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J. Bangladesh Agril. Univ. 9(1): 103–109, 2011 **ISSN 1810-3030**

A coprological survey of gastro-intestinal parasites of water buffaloes (*Bubalus bubalis*) in Kurigram district of Bangladesh

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Abstract

Epidemiology of gastro-intestinal parasites of water buffaloes was investigated in Kurigram district of Bangladesh between November 2007 and October 2008 through coprological examination. A total of 236 water buffaloes were examined, among them 144 (61.02%) buffaloes were found infected with one or more species of gastro-intestinal parasites. Nine species of gastro-intestinal parasites were identified, of them four species were trematodes, namely, *Paramphistomum cervi* (29.24%), *Fasciola gigantica* (22.46%), *Schistosoma indicum* (1.27%), *Schistosoma spindale* (0.85%); three species were nematodes, namely, *Toxocara vitulorum* (2.54%), Strongyles (0.85%), *Strongyloides* sp. (0.42%) and two species were protozoa, namely, *Eimeria* sp. (3.39%) and *Balantidium coli* (37.29%). No cestode was detected. Among the gastro-intestinal parasites mixed infection was common. In this investigation, prevalence of parasites in relation to age, sex and seasonal dynamics was also studied. Significantly ($p<0.01$) higher prevalence of gastro-intestinal parasites was observed in rainy season followed by summer and winter seasons. Males and females were almost equally (odd ratio 1.08) susceptible to gastro-intestinal parasitic infection. In the age groups, young (< 2 to 5 years) were mostly ($p<0.01$) susceptible to gastro-intestinal parasites. In the present study, EPG (Egg/cyst Per Gram of Feces) was also determined. The range of EPG varied from 100-5000 among the identified parasites. The results of the present investigation revealed that the prevalence of gastro-intestinal parasites in buffaloes is very common and quite severe. It is imperative that integrated strategies and measures be taken to control gastro-intestinal parasitic infections in buffaloes in kurigram district and elsewhere in Bangladesh.

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Keywords: Buffalo, Gastro-intestinal parasites, Kurigram district

Introduction

Bubalus bubalis (buffalo) is one of the most important species of domestic livestock as a source of dairy, meat, manure and drought power in Bangladesh. In some parts of Bangladesh, especially in the hilly areas, river basins and low lying marshy land, the farmers are more dependent on buffaloes than cattle. The working life of buffalo is longer than that of cattle, usually more than 17 years and up to 25 years of age. Because of this excellent draft and pulling capacity, buffaloes are called the living tractor of the East (Cockrill, 1968). But, scientific knowledge concerning this animal has not been commensurate with its increasing numbers and importance. The Food and Agriculture Organization (FAO, 2000) has rightly termed buffalo as an important but 'an asset undervalued'.

Buffalo diseases have been identified as one of the major factor which have disrupted the development of the industry in Asia and have caused substantial economic loss to the poor subsistent farmers in the developing countries. The parasitic diseases are not less important in buffaloes than other infectious diseases. These mainly include gastro-intestinal helminthiasis, coccidiosis, fascioliosis and mange (Griffiths, 1974). Besides other etiological factors known commonly to affect the buffalo, diverse and manifold types of “helminthosis” and “helminthiasis”, resulting from different grades of infections with fluke, tapeworms, and roundworms, are responsible for marked deleterious effects which causes considerable economic losses globally to the buffalo industries and farming communities as a consequence of deaths of infected animals, reduced weight gains and the condemnation of affected organs after slaughter (Jithendran and Bhat, 1999; Asif *et al.*, 2007). In spite of significant production losses the problem is neglected due to its chronic and insidious nature (Sanyal, 1998). Moreover, some helminths of buffaloes are also transmissible (directly or indirectly) to humans where they can cause significant clinical diseases, such as schistosomiasis and fascioliasis in a number of countries (Wang *et al.,* 2006; Tum *et al.,* 2007). In excess of helminths, buffaloes are suffered from various intestinal protozoan infections also *(*Azam *et al.* 2002; Nalbantoglu *et al.,* 2008).

