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RESEARCH ARTICLE

Epidemiological studies of fascioliasis (*Fasciola gigantica*) in black Bengal goats

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Özet

Islam KM, Rahman M, Islam MS, Adhikary GN, Abdur Rauf SM. Siyah Bengal keçilerinde fascioliasisin (*Fasciola gigantica*) epidemiyolojik çalışması.

Amaç: Siyah Bengal keçilerinde farklı yaş, cinsiyet ve mevsimde facioliasisin epidemiyolojisini araştırmaktır.

Gereç ve Yöntem: Siyah Bengal keçilerindeki fascioliasisinin epidemiyolojik araştırması Upazilla'nın beş farklı bölgesinin Sylhet bölgesinde farklı iklim koşulları altında gerçekleştirildi. Keçiler genç ve yaşlı olmak üzere iki gruba ayrıldı. Temmuz 2012-Haziran 2013 döneminde çiftliklerdeki keçilerden rektal sıvap örnekleri ve mezbahalardan karaciğer örnekleri toplandı. Örnekler direk/sedimentasyon teknikleri ve makroskobik olarak incelendi.

Bulgular: Toplamda 1288 rektal sıvap ve 2000 karaciğer örneği incelendi. Bunlardan çiftlik keçilerinin 405 (%31.75) ve kesilen keçilerin 202 (%10.10)'u *Fasciola gigantica* açısından pozitif bulundu. Genel prevalans %20.93 olarak belirlenirken, çiftlik keçilerindeki prevalans kesilen keçilerden yüksek belirlendi. Genel prevalans yağmurlu mevsimde yüksek ve yaz mevsiminde düşük belirlendi. Gençlerde yüksek prevalans belirlenirken, dişilerde erkeklerden yüksek tespit edildi.

Öneri: Bangladeş'te evde beslenen ve kesime sevk edilen siyah Bengal keçilerinde yoğun olarak fascioliasis bulunmaktadır. Siyah Bengal keçilerinde yoğun olarak gözlenen fascioliasisin tedavisi için etkili kontrol ile stratejik antelmentik uygulamasına ihtiyaç bulunmaktadır.

Anahtar kelimeler: Epidemiyooji, *Fasciola gigantica*, siyah Bengal keçisi, Sylhet, Bangladeş

Abstract

Islam KM, Rahman M, Islam MS, Adhikary GN, Abdur Rauf SM. Epidemiological studies of fascioliasis (*Fasciola gigantica*) in black Bengal goats.

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Aim: To investigate the epidemiology of fascioliasis in black Bengal goats of different ages, sexes and seasons.

Materials and Methods: Epidemiological studies on fascioliasis of black Bengal goats were undertaken in such localities under different climatic conditions existing in Sylhet region of five different Upazilla. Goats were divided into young and adult groups. Rectal fecal samples from household and livers from slaughtered goats were collected randomly and examined by direct/and sedimentation techniques and grossly from July 2012 to June 2013.

Results: A total of 1288 rectal fecal samples from household live and 2000 livers from slaughtered goats were examined of which 405 (31.75%) household and 202 (10.10%) slaughtered goats were found positive for *Fasciola gigantica*. The overall prevalence was 20.93%. It was noticed that prevalence of household was higher than slaughterhouse goat. The overall prevalence of fascioliasis was higher during rainy while lowest during summer season. The highest prevalence was recorded in young's. Moreover, the overall prevalence of fascioliasis in female's goats was more than males.

Conclusions: Fascioliasis is highly prevalent in both household and slaughtered black Bengal goats in Bangladesh. Effective control and the strategic use of anthelmintics is need for the treatment of intensive fascioliasis in black Bengal goats.

Keywords: Epidemiology, *Fasciola gigantica*, black Bengal goat, Sylhet, Bangladesh

