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CYSTIC ECHINOCOCCOSIS IN DOMESTIC RUMINANTS IN COX'S BAZAR OF BANGLADESH

M K Islam*[ae], S C Basak[b], S Majumder[c], S A Sarder[d], A W M S Islam[a] and M M H Mondal[a]

[a]*Department of Parasitology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh*

[b]*Department of Pathology and Parasitology, Chittagong Government Veterinary College, Pahartoli, Chittagong-4202, Bangladesh*

[c]*Department of Agricultural Statistics, Bangladesh Agricultural University, Mymensingh - 2202, Bangladesh*

[d]*Central Veterinary Hospital, 48 Kazi Alauddin Road, Dhaka-1000, Bangladesh*

[e]*Laboratory of Parasitic Diseases, National Institute of Animal Health, Tsukuba, Ibasaki 305-0856, Japan*

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This investigation was carried out to describe the local epidemiological pattern of cystic echinococcosis among the indigenous domestic ruminants in the Cox's Bazar district of Bangladesh. Home visits and family interviews revealed several socio-economic and cultural characteristics which are thought to be involved in the transmission cycle and widespread occurrence of cystic echinococcosis in the area. Fecal examination of stray and house dogs showed high infection levels (50.65%) with *Echinococcus granulosus.* A significantly higher ($p < 0.00$) prevalence of cystic echinococcosis was recorded in sheep (52.11%) than buffaloes (36.11%), cattle (30.62%) and goats (14.73%). The values of chi-square test and regression-coefficient analysis strongly indicate that age is an important risk factor of being higher infestation with cystic echinococcosis. While sex had no influence on the prevalence of the disease. Lungs of all ruminant hosts were the most common predilection site for *Echinococcus* cysts, liver ranked second, followed by spleen, kidneys and heart. Fertility rate of the cysts was recorded high in sheep (65.43%) than buffaloes (16.33%), goats (14.80%) and cattle (8.11%). The high level of infection with cystic echinococcosis in domestic ruminants and dogs suggests that there is an urgent need for control measure against the disease in the Cox's Bazar area.

***Key words*:** Cystic echinococcosis, Prevalence, Local epidemiology, Domestic ruminants, Cox's Bazar.

Introduction

Cystic echinococcosis, caused by the larval stage of *Echinococcus granulosus*, is an important parasitic disease of domestic herbivorous animals and man. It occurs in all major continents of the world and is particularly important in developing countries where many rural inhabitants live under poor sanitary conditions and in close proximity to their pets and domestic animals (Anderson 1997). The public health and economic impacts of cystic echinococcosis are enormous in terms of morbidity and mortality in humans and losses due to reduced productivity and condemnation of infected edible offal in animals. Although, few scattered reports on the occurrence of echinococcosis/hydatidosis are available in animals (Islam 1981, 1982 a,b; Karim *et al* 1982) and man (Khan 1990), however, no organized approach has yet been made to identify and quantify the biology and epidemiology of the disease in Bangladesh. This investigation was therefore undertaken to describe the prevalence and distribution of cystic echinococcosis and also, to determine the socioeconomic and cultural factors that may govern the local epidemiological pattern of the disease in a particular geographic area. For this, Cox's Bazar district, which is located in the southeastern part of Bangladesh was included in this study. The Cox's Bazar is a healthy place where the longest sea shore is located and many tourists from home and abroad visit the place. To know the possible health hazards due to cystic echinococcosis to the tourists at risks, Cox's Bazar was therefore selected to render more safety zone for the growing tourism industry.

*Author for correspondence, [e]Present address
E-mail: mki@affrc.go.jp

Materials and Methods

This investigation was conducted in the Cox's Bazar district, Bangladesh during the period from January, 1995 to June, 1996. To assess the socio-economic and cultural characteristics as well as dog-animal/dog-human association including environmental sanitation, a total of 600 households in the rural and urban areas were interviewed.

