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Prevalence of *Balantidium coli* in Buffaloes at different areas of Mymensingh

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Abstract

Balantidium coli is a common protozoan disease of animals. A total of 151 buffaloes were examined through faecal examination, of which 68 (45.03%) found to be infected with *B. coli* infection. Prevalence of *B. coli* infection was relatively higher in adult buffaloes (49.52%) aged > 5 years than young (39.29%) aged > 2- ≤ 5 years and buffalo calves (27.78%) aged ≤ 2 years. Higher prevalence of *B. coli* was observed in female (47.32%) than that of male (38.46%) buffaloes which are not statistically significant. Prevalence of *B. coli* infection was significantly ($p<0.01$) higher in poor health buffaloes (78.95%) than healthy buffaloes (24.47%) and buffaloes reared in normal floor/muddy floor (46.21%) than that reared in concrete floor (36.84%), respectively. Significantly ($p<0.05$) higher prevalence of *B. coli* infection was observed in rainy season (60%) followed by summer (42.10%) and winter season (32.76%). It is concluded that buffaloes are highly susceptible to balantidiasis irrespective of age, sex, health status, management system and seasons of the year.

Keywords: *Balantidium coli*, Prevalence, Buffaloes

Introduction

Buffaloes play an important role in the national economy and trade of Bangladesh. Among many constrains, parasitism is thought to be a major cause that hindering the development of livestock population including buffaloes in Bangladesh (Jabber and Green, 1983). Protozoan diseases have great importance in ruminants and other animals. Among the protozoan diseases balantidiasis caused by *Balantidium coli*, is a common disease of ruminants (cattle, buffaloes, sheep and goats), pig, monkey, chimpanzee, orangutan, guinea pig and man (Rahman, 1985; Samad, 1996a and Levine, 1985). *B. coli* naturally inhibitats in the caecum, colon and rectum of apparently healthy animals, but under certain circumstances it produces clinical disease (Samad, 1996a). It has two developmental stages, a trophozoite stage and a cyst stage and usually affects the large intestine, from the caecum to the rectum. The trophozoite is motile having two nuclei (macro and micronucleus) and contains cilia around its ovoid shaped body, naturally voided with faeces of the affected animals and contaminates food and water (Samad, 1996b). Infection occurs through ingestion of food or water contaminated with cysts and pass through the digestive system of the host where excystment (in large intestine) takes place to produce trophozoites and multiply by binary fission (asexual) or sexual conjugation. *B. coli* fundamentally affects the colon and causes clinical manifestation from asymptomatic to serious dysenteric forms (Lazar *et al.,* 2004). *B. coli* also produces hyaluronidase (Tempels and Lipenko, 1957) which potentially enhancing its ability to invade the intestinal mucosa, causing enteritis where the clinical features are manifested by loose faeces to watery persistent foetid diarrhea, dehydration, loss of appetite, retarded growth, loss of body condition and reduced production performance of the animals which impacts on the economy of the farmers as well as the country. *B. coli* has cosmopolitan distribution and it is zoonotic disease which acquired by humans via the faecal-oral route from the normal host, pigs, where it is asymptomatic (Schuster and Ramirez, 2008). The geo-climatic condition of Bangladesh is favorable for the development and survival of various parasites including *B. coli* (Datta *et al.,* 2004). Prevalence of *B. coli* in domestic animals and pig is very high in the developing countries. Islam *et al*., (2000) and Haque *et al*., (1998) found 3.5% and 2.19% of clinical balantidiasis in water buffaloes and cattle. Motaleb (1996) recorded 1.5% and 2.2% prevalence of *B. coli* in cattle and buffaloes. Bilal *et al.,* (2009) reported 25% prevalence of *B. coli* in cattle in Pakistan, Palanivel *et al.,* (2005) reported 45.45% & 51.43% prevalence of *B. coli* in cattle and buffaloes. The literature so far available revealed that only a little work has been carried out on the epidemiology of *B. coli* in buffaloes of Bangladesh. The present study was, therefore, undertaken to study the prevalence of *B. coli* infection (balantidiasis) of buffaloes in different areas of Mymensingh district.