Introduction

The livestock population in Bangladesh is currently estimated to comprise 26.828 million cattle, 0.544 million buffalo, 16.242 million goat and 1.221 million sheep (BBS 2010) which plays an important role in the rural economy (Kamaruddin 2003). Goats are the most second important livestock in Bangladesh which contributes in poverty alleviation and by supplying animal protein of high caloric value in the form of milk and meat. Parasitic diseases especially *F. gigantica* infection in ruminants causes enormous economic losses of the livestock population and these losses are due to costs of anthelmintics, reduction in milk and meat production, fertility and draught power. The disease also has public health significance, causing human fascioliasis (Bhuyan 1970, Lebbie et al 1994). Egg count from fecal sample is a usual tool to investigate prevalence/incidence/diagnosis of fascioliasis. Similarly information regarding epidemiology of fascioliasis on the basis of liver pathology is almost nill though the liver damage is a key factor of heath status, productive and reproductive performance and body immunity and mortality of the animal (Boray 1982). Depending on the climatic conditions, the seasonal occurrence of fascioliasis varies from country to country. The disease usually occurs continuously if suitable temperature (above 10°C) and moisture are available. High incidence and clinical disease with high mortality are reported to occur in wet seasons. Domestic ruminants which are chronically infected are responsible for the spread of the disease by contaminating the pastures with liver fluke eggs; this is especially seen in areas that have favorable climatic conditions and suitable snails. There was several research work carried out on different aspects of fascioliasis in buffaloes (Alim et al 2000), cattle (Chowdhury et al 1994), goats (Howlader et al 1991) and sheep (Alam et al 1994) in Bangladesh but limited study on black Bengal goats.

The present study has undertaken to investigate thoroughly the overall prevalence of *F. gigantica* infection in black Bengal goats on the basis of rectal faecal samples from live and livers from slaughtered black Bengal goats to detect eggs, liver damage and pathological changes in the liver and also their relationship with age, sex, seasons and different areas in Sylhet region of Bangladesh.

Materials and Methods

This study was conducted in Sylhet region of Bangladesh. Sylhet region is located in North-East part of Bangladesh and between 24°30' North latitude and 91°40' East longitudes. The division has an area of 3490.40 square kilometers. More than three quarter of the division consists of mostly tea garden, hilly, water logged and low lying areas. The average maximum and minimum temperatures are 23°C and 7°C, respectively. The annual average rainfall is 3334 mm and humidity is 80%. The study was carried out in the Laboratory under the Department of Parasitology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University (SAU) from July 2012 to June 2013. Different areas of Sylhet region was selected on the basis of irrigated agro-ecological zones such as Sylhet Sadar, Balagonj, Beanibazar, Bishwanath and Zoyantapur Upazilla. The black Bengal goats of various local breeds, sexes and age groups were selected randomly from small holder farmers. The age of the black Bengal goats were determined by dentition. The black Bengal goats were divided into two age groups such as young (<1.5 years) and adult (≥1.5 years) age. The sexes of the black Bengal goats were recorded by examining presence of penis or uterus.

During the study year, 1288 of household black Bengal goat fecal samples were collected from five different Upazillas of Sylhet region and examined by direct smear/and sedimentation techniques for the presence of *Fasciola* eggs in the Laboratory of Parasitology, Faculty of Veterinary and Animal Science, Sylhet Agricultural University, Sylhet-3100, Bangladesh. Identification was done on the basis of morphology (Soulsby 1986).

During the study year, a number of 2000 black Bengal goats at slaughterhouses were examined to record the prevalence of the disease in a systematic survey of various slaughterhouses in different five Upazilla of Sylhet region. Post-mortem examinations of slaughtered black Bengal goats were carried out and livers were checked out for the presence of flukes. The livers with gall bladders in the Laboratory were subjected to thorough investigation and collection of parasites as well as for gross pathology. *F. gigantica* was identified on the basis of morphology (Soulsby 1986).

During collection of parasite, the affected black Bengal goat liver with gall bladders in the laboratory were subjected to thorough investigation and collection of parasites as well as for gross pathology following the procedure of Ross (1967) and those showing evidence of the infection were marked.

Among the male and female black Bengal goats, variations in the prevalence of fascioliasis on the basis of different age groups, season, sex and their location and prevalence were analyzed by logistic regression using statistical software SPSS (Version 15.2)/STATA (Version 8.0) and Microsoft Excel 2007. Values of $p<0.001$ were considered as significant at 99.99% confidence interval. The relationship of different variables with the infection was observed by this regression analysis

Results and Discussion

A total of 1288 rectal fecal samples from householder live and 2000 livers from slaughtered black Bengal goats in different Upazilla of Sylhet region were examined of which 405 (31.75%) faecal samples and 202 (10.10%) livers were found for *F. gigantica* positive. The highest prevalence of fascioliasis was 39.91% and 12.00% in Bishwanath and the lowest 25.43% and 8.25% in Sylhet Sadar Upazilla, which was examined by rectal fecal samples and slaughtered of black Bengal goat liver respectively. The overall prevalence and prevalence of five different Upazilla was correlated with the findings of Bhuyan (1970), Islam and Taimur (2008), Mamun et al (2011) and Alam et al (1994) who reported the prevalence of *F. gigantica* in black Bengal goat was 32.00% and 60.00%, 8.70% and 12.92%, through fecal and liver samples examination respectively. The geo-climatic conditions together with the water logged and low lying areas in Sylhet region of Bangladesh and most of the animals graze on the low land where are highly favorable for the

Table 1. Prevalence of fascioliasis of black Bengal goats and relation with their different areas.

