory of Animal and Veterinary Science, University of Rajshahi during the period of one year from March, 2011 to February 2012. In this cross-sectional study, a total of 720 goats were randomly selected from the villages, farms, pastures, veterinary hospitals, abattoirs and examined for *Haemonchus* infection. Goats were categorized into three according the rearing system such as intensive (N= 131), semi-intensive (N= 247) and extensive (N=342). On the other hand, herd size of goats were grouped into small (1-5) (N=225), medium (6-10) (N=350) and large (>10) (N=145).

Sample collection and examination

Faecal samples were collected directly from the rectum of the randomly selected goats (N= 363) and carried on cool box, brought to the laboratory at the Department of Animal Husbandry and Veterinary Science, Faculty of Agriculture, University of Rajshahi, Bangladesh and preserved at 10% formalin for further coprological study. Both the direct smear and floatation methods were performed to identify the eggs of *Haemonchus* spp. (Urquhart *et al.*, 2000). A total of 357 abomasa were collected from slaughter houses of the area, brought to the laboratory for the examination of contents of the abomasum and collection of *Haemonchus* spp. The *Haemonchus* spp were identified on the basis of morphology (Urquhart *et al.*, 2000).

Statistical analysis

All the data that were collected entered to MS Excel sheet and analyzed by SPSS version 19. Descriptive statistics was used to determine the prevalence of haemonchosis and Chi-square test ($\chi2$) was used to look the significant difference and confidence level was held at 95% and $P<0.05$ were set for significance.

Results and Discussion

Effects of rearing system

Goats managed under intensive rearing system had a significantly low *Haemonchus* infection rate (15.3%) as compared to goats under extensive rearing system (71.6%) (Table 1 & Figure 1). Rabbi *et al.* (2011) also recorded that the helminth and protozoan infections were the highest in extensive system (86.1%) followed by semi-intensive (76.3%) and intensive (57.5%) systems in Black Bengal goats of Bangladesh. Badran *et al.* (2012) studied the epidemiology of *Haemonchus* spp (40.8%) for extensive and intensive rearing system, respectively in Palestine. These findings suggested that goats reared in extensive rearing system are more susceptible to helminth parasitic infection. Under the extensive system, animals are grazed and reared together in the same area during dry and wet seasons. This increases the possibility of pasture contamination and consequently higher prevalence rate of parasitic infections (Magona and Musisi, 2002). In addition, in extensive system, the grazing areas are located in lowland and mid altitude areas, which are thought to be suitable for survival of the larval stage of the parasite. Kuchai *et al.* (2013) reported that grasslands are one of the main sources of gastro-intestinal parasitic diseases to animals. Moreover, the low levels of infection were detected in animals reared in intensive system and were kept in wooden barn with raised

floor that were cleaned regularly while those in extensive rearing system were kept in places which were not regularly cleaned. Furthermore, the extensive rearing environment is considered more conducive of parasitic infections than the intensive rearing environment. In both cases, the closer contact between faeces, parasites and hosts may increase the incidence of existing infections, and potentially result in emergence (or re-emergence) of new parasitic diseases (Waller *et al.*, 2004; Ng'ang'a *et al.*, 2004). Results of this research are consistent with the findings of other researchers (Keyyu *et al.*, 2006; Raza *et al.*, 2007) who found a direct influence of grazing characteristics on the prevalence of most of gastro-intestinal parasites and reported that under traditional free-range grazing systems (extensive) there is continuous infection and re-infection from heavily contaminated pastures compared to their intensive-grazed counter parts. The prevalence of haemonchosis was higher in extensive system possibly due to the closer contact between faeces, infective stage of parasites and hosts. These may increase the incidence of existing infections and potentially result in emergence and re-emergence of new parasitic diseases.

Table 1. Effects of rearing system on the prevalence of haemonchosis

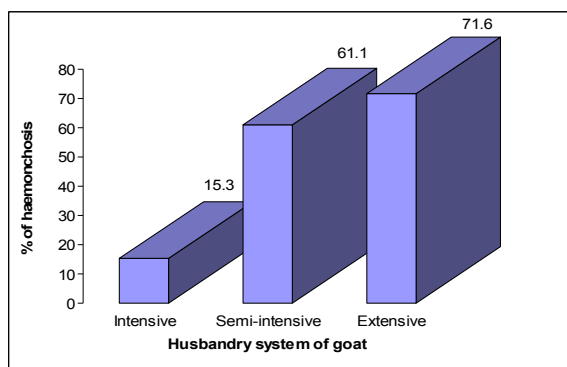| Rearing system	Sample examined (n)	Positive sample (n)	Prevalence of of haemonchosis (%)	Chi-square value	Level of Significance
Intensive	131	20	15.3		
Semi-intensive	247	151	61.1	11.014	0.001***
Extensive	342	245	71.6		
Grand total	720	416	57.8		

Fig. 1. Bar-chart representation of the prevalence of haemonchosis on different rearing system of goats

Effects of herd size

In the present study, large herd size group of goats showed higher (72.4%) prevalence of haemonchosis followed by medium sized (64.2%) goats compared to small herd size (38.2%) (Table 2 & Fig. 2). This findings indicated that haemonchosis was significantly (P<0.001) influenced by the herd size of goats. Hassan *et al.* (2011) reported that the large herd of goats was more susceptible to parasitic infestation than the smaller ones. This may be due to the direct contact, overcrowding and unhygienic condition of goat housing which is difficult to maintain in large herd group. Poor hygienic condition of the floor of house, more close contact of healthy and un-healthy animals which facilitates the favourable environment for larval development were also common observation in this study. Swallowing of urine with faeces of

infected animals increases the possibility to helminthic infection specially the infective stage of the *Haemonchus* spp with feed stuffs.

Table 2. Effects of herd size on the prevalence of haemonchosis in goat

Herd size	of Sample examined (n)	No. affected sample (n)	Prevalence of haemonchosis (%)	Chi-square value	P
Small (1-5)	225	86	38.2		
Medium (6-10)	350	**225**	64.2	55.086	.000***
Large (>10)	145	105	72.4		
Grand total	720	416	57.8		

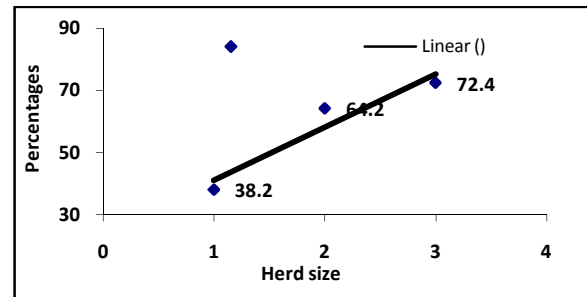n= Number of observation, ***Significant at 0.01% level (P<0.001)

Fig. 2. Line-chart representation of the prevalence of haemonchosis in different herd size of goat.

Conclusions

Extensive rearing system and large herd size of goats are more susceptible to *Haemonchus* spp infection in goat. Regular anthelmintics treatment and rotational grazing management of goats should be tried in extensive rearing system. Proper hygienic management should be maintained in large herd group of goats. Intensive husbandry practices should be maintained to overcome economic losses due to haemonchosis in goats.

Author's contribution

The first author has contribution on study design, analyzing the data and writing the manuscript and the other authors have contribution on editing the manuscript and analyzing the data.

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