

OESOPHAGOSTOMIASIS IN BLACK BENGAL GOATS IN BANGLADESH

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Examination of the intestinal tracts (both small and large) of 208 apparently healthy slaughtered Black Bengal goats from different parts of Bangladesh revealed *Oesophagostomum columbianum* infection in 185 (88.94%) cases. In the presence of the parasites, nodular lesions were detected in the wall of the intestines of 166 (79.81%) goats. The mean worm burden (28.66) and the number of nodules (30.88) varied independently. Both worm burden and nodule formation were found to be very much age dependent ($p < 0.01$), higher in goats above 18 months old, but without any seasonal variations ($p > 0.05$). Sex of the animals had significant bearing on nodule formation, more in male than in female goats ($p < 0.05$). The mucous membrane of the intestines were inflamed, discoloured and covered with mucus. Slightly yellow to green coloured nodules of various sizes were seen on the outer surface of the intestines. There was destruction and desquamation of the villar epithelium due to invasion of parasites. In many cases larval worms were present inside the nodules and destruction of the muscularis mucosa and submucosa was noted. At places, the nodules contained central caseous mass surrounded by chronic inflammatory cells, mostly lymphocytes and macrophages.

Key words: Oesophagostomiasis, Black Bengal goats, Bangladesh.

Introduction

Goats play an important role in the economy of rural farmers in existing farming system of Bangladesh. Most of them are of Black Bengal variety [1]. Black Bengal goat is unique in characters because of its prolificity, twins and/or multiple births, good quality meat and skin [2]. The geoclimatic conditions of Bangladesh are very much conducive to various parasitic infections in goats [3-5]. Among the parasites, the occurrence of *Oesophagostomum* sp. has been reported in goats in Bangladesh [6-7]. The disease is associated with extensive nodule formation in the gut wall, peritonitis, adhesion and death in goats and sheep [8-10]. In spite of high incidence of *Oesophagostomum* sp. in Black Bengal goats in Bangladesh, very little information is available on its pathogenicity in relation to host's age and sex and seasonal prevalence. The present paper deals with oesophagostomiasis in naturally infected Black Bengal goats in Bangladesh.

Materials and Methods

Intestinal tracts of 208 Black Bengal goats (69 male and 139 female) were collected from abattoirs located at various parts of Bangladesh during the period from July, 1989 to June, 1990. Animals of different age, age determined by their teeth, were assorted into groups of: 6 months to 12 months, >12 months to 18 months and >18 months. The worms were collected, counted, preserved and identified according to the methods of Bell [11], Yamaguti [12], Arundel [13] and Soulsby [9]. The viscera surrounding the intestines as well as mucosal surface of the intestines were examined carefully

for gross pathological changes and the number of nodules found on the gut wall were counted. The representative tissue samples for histo-pathology were preserved in 10% buffered neutral formalin solution. The well fixed tissues were processed, sectioned at 5 to 6 micron thickness from paraffin embedded blocks and stained with routine Haematoxylin and Eosin for detailed histopathological studies.

Statistical analysis was done by X^2 (Chi-square) test using the following formula described by Shil and Debnath [14]:

$$X^2 = \sum_{i=1}^{\gamma} \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

$$= \sum_{i=1}^{\gamma} \sum_{j=1}^c \frac{O_{ij}^2}{E_{ij}} - N \text{ with } (\gamma-1)(c-1) \text{ d.f.}$$

Where

O= Observed frequency

E= Expected frequency

N= Total number of animals studied

Significance was determined either at 1% or 5% level.

Results and Discussion

The study revealed *Oesophagostomum columbianum* infection in 185 (88.94%) Black Bengal goats, while nodular lesions were seen on the wall of the intestine in 166 (79.81%) animals. The maximum number of worms recovered from a single goat was 112 and minimum 3 ($X=28.66$), whereas the number of nodules recorded in individual goats ranged from 2 to 150. The details of this are shown in Table 1.

TABLE 1. STATUS OF *O. COLUMBIANUM* INFECTION IN BLACK BENGAL GOATS.

Parameter	Animal examined	Animal positive for worms (%)	Animal positive for nodules (%)	Density of worms/nodules		Value of X ²		Probability level		
				worms (mean)	nodules (mean)	worms	nodules	worms	nodules	
Seasons	Monsoon (Jul-Oct)	68	59 (86.76)	56 (82.25)	5-101 (32.32)	2-150 (40.50)				
	Winter (Nov-Feb)	77	73 (94.81)	62 (80.51)	5-112 (29.66)	62-80 (27.29)	4.50	0.81	p>0.05	p>0.05
	Summer (Mar-Jun)	63	53 (82.40)	48 (76.19)	3-60 (23.21)	3-60 (24.29)				
Age	6 months to 12 months	108	89 (82.40)	77 (71.29)	5-112 (39.11)	2-38 (16.18)				
	>12 months to 18 months	35	31 (88.57)	26 (74.28)	3-73 (25.70)	3-60 (28.12)	12.77	17.31	p<0.01	p<0.01
	>18 months	65 (100.00)	65 (96.92)	63 (15.75)	3-56 (49.98)	2-150				
Sex	Male	69 (92.75)	64 (88.40)	61 (25.42)	3-82 (36.33)	2-150 1.53	4.73	p>0.05	p<0.05	
	Female	139 (87.05)	121 (75.53)	105 (30.37)	5-112 (27.71)	2-60				