Upazilla	Household goat			Slaughterhouse goat			Overall (%)
	No. examined	No. Positive	Prevalence (%)	No. examined	No. positive	Prevalence (%)	
Sylhet Sadar	291	74	25.43	400	33	8.25	16.84
Balagonj	266	81	30.45	400	40	10.00	20.23
Beanibazar	280	94	33.57	400	43	10.75	22.16
Bishwanath	223	89	39.91	400	48	12.00	25.96
Zoyantapur	228	67	29.39	400	38	9.50	19.45
Average	1288	405	31.75±2.42***	2000	202	10.10±.63***	20.93

***: P <0.001, Mean in row with letters shown significantly (P<0.05)

Table 2. Prevalence of fascioliasis in both household and slaughter black Bengal goats in relation to age factor.

Upazilla	Young age (<1.5 years)				Overall prevalence (%)	Adult age (≥1.5 years)				Overall prevalence (%)
	Household goat		Slaughterhouse goat			Household goat		Slaughterhouse goat		
	No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)		No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)	
Sylhet Sadar	151(48)	31.79	34 (04)	11.77	33.61±1.74***	140 (26)	18.57	366 (29)	7.92	13.04±0.93***
Balagonj	140 (56)	40.00	28 (05)	17.86		126 (25)	19.84	372 (35)	9.41	
Beanibazar	149(58)	38.93	23 (04)	17.39		131 (36)	27.48	377 (39)	10.35	
Bishwanath	128(61)	47.66	49 (09)	18.37		95 (28)	29.47	351 (39)	11.11	
Zoyantapur	122 (45)	36.89	40 (05)	12.50		106 (22)	20.76	360 (33)	9.17	
Average	690 (268)	39.05±2.57**	174 (27)	15.58±1.42**		598 (137)	23.22±2.19**	1826 (175)	9.59±0.54**	

***Significant differences between age groups p<0.001, **household groups p<0.002 and **slaughtered groups p<0.004

Table 3. Sex-wise prevalence of fascioliasis in both household and slaughterhouse black Bengal goats in relation to sex factor.

Upazilla	Male				Overall prevalence (%)	Female				Overall prevalence (%)
	Household goat		Slaughterhouse goat			Household goat		Slaughterhouse goat		
	No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)		No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)	
Sylhet Sadar	120 (17)	14.17	200 (12)	6.00	11.33±0.91***	171 (57)	33.33	200 (21)	10.50	24.52±1.35***
Balagonj	106 (23)	21.70	200 (13)	6.50		160 (58)	36.25	200 (27)	13.50	
Beanibazar	119 (27)	22.69	200 (15)	7.50		161 (67)	41.62	200 (28)	14.00	
Bishwanath	71 (18)	25.35	200 (18)	9.00		152 (71)	46.71	200 (30)	15.00	
Zoyantapur	88 (14)	15.91	200 (13)	6.50		140 (53)	37.86	200 (25)	12.50	
Average	504 (99)	19.96±2.12***	1000 (71)	7.10±.53***		784 (306)	39.15±2.32***	1000 (131)	13.10±.77***	

***Significant differences between sex's and groups p<0.001.

development and multiplication of *Fasciola* species and their intermediate hosts (snails).

In this study, the overall prevalence of young (<1.5 years) age group of black Bengal goats were infected significantly (p<0.001) higher than adult (≥1.5 years). Similar observation was reported by, Shah-Fischer and Say (1989), Kiyyu et al (2003) and Tasawar et al (2007). The young age groups of black Bengal goats found to be infected more with helminths is an important factor in the onset of infection because immunity plays a great role in the establishment of parasites in the host body and/or undernourishments and generally poor husbandry. In adult animals, the prevalence of helminth is low due to the development of significant immunity. When the animals cross one year of age the major part of their parasitic infection is eliminated so called self cure phenomenon and/or high acquired immunity which increase with age. Winkler (1982) reported that host may recover from parasitic infection with increasing age and hence become resistant. On the other hand, young age groups of goats were more infected than adults may be due to decrease of immunity. Similar observation was reported by Shah-Fischer and Say (1989), Kiyyu et al (2003) and Tasawar et al (2007).