In developed countries, the data on epidemiology of various gastro-intestinal parasites are published in an efficient manner as an aid to combat infections more effectively. In contrast, in developing countries, little published information exists and data on the epidemiological aspect of gastro-intestinal parasitic infections. As is the case elsewhere, infection of water buffaloes with gastro-intestinal parasites represents a significant problem which causes difficulty for the development of the water buffalo industry. However, while there have been only limited surveys of gastro-intestinal parasitic infections in water buffaloes in, little is known about the prevalence of gastro-intestinal parasites of water buffaloes in the country under present husbandry practices. In order to provide a foundation for the improved control of gastro-intestinal parasites in water buffaloes, the objective of the present investigation was to estimate the prevalence of gastro-intestinal parasites in water buffaloes in Kurigram district of Bangladesh by coprological examination.

Materials and Methods

The study area

Kurigram District (Coordinates: 25°45′N 89°40′E / 25.75°N 89.66°E) with an area of 2,296.10 square km is located in the north-eastern region of Bangladesh along the border of India. Maximum and minimum annual average temperature of Kurigram is 32.3°C and 11.2°C, respectively; in both cases it is more acute than the middle or southern part of Bangladesh. The average annual rainfall is about 3000 mm with heavy rainfall is usually observed during the rainy season like other parts of Bangladesh. Several rivers are flowing through the heart of this district including Brahmaputra, Dharla, Tista, Sonaburi, Jinjiram etc. with numerous chars (Char is a Bangla word and it means "island") provide unique pasture resource for the development of livestock industry including buffaloes. Moreover, buffaloes are popularly used for drought purposes in these char area because of poor transport system.

Sampling and Selection of water buffaloes

The investigation took place between November 2007 and October 2008. Two hundred and thirty six water buffaloes were selected randomly from different chars of the study area. During collection of fecal samples the age and sex of the buffaloes and seasons of the year were carefully recorded. Seasons were considered as summer (March-June), rainy (July-October) and winter (November-February).

Collection and examination of faecal sample

The faecal samples were collected directly from the rectum of the animals. Before collection, the animals were restrained properly and all possible hygienic measures including wearing of apron, hand gloves and gumboot were taken to avoid contamination. Fresh faecal samples were also collected from the ground when the animals were found in the act of defecation. About 20-25 grams of faeces were collected from each buffalo. Each sample was kept in separate polythene bag, tied carefully and numbered properly and the samples were preserved in 10% formalin. The correctly labeled and properly numbered polythene bags containing the faecal samples with all required information were brought to the laboratory and examined. The fecal samples were examined by Modified Stoll's Dilution Technique which was following for total egg/cyst count per gram of faeces (EPG) as described by Soulsby (1982).

Statistical analysis

Statistical analyses were carried out by Statistical Package for Social Science (SPSS) using F test. Odd ratio was calculated according to the formula given by Schlesselman (1982).

Results and Discussion

Overall prevalence of gastro-intestinal parasites

The research work indicated that, the water buffaloes were very much susceptible to gastro-intestinal parasitic infection. It was observed that, 144 (61.02%) buffaloes were found infected with one or more species of gastro-intestinal parasites. Similar findings were reported by Azam *et al.* (2002) who revealed that 64.41% buffaloes are positive for internal parasites in Pakistan. Slightly lower prevalence was observed by Bachal *et al.* (2002) who recorded 47% buffaloes suffering from different types of helminths in Pakistan. Cockrill (1974) stated that the buffalo is exposed to a higher risk of infection with snail borne helminthes due to the animals propensity to seek rivers, pools or swamps for wallowing. This is true in Bangladesh context as well.

A total of nine species of gastro-intestinal parasites (ova/eggs/cysts) were identified, representing four species of trematode, three species of nematode and two species of protozoa. No cestode was detected. Mixed infection was common. It was observed that, prevalence of *B. coli.* (37.29%) was the highest whereas *Strongyloides* sp. infection (0.42%) was the least. The species of parasites found, their prevalence and the intensities of infection (ranges) are given in Table 1. Among the trematodes, prevalence of *Fasciola gigantica* (22.46%) and *Paramphistomum cervi* (29.24%) was the highest. Islam *et al.* (1992) also reported an overall 18.9% *F. gigantica* and 29.50% *Paramphistomum* spp. infection by fecal sample examination in buffaloes in Bangladesh. The present finding is in agreement with the earlier findings of Hossain (1991) who recorded 24% fasciolosis in Bangladesh. Islam (1991) reported that *Fasciola* infection in buffaloes varies from place to place. In this study, prevalence of schistosomiasis was found negligible but Ravindran *et al.* (2007) reported 50% visceral schistosomiasis among buffaloes in India. This is might be due the faulty fecal sample collection and examination procedure.