Materials and Methods

The research was carried out for a period of one year from June 2009 to May 2010 at Mymensingh district of Bangladesh. Morphological examination was conducted in the Department of Parasitology, Bangladesh Agricultural University, Myamensingh. A total of 151 buffaloes were selected randomly irrespective of age, sex, health status, management system and seasons of the year from different villages of Mymensingh district. The age of the buffaloes was determined by examination of teeth as well as interrogating the farmer (Rahman and Hossain, 1997). According to age, buffaloes were categorized into three groups, namely, buffalo calf (≤ 2 years), young (> 2- ≤ 5 years) and adult (> 5 years). The health status of buffaloes was categorized into two groups, namely, poor health and healthy buffaloes (according to eye inspection and body condition score) (Rahman and Hossain, 1997). The management system (floor type) was also divided into concrete floor (brick built) and normal floor (muddy floor). For seasonal prevalence, the whole year was divided into conventional three seasons, namely, summer (March-June), rainy (July-October) and winter (November-February). The fecal samples were collected directly from the rectum of these animals by wearing of apron, hand gloves and gumboot to avoid contamination. The collected faecal samples were examined by Stoll's ova counting techniques for determining the number of cysts or trophozoites (Fig. 1 and 2) per gram of faeces by their characteristic morphological features as described by Soulsby (1982).

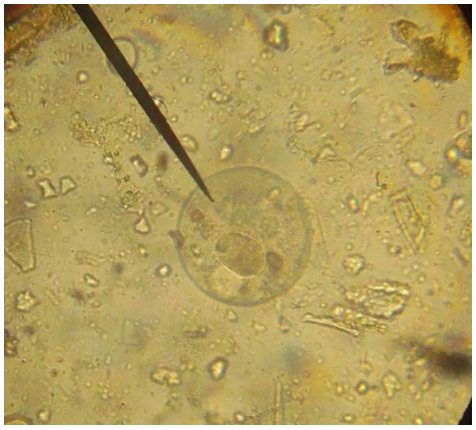

Fig. 1. Cyst of *B. coli* in buffaloes

Fig. 2. Trophozoite of *B. coli* in buffaloes

Statistical analysis was done by using the Statistical Package for Social Sciences (SPSS-11.5 version) technique. To compare the mean values of cysts per gram of faeces of *Balantidium coli*, data were analyzed by using the Least Significant Difference (LSD) test (Steel and Torrie, 1980). Logistic regression models were fitted for identifying the risk factor(s) that significantly influences the infection of *Balantidium coli* in buffaloes (Hosmer and Lemeshow, 1989). Chi-square (χ^2) test was performed for testing the overall significance of several prevalences at 1% or 5% level of significance (Mostafa, 1989). To diagnose the pair wise significant of several factors (age, sex, health status, and management system) one-sided z test was done (Ahmed, 2007).

Results and Discussion

Overall prevalence of *Balantidium coli* infection in buffaloes

During the study period, a total of 151 buffaloes were examined through faecal examination, of which 68 (45.03%) were found to be infected with *B. coli* (Table 1). The mean of cyst per gram of faeces count (304.41±20.68) was recorded in buffaloes (Table 1). Palanivel *et al.* (2005) reported the prevalence of *B. coli* 45.45% and 51.43% in cattle and buffaloes, respectively which is similar to the findings of the present study. Lower prevalence of *B. coli* was also observed by Motaleb (1996) and Sinha *et al. (*1976) who recorded 1.5%, 2.2% and 1.28% cattle and buffaloes were suffering from balantidiasis in Bangladesh and India. The variations between the present and previous findings might be due to difference in the sample size, selection of samples, technique of sample examination, geographical locations/ topography, climatic condition, managemental and nutritional factors of the animals.

Age wise distribution of *B. coli* infection in buffaloes

Age of buffaloes had effect on the prevalence of balantidiasis. Prevalence of *B. coli* infection in buffaloes was relatively higher in adult animals (49.52%) than young (39.29%) and buffalo calves (27.78%) (Table 1). Calculated odds ratio revealed that adult and young buffaloes were 2.16 times and 1.73 times more prone to infection with *B. coli* than that of buffalo calves (Table 6) which supported to the earlier findings of Islam *et al.* (2000) who reported the highest prevalence in buffaloes of 5 years and above age group (4.0%) than in animals 2-5 years (3.48%) and below 2 years of age (3.24%). The variation of prevalence of balantidiasis in different age groups of buffaloes may be assumed that the various stress condition (pregnancy, lactation, parturition, transportation of goods etc), exhausted immune system and management system are responsible for the higher prevalence of *B. coli* in adult animals.