During the present study, the overall prevalence of both

Table 4. Seasonal prevalence of fascioliasis in both household and slaughterhouse black Bengal goats.

Upazilla	Rainy season				Overall prevalence (%)	Winter season				Overall prevalence (%)	Summer season				Overall prevalence (%)
	Household		Slaughterhouse			Household		Slaughterhouse			Household		Slaughterhouse		
	No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)		No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)		No. examined (positive)	Prevalence (%)	No. examined (positive)	Prevalence (%)	
Sylhet Sadar	108 (36)	33.33	140 (19)	13.57	25.71±1.98***a	101 (26)	25.74	147 (10)	6.80	16.84±0.79***c	82 (12)	14.63	113 (4)	3.54	10.12±0.89***b
Balagonj	101 (40)	39.60	149 (24)	16.11		92 (29)	31.52	148 (11)	7.43		73 (12)	16.44	103 (5)	4.85	
Beanibazar	109 (45)	41.28	149 (27)	18.12		95 (32)	33.68	142 (10)	7.04		76 (17)	22.37	109 (6)	5.50	
Bishwanath	94 (45)	47.87	138 (29)	21.01		80 (31)	38.75	144 (12)	8.33		49 (13)	26.53	118 (7)	5.93	
Zoyantapur	102 (35)	34.31	189 (26)	13.76		76 (24)	31.58	129 (09)	6.98		50 (08)	16.00	82 (3)	3.66	
Average	39.28±2.63***a		16.51±1.40***a			32.25±2.09***a		7.32±0.27***b			19.19±2.26***b		4.70±0.48***b		

a, b, c: In a column among seasons and groups with same or without superscripts do not differ significantly as per DMRT, data were calculated at 99.99% level of significance (p<0.001).
***Significant differences in different season's and groups p<0.001

household live and slaughterhouse black Bengal goats in different Upazilla of fascioliasis were observed that female black Bengal goats were more infected than their counter partners. These findings are in agreement with others who have reported of Dhar et al (1988), Selim et al (1997) and Fatima et al (2008). Physiological peculiarities of female animals which usually constitute stress factors like calving and lactation reduced their immunity to infections. Females are usually weak and malnourished and consequently are more susceptible to infections besides some other reasons (Blood and Radostits 2000).

The study also shows seasonal relation of infections indicated that the highest infection was observed in rainy season followed by in winter and in summer. These results are similar to finding of Mzembe and Chaudhry (1981), Jithendran and Bhat (1999) and Tamloorkar et al (2002). Climatic conditions, particularly rainfall, were frequently associated with differences in the prevalence of fascioliasis because this was suitable for intermediate hosts like snails to reproduce and to survive longer under moist conditions (Ahmed et al 2007). Moreover, Bangladesh has a rainy season for four months, which facilitates parasitic survival in such an environment. The prevalence of *F. gigantica* was found to be significantly higher during the wet season than that of dry season. The proportion of animals passing fluke eggs increased gradually from the early dry season and peaked at the end of the dry season and the early part of the rainy season (Keyyu et al 2005).

Conclusions

It is evident that comprehensive data on the impact of fascioliasis over several years is difficult and expensive to obtain. This is due mostly to the long term and chronic nature of the disease, its multiple effects on productivity and the difficulty of making an accurate diagnosis. Fascioliasis devastates the small ruminants and continually drains the economic gains from the animals in case of Sylhet region of Bangladesh. These observations will help to adopt control strategies against fascioliasis in animals as well as meat inspection and treatment protocol like choice of anthelmintics, liver tonic etc of infected animals. The effective methods are required to control fascioliasis in black Bengal goats. The effective methods such as the strategic use of anthelmintics, reduction of intermediate host and proper husbandry practices may be suggested to overcome economic loss due to fascioliasis in black Bengal goats.

In explaining of the genetic relation *F. hepatica* obtained from different hosts can be useful RAPD-PCR technique. Both sheep and goat were amplified products in different numbers and sizes by RAPD-PCR techniques. Therefore this technique has the potential to differentiate these two worm species. These findings may also form a base for future studies aimed at determining genetically the phylogenic evolution of worm species.

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