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PREVALENCE OF BRUCELLOSIS IN BLACK BENGAL GOATS IN BANGLADESH

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ABSTRACT

Brucellosis is an important bacterial zoonotic disease causing significant economic loss in dairy industries worldwide including Bangladesh. But limited studies are devoted to determine the prevalence of brucellosis in goat in all districts of Bangladesh. Therefore, a cross-sectional study was undertaken to determine the seroprevalence of brucellosis in Black Bengal goats in Nilphamari Sadar and Kishoreganj upazillas of Nilphamari district of Bangladesh using Rose Bengal Test (RBT) as screening test and I-ELISA as confirmatory test. A total of 154 sera samples from Black Bengal goats were collected from Nilphamari district. Epidemiological data on the selected Black Bengal goats were collected using a structured questionnaire. The overall seroprevalence of brucellosis was found to be 2.59% in Black Bengal goats. A significantly ($p<0.01$) higher prevalence of brucellosis was found in Black Bengal goats with the history of previous abortion (33.33%). An insignificant ($p>0.05$) but higher prevalence of brucellosis was found in adult Black Bengal goats (>24 months) than young. The prevalence was relatively higher in cross-bred than pure Black Bengal goats, in female than male and in pregnant than non-pregnant Black Bengal goats. The result of the study will provide baseline data for control of brucellosis in goat in Bangladesh.

Key words: Brucellosis, Black Bengal goats, RBT, I-ELISA, Bangladesh

INTRODUCTION

Economically and culturally, the goat has played an important role in traditional Bengali society. Among the Asiatic countries, Bangladesh, a tropical agro-based developing country, possesses the third largest repository of goats, with a population of more than 34 million heads, according to the FAO (WHO, 2006). This figure represents more than 57% of total livestock in Bangladesh. More than 90% of the goats of the country are of the Black Bengal breed. Each year goat production provides 127,000 MT meat, which accounts for 25% of total red meat in Bangladesh. More than 98% of goats are owned by the small, marginal and landless farmers in the villages (Bangladesh Economic Review, 2011).

In Bangladesh, especially in the northern districts like Nilphamari and other adjacent area, the marginal farmers can earn a little bit extra income by rearing this Black Bengal goat. It is very easy to rear Black Bengal Goat in the rural area of Bangladesh. The marginal farmers, specially the women like to rear two or more goats at their small cottages. Their children help them in rearing this goat at their premises. As goats come in very close contact with humans, the risk of transmitting this zoonosis is very high.

Brucellosis is an important disease of animals caused by small non-motile coccobacilli shaped gram-negative bacteria *Brucella spp.* (Baek *et al*., 2003). There are various species of *Brucella* such as *B. abortus*, *B. suis* and *B. melitensis*, their host preference in order being cattle, swine and, sheep and goats. Brucellosis is considered by the Food and Agricultural Organization (FAO), the World Health Organization (WHO) and the World Organization for Animal Health (OIE) (WHO, 2006) as the most widespread zoonosis worldwide (Acha and Szyfres, 2001). It is a disease of economic and public health significance and it can have a considerable impact on human and animal health, as well as on socioeconomic impacts. Human brucellosis is caused by exposure to livestock and livestock products. Infections can result from direct contact with infected animals and can be transmitted to consumers through raw milk and milk products (Radostits *et al*., 2000). Brucellosis in goats caused by *B. melitensis*. It remains one of the most common zoonotic diseases worldwide with more than 500,000 human cases reported annually (Seleem *et al*., 2010). *B. melitensis* has 3 biovars (1–3), highly pathogenic for humans (Pappas *et al.*, 2005).

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Brucellosis is present throughout the five continents and it is still an uncontrolled serious public health problem in many developing countries (Benkirane, 2006). In Bangladesh, through blood serology the disease was first identified in cattle in 1967, in buffalo in 1997, in human in 1983 and in goat in 1988 (Rahman *et al*., 2011). Brucellosis has been reported in small ruminants from different parts of the world including Bangladesh (El-Ansary *et al*., 2001; Mahasin, 2010; Arshad *et al*., 2011; Rahman *et al*., 2011; Rahman *et al.,* 2012). Although seroprevalence of brucellosis in cattle, buffalo, human, sheep and goats were determined previously by Milk Ring Test, Plate Agglutination test, Tube Agglutination test and Rose Bengal Test and I-ELISA in different districts of Bangladesh but there was no previous study for determination of prevalence of brucellosis using RBT and I-ELISA in Nilphamari district of Bangladesh. Therefore the present study was carried out to determine the seroprevalence of brucellosis in Black Bengal goats in the selected areas of Nilphamari Sadar and Kishoreganj Upazilas of Nilphamari district of Bangladesh.