Table 1. Age wise prevalence of *B. coli* infection in buffaloes

Animals	Age	No. of samples examined (N=151)[1]	No. of sample positive for *B. coli*	Prevalence (%)	χ^2-value	Cyst per gram of feces **Mean± SE** [2]
Buffaloes	Buffalo calf (≤2years)	18	5	27.78	3.38^{NS}	260.00±24.50[a]
	Young (>2 -≤5 years)	28	11	39.29		318.18±22.64[a]
	Adult (> 5 years)	105	52	49.52		305.77±26.54[a]
	Total	151	68	45.033		304.41±20.68

[1] N= Total number of samples examined.
[2] Two means having common superscripts do not differ significantly (p<0.05).
NS: Not significant.

Sex wise distribution of *B. coli* infection in buffaloes

From this study, it was recorded that the prevalence of *B. coli* infection was relatively higher in female (47.32%) than male (38.46) buffaloes (Table 2) which was not statistically significant. This finding is differed from that of the earlier finding described by Islam *et al.* (2000)) who reported higher prevalence in male buffaloes (3.8%) than females (3.4%). Mamun (2008) also reported that male buffaloes (37.11%) were more susceptible to *B. coli* infection than female (35.71%). The mean burden of cysts per gram of feces was significantly (p<0.05) higher in female (318.87±25.7) than that of male buffaloes (253.33±15.17) (Table 2). The disparity between the present and previous findings possibly may be due to the alteration in the physiological condition of the females during pregnancy, lactation and parturition (hormonal influences) and lower feed supplement for production which may lead to lowering of the body resistance/ suppression of immune system. Higher levels of prolactin and progesterone hormones make the female individual more susceptible to any infection (Lloyd, 1983).

Table 2. Sex wise prevalence of *B. coli* infection in buffaloes

Animals	Sex	No. of samples examined (N=151)[1]	No. of sample positive for *B. coli*	Prevalence (%)	z-value	Cyst per gram of feces **Mean ±SE** [2]
Buffaloes	Female	112	53	47.32	0.956^{NS}	318.87±25.70[a]
	Male	39	15	38.46		253.33±15.17[b]

[1]N= Total number of samples examined.
[2]Two means having different superscripts differ significantly (p<0.05).
NS: Not significant.

Health status related prevalence of *B. coli* infection in buffaloes

The health status of hosts had a profound effect on the prevalence of *B. coli* infection in buffaloes. Prevalence of *B. coli* infection was significantly (p<0.01) higher in poor health buffaloes (78.95%) than that of healthy buffaloes (24.47%) (Table 3). Odds ratio revealed that poor health buffaloes were 11.42 times more likely to be susceptible to infection than that of healthy animals (Table 6). The mean burden of cysts per gram of feces was significantly (p<0.05) higher in poor health buffaloes (308.89 ± 29.78) than

that of healthy (295.65±19.36) buffaloes (Table 3). Higher prevalence of *B. coli* infection in poor health animals may be due hormonal influences of females during pregnancy, lactation and lower feed supplement for production which may lead to suppression of immune system. Lapage (1962) reported that malnourished animals are more susceptible to any infection as they are immunocompromised. The fecundity of parasites is usually increased in immunocompromised animals (Etter *et al.,* 1999).

Table 3. Health status related prevalence of *B. coli* in buffaloes

Animals	Health status	No. of samples examined (N=151)[1]	No. of sample positive for *B. coli*	Prevalence (%)	z-value	Cyst per gram of feces
						Mean± SE [2]
Buffaloes	Poor health	57	45	78.95	6.52**	308.89±29.78 [a]
	Healthy	94	23	24.47		295.65±19.36 [b]

[1]N= Total number of samples examined.
[2] Two means having different superscripts differ significantly (p<0.05).
**Indicates significant (p<0.01).

Prevalence of *B. coli* infection in buffaloes in relation to management

During this study, it was observed that the prevalence of *B. coli* infection was higher in buffaloes reared in normal floor/muddy floor (46.21%) than that of animals reared in concrete floor (36.84%) (Table 4). This finding can not be compared and contrasted due to paucity of relevant literature but it may be assumed that conscious and rich farmers use concrete floor for rearing their animals and practice proper disposal of faeces and waste products from the floor daily. Moreover, they maintain hygienic condition and fed the animals in the stall without grazing here and there which reduce the chance of ingestion of contaminated feed leading to lower prevalence of *B. coli* infection. On the other hands, poor and unconscious farmer do not practice to maintain proper hygienic condition of the floor (floor remains damp & moist) and graze their animals in the agricultural fields, road sides, river bank which have been already contaminated by pig faeces resulting higher prevalence.