A total of 405 cattle, 108 buffaloes, 142 sheep and 292 goats of both sexes and various age groups, slaughtered at different locations were examined randomly. All animals were of local origin and indigenous breed. Carcasses were examined for the presence of echinococcus cysts following the methods described by Islam *et al* (1995). To examine the fertility of the cysts, the brood capsules and daughter cysts were examined for the presence of protoscolices according to the description of Soulsby (1982).

Stastical analysis of the data was performed using Chi-square (X^2) test, Odds ratio (Ψ) and regression-co-efficient analysis as per methods described by Schwabe *et al* (1997), Schlessman (1982) and Lee (1980).

Results and Discussion

Home visits and family interviews revealed that 94% of them have no knowledge about hydatid disease in the Cox's Bazar areas. Of 600 households visited, 144(24%) have house dogs. Stray dogs are most abundant and they frequently come in contact with humans and animals. Dog-animal association was observed in 96% households. Feces of house dogs was disposed only in 5% cases and prophylactic dosing with anthelmintics usually not been practised. Offal of home butchered ruminants was offered to dogs as foods. This study also revealed that the numbers of slaughter houses were inadequate and lack veterinary supervision of the slaughtered animals. Farm animals were grown under traditional management practices. In 79% households, animals were allowed to drink from fecal (humans, dogs and other wild carnivores) contaminated sources (eg., ponds, canals, small ditches, etc). Examination of fecal samples from 77 dogs revealed *E. granulosus* in 39 cases (50.65%).

The detailed results of this investigation are summarized in Tables 1, 2, 3 and 4. This study recorded a significantly higher

Table 1
Distribution of cystic echinococcosis among domestic ruminants in Cox's Bazar

Demographic variables		No. of Animals		Prevalence	X^2 –value	Odds ratio (Ψ)	95% confidence interval for (Ψ) %
Name	Category	Examined	Infected				
	Cattle	405	124	30.62	67.97*		
Animals	Buffaloes	108	39	36.11			
	Sheep	142	74	52.11			
	Goats	292	43	14.73			
	<3 years	71	5	7.04	68.76*		
Age	>3 to <5 years	531	120	22.60			
	>5 years	345	155	44.93			
Sex	Male	523	151	28.87		0.928	0.70, 1.23
	Female	424	129	30.42			

*P<0.00

Table 2
Fitting of logistic regression models for identifying the risk factor

Models	Factors	Regression-Coefficient	S.E	Wald statistic	P-value
Overall	Age	0.4711	0.0468	101.4361	0.0000
	Sex	-0.0906	0.1529	0.3513	0.5534
For Cattle	Age	0.4509	0.0650	48.0486	0.0000
	Sex	-0.0448	0.2345	0.0365	0.8485
For Buffaloes	Age	0.5376	0.1413	14.4714	0.0001
	Sex	-0.0459	0.4419	0.0108	0.9173
For Sheep	Age	0.4876	0.1292	14.0663	0.0002
	Sex	0.0633	0.3631	0.0304	0.8617
For Goats	Age	0.3870	0.1027	14.1947	0.0002
	Sex	0.1893	0.3499	0.2926	0.5886

Table 3
Percentage of *Echinococcus* cyst observed in different organs in domestic ruminants

Species	Organs developed echinococcus cysts					
	Lungs	Liver	Lungs & Liver	Spleen	Kidney	Heart
Cattle	46.77 (58)	40.32 (50)	8.87 (11)	4.03 (5)	-	-
Buffaloes	43.58 (17)	38.46 (15)	10.25 (4)	5.12 (2)	2.56 (1)	-
Sheep	48.64 (36)	33.78 (25)	9.46 (7)	4.05 (3)	2.70 (2)	1.35 (1)
Goats	44.18 (19)	27.09 (12)	11.06 (5)	4.03 (4)	6.97 (3)	-
Overall	46.43 (130)	36.43 (102)	9.64 (27)	5.00 (14)	2.14 (6)	1.35 (1)

Figures in the parentheses indicate number of organs involved

Table 4
Different types of *Echinococcus* cysts recovered from the visceral organs of the domestic ruminants