Table 1. Overall prevalence of gastro-intestinal parasites of buffaloes in Kurigram, Bangladesh

Name of parasites	No of animals affected (N=236)	Percentage (%)	Egg/cyst Per Gram of Feces (EPG)	
			Range	Mean±SD
Paramphistomum cervi	69	29.24	100-500	186.95±119.95
F. gigantica	53	22.46	100-1200	201.88±142.18
S. indicum	3	1.27	100-100	100.00±0.00
S. spindale	2	0.85	100-100	100.00±0.00
T. vitulorum	6	2.54	100-200	116.67±40.83
Strongyles	2	0.85	100-100	100.00±0.00
Strongyloides sp.	1	0.42	100-100	100.00±0.00
B. coli	88	37.29	100-5000	452.27±359.22
Eimeria sp.	8	3.39	100-300	250.00±130.93
Total	144*	61.02	100-5000	178.57±88.12

***** = Total no. of animals affected is less than the summation of individual infection because same animal was infected by more than one type of gastro-intestinal parasites

N = Total animals examined

In the present study, the numbers of nematode species found in buffaloes are less than that reported by other scientists from different parts of the world (Condoleol *et al.,* 2007), which may due to the difference in the habitat and physiological conditions of the buffaloes and also the use of anthelmintics in recent years.

In this experiment, no cestode was detected which supported the findings of Azam *et al.* (2002) and Bachal *et al.* (2002). This is not surprising because cestodes of buffaloes are rare in recent years (Liu *et al*., 2009) since buffaloes are usually raised in animal houses and seldom accessible to intermediate hosts of cestodes. Azam *et al.* (2002) reported that 72% of the buffalo calves are suffered from intestinal protozoan infection in Pakistan which is much higher than the present finding. Nalbantoglu *et al.* (2008) reported 75% of water buffaloes are suffered from different *Eimeria* spp. in Turkey. The variations among the findings might be due to the difference in the sample size, selection of samples, techniques of sample collection, period and place of study, environmental factors, breed of the buffaloes etc.

Age related prevalence of gastro-intestinal parasites

It was revealed that, age of the buffaloes had a significant ($p<0.01$) effect on gastro-intestinal parasitic infection. Young buffaloes (65.85%) were more susceptible ($p<0.01$) to infection than calves (63.16%) and adult buffaloes (59.66%). Calculated odd ratio implied that young buffaloes were 1.30 and 1.12 times more susceptible to infection than adult buffaloes and calves, respectively. On the other hand, calves and adult buffaloes were almost equally (odd ratio 1.16) susceptible to gastro-intestinal parasitic infection (Table 2). The present finding is in agreement with the earlier report of Azhar *et al.* (2002) who noticed higher infection rate in buffaloes aged > 2 years of age. Asif *et al.* (2007) also reported the higher prevalence of helminths infection in young buffaloes compared to adults in Pakistan. But the present

finding is in contrast to the previous reports of Alim (1997) who observed that infection rate of fasciolosis increased with the increase of age. Baily (1971) also suggested that the fasciolosis is not as self limiting in the buffaloes as this in the cattle. It is very difficult to explain exactly the frequent occurrence of gastro-intestinal parasitic infection in young buffaloes. But it may be assumed that young buffaloes got more access to pasture land than the calves to have the infection. On the other hand, adults developed immunity with the increase of age, so susceptibility decreased with increase of age.

Table 2.Age related prevalence of gastro-intestinal parasites of buffaloes in Kurigram, Bangladesh