MATERIALS AND METHODS

A cross sectional study was conducted in Nilphamari Sadar and Kishoreganj upazilas of Nilphamari district during the period from July to November 2011. A total of 154 Black Bengal goats, irrespective of age, sex and breed were randomly selected from two upazilas of Nilphamari district. Out of 154 goats, 50 were male and 104 were female. Epidemiological data on the randomly selected Black Bengal goats were collected using a structured questionnaire. The animal level variables were age, sex and reproductive problem and the farm level variable was flooring system such as kacha (floor without cement and brick), macha (floor is higher than the ground and made of bamboo) and brick floor. After collection of data, about 5-7 ml of blood was collected aseptically from each of the randomly selected Black Bengal goats. All the blood samples were processed for sera preparation.

Rose Bengal Test (RBT)

All the sera samples were subjected to Rose Bengal Test (RBT) as a screening test using *B. abortus* antigen (obtained from Dae Sung Microbiological lab, South Korea).The RBT was performed according to the procedure as described by Uddin and Rahman (2007).

Indirect Enzyme Linked Immunosorbent Assay (I-ELISA)

The assay was performed according the protocol supplied by the manufacturer (Svanova Biotech AB, art.No.10-2700-10, SE-751 83 Uppsala, Sweden). The assay was calibrated against the OIE ELISA Standard sera and Standardized against the EU derivatives 64/432/EEC.

Statistical analysis

The questionnaire-based data was processed by Microsoft Excel and analyzed by SPSS. The Z test for proportions was done to find out the significant differences in the prevalence in terms of demographic variables such as age, sex, breed, pregnancy status and flooring system in goat farms (Ahmed *et al.*, 2010).

RESULTS AND DISCUSSION

Bangladesh has been reported as an endemic area for brucellosis because of a considerable number of human and animal populations are exposed to the infection each year (Nahar and Ahmed, 2009; Ahasan *et al*., 2010; Rahman *et al*., 2011). RBT is used as a screening test of *Brucella* infection (MacMillan, 1990) and it is reported to be more sensitive than the CFT in the case of culture positive animal (Blasco *et al*., 1994). I-ELISA is known to be more effective than the traditional tests (RBT, SAT and CFT) and the fact that all RBT positive with including the negative samples were also classified as positive by I-ELISA and strongly suggests that seropositivity was indeed due to sensitization to *Brucella spp*. The objectives of the study were to know the status of brucellosis by RBT and I-ELISA in Nilphamari district of Bangladesh, to improve the understanding the epidemiology of brucellosis in Black Bengal goat and to provide information for disease control in livestock of Bangladesh. Seropositivity was considered to be due to natural infection because vaccination has never been practiced in Bangladesh. This preliminary survey confirms the presence of brucellosis in goats of Nilphamari district of Bangladesh.

Out of 154 sera samples, total positive reactor of brucellosis was 5 with the prevalence 3.24% by RBT and 4 with the prevalence 2.59% by I-ELISA. The overall sero-prevalence of brucellosis was found to be 2.59% in Black Bengal goats by I-ELISA (Table 1). This finding was slightly higher than that of the findings of Uddin and Rahman (2007) and Mahasin (2010) who reported the prevalence 2.33% and 2.50%, respectively. But prevalence rate is lower than that of Rahman *et al*. (2011) who reported 3.15% in goat. Prevalence is also lower that were reported in abroad are 9.8 % in goats at public livestock farm in Pakistan (Arshad *et al*., 2011), 4% in goats in eastern Sudan (El-Ansary *et al.*, 2001).

Table 1. Overall sero-prevalence of brucellosis in Black Bengal goats in Sadar and Kishoreganj upazilas of Nilphamari district.