Species	Types of echinococcus cysts recovered			
	Fertile	Sterile	Suppurative	Calcified
Cattle	12 (08.11)	96 (64.86)	18 (12.16)	22 (14.86)
Buffaloes	8 (16.33)	28 (57.14)	7 (14.29)	6 (12.24)
Sheep	106 (65.43)	32 (19.75)	15 (09.26)	9 (05.56)
Goats	8 (14.80)	36 (66.67)	6 (11.11)	4 (07.41)
Overall	134 (32.45)	192 (46.49)	46 (11.14)	41 (09.93)

Figures in the parentheses expressed as percentage

($p<0.00$) prevalence of cystic echinococcosis in sheep than any other domestic ruminants inspected at Cox's Bazar district. A significantly ($p<0.00$) higher prevalence of cystic echinococcosis was also observed in older animals (>5 years old). The values of Odds ratio and confidence interval did not reveal any significant difference in the prevalence of the disease between males and females (Table1). The logistic regression model fitted for identifying the risk factors revealed a positive association between animals age and disease (Table 2).

The present investigation revealed several important factors which may be considered to understand the local epidemiological patterns of cystic echinococcosis in the Cox's Bazar areas. These include abundance of stray and house dogs, feeding of hydatid infected offal of home butchered farm animals to dogs, poor public health knowledge and environmental hygiene, lack of well run abattoirs, traditional management practices of farm animals, etc. All these factors together might contribute to the high levels of infection with *E. granulosus* in the definitive hosts and increase the environmental contamination with cestode eggs. Under such conditions, the ruminant intermediate hosts get infection readily when grazing along the contaminated road-sides, follow lands and pastures, and drinking water from the contaminated sources. These findings are in conformity with the reports of Schantz *et al* (1995) and Ibrahem and Gusbi (1997).

The high level of *E. granulosus* infection in dogs as recorded in this study reflects the high prevalence of *Echinococcus* cysts in sheep, cattle and buffaloes indicating that these animals play an important role as intermediate hosts. The reason for low prevalence rate of cystic echinococcosis in goats is not clear in this study. Deka and Gour (1998) also reported a higher prevalence rate of the disease in sheep than pigs and goats from India. A significantly lower infection rate in goats has also been reported from Jordan (Abdel - Hafez *et al* 1986; Kamhawi *et al* 1995). However, it is likely that in the absence of sheep and cattle, goats may serve as the principal reservoir host for zoonotic diseases including cystic echinococcosis (Mattossian 1990).

Older animals were prone to develop more *Echinococcus* cysts than growing and young animals. This finding also conforms to the report of Gemmel (1961) and Gusbi (1987). It is thought that the differences in prevalence of cystic echinococcosis may be related to the opportunity for infection and also time taken to developing the metacestodes rather than an increased susceptibility with age. Organ distribution of *Echinococcus* cysts showed that lung is the most common predilection site followed by liver, spleen, kidney and heart irrespective of the ruminant host infected naturally. Our observation found to differ from the reports of Gómez *et al* (1980), Pandey *et al* (1987) and Ibrahem and Gusbi (1997) who demonstrated that liver of sheep, goats and pigs is most commonly infected organ and the lung ranked second, followed by other organs such as kidneys and spleen.

It has been reported that the difference in predilection site may be due to the loose structure of the lungs, which allow a large number of onchospheres to grow more freely in those hosts, in contrast to the more compact tissue of the liver, which may hinder the development of onchospheres (Ibrahem and

Gusbi 1997). Some researchers reported that strain differences may also account for this phenomenon (Ibrahim and Gusbi 1997; Pangi and Ould 1991). Fertility rate of hydatid cysts was recorded significantly high in sheep than other ruminant hosts examined in this study, which indicates that sheep is the more adapted host in the Cox's Bazar areas of Bangladesh. Kachani *et al* (1997) reported that *Echinococcus* cysts are generally more fertile in sheep than in cattle. Further study is required to determine the parasite strains.

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