Age	Name of parasites recovered	No. of animals affected	Percentage (%)	Egg/cyst Per Gram of Feces (EPG)		Odds ratio
				Range	Mean±SD	
Buffalo Calves (0.5-2years) n=19	*F. gigantica*	4	22.22	100-200	125.00±50.00	Young vs Calves = 1.12
	Paramphistomum cervi	2	11.11	100-400	193.33±138.70	
	T. vitulorum	3	16.67	100-200	133.33±57.74	
	B. coli	7	38.89	100-900	347.06±264.85	
	Eimeria sp.	1	5.56	500-0.00	500±0.00	
	Subtotal=	**12***	**63.16**	**100-900**	**259.74±102.26**	
Young (>2-5 years) n=41	*Paramphistomum cervi*	15	36.59	100-500	193.33±138.70	Young vs Adult = 1.30
	F. gigantica	7	17.07	100-1400	300±286.48	
	S.indicum	1	2.44	100-100	100.00±0.00	
	S.spindale	2	4.88	100-100	100.00±0.00	
	T. vitulorum	1	2.44	100-100	100.00±0.00	
	B. coli	17	41.46	100-1000	347.06±264.85	
	Eimeria sp.	2	4.88	100-200	150.00±70.71	
	Subtotal=	**27***	**65.85**	**100-1400**	**184.34±108.68**	
Adult (>5 years) n=176	*Paramphistomum cervi*	52	29.38	100-500	193.33±138.70	Calves vs Adult = 1.16
	F. gigantica	42	23.73	100-1200	193.04±192.85	
	S. indicum	2	1.13	100-100	100.00±0.00	
	T. vitulorum	2	1.13	100-100	100.00±0.00	
	Strongyles	2	1.13	100-100	100±0.00	
	Strongyloides sp.	1	0.56	100-100	100±0.00	
	B. coli	63	35.59	100-5000	347.06±264.85	
	Eimeria sp.	5	2.82	100-300	150.00±70.71	
	Subtotal=	**105***	**59.66**	**100-5000**	**160.43±83.39**	
Level of significance			(0.0002)**			

n = Total animals examined
***** = Total no. of animals affected is less than the summation of individual infection because same animal was infected by more than one type of gastro-intestinal parasites
** = Means p<0.01

Sex related prevalence of gastro-intestinal parasites

There was significant (p<0.01) difference in the rate of gastro-intestinal parasitic infection in between the male and female buffaloes. It was observed that, the prevalence of gastro-intestinal parasites was slightly higher in male (61.34%) than in female buffaloes (59.52%). Male buffaloes were 1.08 times more vulnerable to gastro-intestinal parasitic infection than females (Table 3). Asif *et al.* (2007) also reported the higher prevalence of gastro-intestinal parasites in males than females for buffaloes in Pakistan. But this report is in contrast to the previous report of Bachal *et al.* (2002) who reported a slightly higher prevalence (48.30%) of helminths in female buffalo calves than in male (45.12%). Alim (1997) also reported that females (52.65%) are more susceptible to *Fasciola* infection than male (47.76%). On the other hand, Azhar *et al.* (2002) noticed that buffaloes of either sex are equally affected. This disparity among the findings can not be explained exactly but it might be assumed that disparity of sample among the male and female may be associated with this. Moreover, male buffaloes are popularly used for drought purposes leading to stress which predisposes the infection.

Table 3. Sex related prevalence of gastro-intestinal parasites of buffaloes in Kurigram, Bangladesh

Parameters	Name of parasites	No. of animals affected	Percentage %	Egg/cyst Per Gram of Feces (EPG)		Odds ratio
				Range	Mean±SD	
Male n=194	*Paramphistomum cervi*	57	29.38	100-500	119.94±116.96	Male vs Female = 1.08
	F. gigantica	47	24.23	100-1300	242.18±201.89	
	S. indicum	2	1.03	100-100	100.00±0.00	
	T. vitulorum	4	2.06	100-200	40.82±116.67	
	Strongyles	2	1.03	100-100	100.00±0.00	
	Strongyloides sp.	1	0.52	100-100	100.00±0.00	
	B. coli	72	37.11	100-5000	622.60±454.02	
	Eimeria sp.	5	2.58	100-500	130.93±75.00	
	Subtotal=	**119***	**61.34**	**100-5000**	**182.06±120.56**	
Female n=42	*Paramphistomum cervi*	12	28.57	100-500	188.06±121.26	
	F. gigantica	6	14.29	100-1400	206.00±148.00	
	S. spindale	2	4.76	100-100	100.00±0.00	
	S. *indicum*	1	2.38	100-100	100.00±0.00	
	T. vitulorum	2	4.76	100-200	116.67±40.82	
	Strongyloides sp.	1	2.38	100-100	100.00±0.00	
	B .coli	15	35.71	100-5000	450.00±431.03	
	Eimeria sp.	3	7.14	100-500	250.00±130.93	
	Subtotal=	**25***	**59.52**	**100-5000**	**178.97±96.89**	
Level of significance				(0.0001)**		

n = Total animals examined
***** = Total no. of animals affected is less than the summation of individual infection because same animal was infected by more than one type of gastro-intestinal parasites
** = Means p<0.01