Grossly, the mucous membrane of the intestine was found inflamed, discoloured and covered with mucus. In some cases, corrugation of the mucous membrane along with numerous haemorrhagic spots was noticed in the wall of the intestine. Nodules of various sizes were readily visible on the outer surface of the intestine. In fresh samples, these were raised, hard and slightly yellowish to greenish in colour. The nodules were more common in the caecum and colon. In few cases, the nodules were found to rupture in the lumen of small intestine leaving small red ulcers, though such changes were not observed in the large intestine. When the nodules were cut, in several cases, larvae (3rd and 4th stage) of *Oesophagostomum columbianum* were detected in living condition along with the inspissated caseous material.

Microscopically, the intestine revealed destruction and desquamation of villar epithelium with considerable increase of goblet cells especially in the intestinal glands. The lamina propria exhibited increased accumulation of lymphocytes alongwith few eosinophils. There was nodule formation in the deeper layers e.g. muscularis mucosa and submucosa and the parasitic larvae inside the nodule were associated with destruction in the muscularis and submucosal layers. Nodules were composed of central caseous mass surrounded by chronic inflammatory cells consisting chiefly of lymphocytes and macrophages. There was relatively little eosinophilic infiltration. Occasional presence of plasma cells and infiltra-

tion of few neutrophils were not uncommon. Parasites in cross or in longitudinal sections were noticed close to the caseous mass where intense cellular reactions were observed. Macrophages near the parasites aggregated together forming giant cells of foreign body type. Parasites and the cellular aggregates were surrounded by a proliferation of thick layer of fibrous connective tissue. Nodular fusion was not unusual.

The prevalence of *Oesophagostomum columbianum* in Black Bengal goats found in the study is in conformity with the reports of Hassan [3], Haq and Shaikh [15] and Islam *et al.* [7]. But the magnitude of infection and nodular lesions produced by this worm were not taken into consideration by any of the workers before. In the present study, in the presence of parasites, the nodular lesions were noted in 79.81% cases. However, about 10% of the animals had parasites but without any grossly visible nodule formation. It is possible that the nodular lesions represent immunological response to repeated exposures to the parasites [9-10]. The number of worms present in the hosts bore no relationship to the numbers of nodules produced conforming to the study of Fritsche *et al.* [16]. However, the number of worms and nodules recorded were much lower than that noted by Fritsche *et al.* [16]. This might be due to the variation of animal breed and geographical locations. Apparently the highest number of worms and nodules was recorded in the goats in winter, followed by monsoon and lowest in summer. The reason of

such variation cannot be explained easily due to lack of literature. But this might be due to the abundance of infective larvae as well as crop free pasture in the late summer thus providing ample opportunity to pick up the infection by the host and subsequent development of the adult worms and the nodules in the monsoon.

A 100% incidence of *Oesophagostomum columbianum* observed in aged goats (>18 months) is contradictory to the report of Islam *et al.* [7], who recorded a high incidence in young goats: but more number of nodules found in the adult goats than in the young ones agree with the statement of Blood and Radostits [10]. Relatively higher number of worms with a lower number of nodules in young animals (<18 months) might be due to absence of immunity and/or repeated exposure of the host to the parasites. On the contrary, a lower number of worms with higher number of nodules in aged animals (>18 months) might be due to presence of immunity and/or repeated exposure of the host to the parasites. Significantly larger number of nodules in male goats might be due to repeated exposure of the animals to parasites from the pasture as the male goats were kept free in the pasture for a longer period of time than the female goats, for fattening purpose.

The gross pathological changes recorded in naturally affected Black Bengal goats were in agreement with the descriptions of Shelton and Griffiths [17], Soulsby [9] and Blood and Radostits [10] but peritonitis and adhesions of organs reported by them were not detected in the present study. The nodule formation was found more common in caecum and colon than in other parts of intestine as against Soulsby [9] and Blood and Radostits [10]. The presence of alive developing larvae in the nodules observed in this study were also reported by Grigorev [18] and Dash [19].

The histopathological changes revealed in the present study were almost similar to those described by Dhar and Singh [20], Bhatnagar *et al.* [21] and Soulsby [9], although of epithelial cells were not observed in the present study. Destruction of the muscularis and submucosal layers of the intestines might be due to secretion of some bio-chemical substances by the invading larvae. Monning [22] has stated that damage to tissues in heavily infected sheep with *Oesophagostomum columbianum* is due to toxic secretions of the parasites.

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