Table 4. Prevalence of *B. coli* infection in buffaloes in relation to management

Animals	Management system (Floor type)	No. of samples examined (N=151)[1]	No. of sample positive for *B. coli*	Prevalence (%)	z-value	Cyst per gram of feces
						Mean ±SE [2]
Buffaloes	Concrete floor	19	7	36.84	- 0.767NS	304.92±22.84[a]
	Normal floor	132	61	46.21		300.00±30.86[a]

[1]N= Total number of samples examined.
[2]Two means having common superscripts do not differ significantly (p<0.05).
NS: Not significant.

Seasonality of *B. coli* infection in buffaloes

The present study reveals that the seasonal fluctuation had an effect on the prevalence of *B. coli* infection of buffaloes (Table 5). Significantly (p<0.05) higher prevalence of balantidiasis in buffaloes was observed during rainy season (60%) followed by summer (42.10%) and winter (32.76%) season and buffaloes in rainy season were 2.88 times more prone to infection than that of winter (Table 6). The mean burden of cysts per gram of feces in three seasons was not differed significantly (Table 5). This finding is in contrast to the earlier report described by Mamun (2008) who observed the higher prevalence of *B. coli* infection in buffaloes during rainy season (54.72%), followed by winter season (33.64%) and summer season (30.14%) and Islam *et al.* (2000) who also reported the highest prevalence of clinical balantidiasis during summer season (4%) followed by rainy (3.69%), autumn (3.44%) and winter (3.07%) in water buffaloes at Madhupur Thana of Tangail district, Bangladesh. The contrast between the present and previous findings can be explained by the fact of variation in the geographical location (topography) of the experimental area, technique of sample examination, contamination of feeds. However, the highest prevalence in rainy season may be due the high humidity, heavy rain fall and higher chance of contamination of feeds that enhance the rate of infection of *B. coli*.

The observations from the present study revealed that buffaloes were highly susceptible to balantidiasis. So, further extensive work is needed to assess the impact of balantidiasis on buffaloes and to find out a proper control strategies against it in Bangladesh.

Table 5. Seasonality of *B. coli* infection in buffaloes

Animals	Season	No. of samples examined (N=151)[1]	No. of sample positive for *B. coli*	Prevalence (%)	χ^2-value	Cyst per gram of feces Mean ±SE[2]
Buffaloes	Summer	38	16	42.10	8.64*	368.75±75.12[a]
	Rainy	55	33	60.00		287.88±16.14[a]
	Winter	58	19	32.76		278.95±26.02[a]

[1]N= Total number of samples examined.
[2]Two means having common superscripts do not differ significantly (p<0.05).
*Indicates significant (p<0.05).

Table 6. Fitting of Multiple Logistic regression models for identifying the risk factors of *B. coli* infection in buffaloes

Variables	Category	Coefficient (β)	Standard error	Wald's P value	Odds ratio = exp(β)	95% C. I for odds ratio
Age	(≤ 2 years)(Ref.)	-		-	-	-
	(>2 - ≤ 5 years)	0.546	0.776	0.481	1.726	0.378-7.896
	(>5 years)	0.771	0.673	0.252	2.162	0.578-8.085
Sex	Male	-0.838	0.531	0.114	0.432	0.153-1.224
	Female(Ref.)	-	-	-	-	-
Health status	Poor health	2.435	0.448	0.000	11.415**	4.744-27.466
	Normal health(Ref.)	-	-	-	-	-
Season	Summer	-0.151	0.555	0.786	0.860	0.290-2.551
	Rainy	1.058	0.562	0.060	2.880	0.958-8.656
	Winter(Ref.)	-	-	-	-	-
Management	Concrete floor	-.080	0.624	0.897	0.923	0.272-3.133
	Normal floor(Ref.)	-	-	-	-	-
	Constant	-1.892	0.684	0.006	0.151	

* Indicates significant (p<0.05).
** Indicates significant (p<0.01).

Odds ratio: In epidemiologic studies, the odds ratio measures the intensity or the degree of association between a risk factor and an outcome. The degree of association increases as the odds ratio increases.

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