Seasonal prevalence of gastro-intestinal parasites

Seasonal fluctuation of the year had a significant (p<0.01) effect on the prevalence of gastro-intestinal parasitic infection in buffaloes. A relatively higher infection with gastro-intestinal parasites were observed in rainy season (71.70%), followed by summer (58.90%) and winter (52.27%) seasons. In this study, it was also revealed that buffaloes were 1.77 and 1.89 times more susceptible to gastro-intestinal parasitic infection in rainy season than summer and winter seasons, respectively. On the other hand, in summer and winter season buffaloes were almost equally (odds ratio 1.07) prone to gastro-intestinal parasitic infection (Table 4). The present finding is much higher than the previous reports of Azhar *et al.* (2002) who reported the highest (24.0%) seasonal prevalence in all types of buffaloes during autumn, followed by spring (20.0%), winter (13.0%), while the lowest (9.0%) was recorded during summer in Pakistan. The present finding is in agreement with the earlier reports of Islam (1989) who reported the prevalence of fasciolosis by feces examination is 28.6%, 18.7% and 11.7%, respectively, during winter, summer and rainy season. But the author reported the much higher prevalence of *Strongyloides* sp. during winter (17.1%), summer (20%) and in rainy season (8.3%). The contrast in between the present and earlier findings can be explained by the fact of variation in the geographical location of the experimental area and also the methods of study. Moreover, in this study, year was divided into three seasons but in other parts of the world there were four seasons. So, this difference in the division of seasons had made some over lapping of months and seasons. Therefore, that might have created some contradictions. However, the highest prevalence in rainy season may be due to high humidity and heavy rainfall which favors the growth and multiplication of parasites as well as their vectors.

Table 4. Seasonal prevalence of gastro-intestinal parasites of buffaloes in Kurigram, Bangladesh

Season	Name of parasite	No. of animals affected	Percentage (%)	Egg/cyst Per Gram of Feces (EPG)		Odds ratio
				Range	Mean±SD	
Rainy n=53	*Paramphistomum cervi*	24	45.28	100-500	186.95±119.94	Rainy vs Summer = 1.77
	F. gigantica	7	13.21	100-1200	201.88±112.18	
	S. spindale	2	3.77	100-100	100.00±0.00	
	S. *indicum*	1	1.89	100-100	100.00±0.00	
	T. vitulorum	1	1.89	100-200	116.67±40.82	
	Strongyloides sp.	1	1.89	100-100	100.00±0.00	
	B. coli	29	54.72	100-5000	452.27±405.63	
	Subtotal=	**38***	**71.70**	**100-5000**	**192.96±113.09**	
Summer n=73	*Paramphistomum cervi*	21	28.77	100-500	175.56±120.90	Summer vs Winter = 1.07
	F. gigantica	19	26.03	100-1200	217.39±256.74	
	S. indicum	1	1.37	100-100	100.00±0.00	
	T. vitulorum	2	2.74	100-200	120.00±44.72	
	Strongyles	1	1.37	100-100	100.00±0.00	
	B. coli	22	30.14	100-5000	471.18±332.51	
	Eimeria sp.	4	5.48	100-300	250.00±130.93	
	Subtotal=	**43***	**58.90**	**100-5000**	**204.87±126.54**	
Winter n=110	*F. gigantica*	27	24.55	100-1200	192.59±123.80	Rainy vs Winter = 1.89
	Paramphistomum cervi	24	21.82	100-500	179.16±128.47	
	S. spindale	1	0.91	100-100	100.00±0.00	
	T. vitulorum	3	2.73	100-200	133.33±57.74	
	Strongyles	1	0.91	100-100	100.00±0.00	
	B. coli	37	33.64	100-5000	302.70±236.27	
	Eimeria sp.	4	3.64	100-300	275.00±170.78	
	Subtotal	**63***	**57.27**	**100-5000**	**183.21±102.44**	
Level of significance				(0.0021)**		

n = Total animals examined
***** = Total no. of animals affected is less than the summation of individual infection because same animal was infected by more than one type of gastro-intestinal parasites
** = Means p<0.01

The results of the present investigation indicated that the prevalence of gastro-intestinal parasites in water buffaloes is very common and quite severe irrespective of age and sex of the buffaloes and seasons of the year. It is imperative that integrated strategies and measures be taken to control gastro-intestinal parasitic infections in buffaloes in kurigram district and elsewhere in Bangladesh.

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