Sera tested	Number (%) of positive reactors	
	RBT	I-ELISA
154	5 (3.24)	4 (2.59)

RBT= Rose Bengal Test I-ELISA= Indirect ELISA

The sero-prevalence of brucellosis was relatively higher in >24 months (6.89%) of age group compared to age group of 12-24 months (2.50%) and 6-12 months (0.00%) (Table 2). Statistically, there was no significant ($p=0.190$) association between age groups of Black Bengal goat and the sero-prevalence of brucellosis ($p>0.05$). This is an agreement with the report of Ashenafi *et al.* (2007) who recorded prevalence of brucellosis 5.3% observed in adult Black Bengal goats. It appears that the high prevalence of brucellosis among older animals might be related to maturity with the advancing age (Amin *et al*., 2005).

Sex-wise prevalence of brucellosis was higher in female (3.84%) than in male (Table 2). However, no significant relationship was found between the prevalence of brucellosis and sex of Black Bengal goats ($p>0.05$). This finding supports the observation of Chandra *et al*. (2005) and Rahman *et al*. (2011). The breed wise distribution of brucellosis was shown in Table 2. An insignificantly higher prevalence was found in crossbred of Black Bengal goat (4.05%) than Black Bengal goat (1.25%). The sero-prevalence of brucellosis in terms of pregnancy has been shown in Table 2. A relatively higher prevalence was found in pregnant Black Bengal goats (3.33%) than non-pregnant Black Bengal goats (1.56%) which was not statistically significant ($p>0.05$). The prevalence of brucellosis was much higher (33.33%) in Black Bengal goat with the history of previous abortion (Table 2) than other reproductive disorders. Statistically, there was a significant ($p<0.01$) effect of reproductive disorders on the sero-prevalence of brucellosis in Black Bengal goats. This finding is lower than that of Rahman *et al*. (2011) who reported 66.67% with previous history of abortion. Prevalence rate is reported in 41.9% in goat in Jordan with previous history of abortion (Samadi *et al*., 2010). Similar result was observed by Sandhu *et al*. (2001) and Rahman *et al*. (2006). Brucellosis is essentially a disease of the sexually mature animals, the predilection site being the reproductive tract, especially the gravid uterus. Allantoic factors including, erythritol, possibly steroid hormones and other substances stimulate the growth of most of the *Brucellae* (Radolf, 1994). There was no positive reactor among seven Black Bengal goats kept in brick floor. More positive cases were found in Black Bengal goats kept in macha system floor (10.0%) than in goats kept in kacha floor (Table 3).

Brucellosis is a true zoonosis and the stimulus for hopeful elimination is primary public health. Nearly every case of human brucellosis has an animal origin and, therefore, control is primarily a veterinary responsibility (Nicoletti, 1992). Some future recommendations to address this disease were; regular sero-monitoring of the Black Bengal goat, positive reactors must not be used in breeding purpose and further studies for isolation; identification and typing of specific *Brucella sp*. are also recommended.

Table 2. Demographic factors related seroprevalence of brucellosis in Black Bengal goats based on RBT and I-ELISA.

Demographic factors	Number of sera tested	Number of positive reactors by RBT (%)	Number of positive reactors by I-ELISA (%)
Age (months)			
6-12	45	0 (0.00)	0 (0.00)
12-24	80	3 (3.75)	2 (2.50)
> 24	29	2 (6.89)	2 (6.89)
Sex			
Male	50	1 (2.00)	0 (0.00)
Female	104	4 (3.84)	4 (3.84)
Breed			
Black Bengal goat	80	2 (2.50)	1 (1.25)
Crossbred goat	74	3 (4.05)	3 (4.05)
Pregnancy status			
Yes	90	4 (4.44)	3 (3.33)
No	64	1 (1.56)	1 (1.56)
Reproductive disorders*			
Previous abortion	9	4 (44.44)	3 (33.33)
Retained placenta	8	0 (0.00)	0 (0.00)
Failure to conceive	18	0 (0.00)	0 (0.00)
Others (metritis, delayed heat, dystocia etc.)	119	1 (0.84)	1 (0.84)

* Significant at $p < 0.01$ RBT= Rose Bengal Test I-ELISA= Indirect ELISA

Table 3. Sero-prevalence of brucellosis in Black Bengal goats regarding the flooring system of goat farms of Nilphamari Sadar and Kishoreganj Upazilas of Nilphamari district.

Flooring system	Number of Sera tested	Number of positive reactors by RBT (%)	Number of positive reactors by I-ELISA(%)
Kacha floor	137	4 (2.91)	3 (2.18)
Brick floor	7	0 (0.00)	0 (0.00)
Macha system	10	1 (10.0)	1 (10.0)

RBT= Rose Bengal Test I-ELISA= Indirect ELISA

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