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Full Length Research Paper

An epidemiological survey on investigation of tick infestation in cattle at Chittagong District, Bangladesh

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Epidemiology of tick infestations was studied in cattle at different upazila of Chittagong District from November, 2008 to May, 2009 to know the prevalence of ticks in relation to age, sex, breed, management of cattle, seasons of the year, topography of the area and different body parts of the host. A total number of 380 cattle were examined, of which 138 (36.31%) cattle were found infested. Three species of ticks were identified namely *Boophilus microplus*, *Rhipicephalus sanguineus* and *Haemaphysalis bispinosa*. The range of tick burden was 1 to 7 per four square inch of heavily infested area of Chittagong District. Mean tick burden was also high in case of *B. microplus* (2.77 ± 0.18) followed by *H. bispinosa* (1.03 ± 0.12) and *R. sanguineus* (0.83 ± 0.10). Prevalence was significantly (p<0.01) higher in cattle of 1.5 years of age (46.28%) than in cattle of >1.5 years of age (27.80%). Infestation of tick was significantly higher (p<0.01) in female (59.37%) than the male (35.83%) cattle. Tick infestation was more prevalent in local (43.82%) cattle than the cross-bred (24.13%) cattle. Field grazing (41.96%) cattle were more susceptible (p<0.01) to tick infestation than the stall-feeding (24.8%) animals. Prevalence of tick infestation was significantly (p<0.01) higher in summer (41.66%) season followed by winter (31.5%) season. Ticks were widely distributed in different parts of the host body such as ear, neck, tail, mammary gland, udder, groin and perianal region of which groin (48.75%) was most affected parts of animal body and face and neck (30%) was the least. Prevalence of tick infestation was significantly (p<0.01) higher in hilly area (44.44%) followed by plain area (30.27%). It is concluded that *B. microplus* is the main tick species identified and threatening to the cattle population in Chittagong District irrespective of age, sex, breed of the animal, seasons of the year and topography of the study area.

Key words: Epidemiology, prevalence, survey, infestation, cattle, tick.

INTRODUCTION

The livestock sector represents a significant part of the global economy, particularly in the developing world. Thus, livestock provides energy, food, raw material, and manure for crops. It is therefore not surprising that the livestock sector, especially the dairy sector, has emerged as an important economic source for a vast majority of the rural population and a target for agribusiness in the dairy, meat, and various other products in the processed foods sector. The climatic condition of Bangladesh is very conducive to a wide variety of parasites as well as ticks (Razzak and Shaikh, 1969). Ticks are hematophagous

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arthropods belonging to the Class Arachnids. Once they attach to a host for a blood meal, they can cause skin irritation and anemia. Usually a tick or its instars can suck 0.8 to 2.0 ml blood in twenty-four hours and one female tick can suck blood more than thirty times of her weight (70.0 mg) during engorgement (Sangwan et al., 1995). Ticks are also one of the major vectors of pathogens, such as *Babesia*, *Theileria,* and *Anaplasma* spp., heart water disease, louping ill and viral encephalomyelitis to animals in the world (Souls by, 1982; and Dreyer et al., 1998). Heavy infestation of ticks caused severe irritation, which made the animals to rub and scratch the skin that might result in loss of hairs. The skin became inflamed, corrugated and scaly which subsequently resulted in dermal lesions. Once being attached with the body of the animals, in any instars, the ticks remain firmly attached until it has time to leave for moulting or ovipositing. Tick bite also damages the hides and skins, which are one of the most profitable raw materials that are exported from Bangladesh. A bulk of foreign currency is earned by the export of these materials. But due to damage of skin and hides by tick bite, our newly born nation is deprived of its actual value (Basu, 1951). The diverse agro climatic conditions, animal husbandry practices and pasture management largely determine the prevalence and severity of various parasitic diseases including ticks. Epidemiological pattern of the ectoparasitic diseases in the different agro climatic zones of the country would provide a basis for evolving strategic and tactical control of these diseases. To often farmers tend to regard tick infestations as a problem of cattle but factually it is a serious problem. However, little information is available regarding the epidemiology of tick infestation of cattle in Chittagong District of Bangladesh. Therefore, the present study was undertaken to know the prevalence of ticks in relation to age, sex, breed, management of cattle, seasons of the year, topography of the area.

MATERIALS AND METHODS

Study area and duration

The survey were conducted on two seasons such as winter (November, 2008 to February, 2009) and summer (March to May, 2009) season at some selected upazila in Chittagong District.

Selection of animals

Three hundred and eighty cattle were selected randomly on the basis of sex, age, breed (local and cross- bred) and feeding (stall-fed and field grazing) system. For the convenience of study, animals were divided into two age groups such as animals of 1.5 year and >1.5 years.

Collection of ticks

Ticks were collected by hand picking and smeared around the tick to loosen attachment of the tick from the body surface with ethanol.

Preservation of samples

Ticks were preserved in 70% alcohol in clean, well-stopped glass vials with labeled properly.

Identification of ticks

Presumptive identifications were made while preserved in 70% alcohol under stereoscopic microscopic. Final identifications were made under compound microscope according to keys and description (Souls by, 1982; Cable, 1967).

Statistical analysis

Statistical analyses were carried out by using statistical package for social science (SPSS) using F test. Moreover, to compare the prevalence of ticks of cattle of both sexes, ages, breeds, rearing system, seasons and topography of the area, data were analyzed by using paired sample t test (Mostafa, 1989) . Odds ratio was calculated according to the formula Schesselman (1982).

RESULTS AND DISCUSSION

Overall prevalence of ticks in cattle

During this study, a total of 380 cattle were examined of which 138 animals were found to be infested with different species of ticks. The research work revealed that about 36.31% cattle were found to be infested with tick of which *Boophilus microplus* (25%), *Rhipicephalus sanguineus* (13.68%) and *Haemaphysalis bispinosa* (12.63%) were identified (Table 1). In this study, the parasitic burden of individual tick was also determined. The range of tick burden was 1 to 7 per four square inch of heavily infested area in case of *B. microplus* (1-7) followed by *H. bispinosa* (1-5) and *R. sanguineus* (1-4). Mean tick burden was also high in case of *B. microplus* (2.77 ± 0.18) followed by *H. bispinosa* (1.03 ± 0.12) and *R. sanguineus* (0.83 ± 0.10) (Table 1). Similar findings were reported by some other scientists in home and abroad. Islam et al. (2006) reported *B. microplus* (42.4%) *H. bispinosa* (12.0%) and *R. sanguineus* (10.8%) in cattle in Bangladesh. Yakhchali and Hasanzadehzarza (2004) reported 44.5% tick infested in cattle in West Azerbaijan. Mamak et al. (2006) reported 29.6% tick infestation in cattle in Turkey. Torina et al. (2006) recorded *R. sanguineus* (19.3%) in cattle in Italy. But Swai et al. (2005) who reported 85.6% tick infestation rate in cattle. Aydin et al. (2006) identified tick infestation in cattle from three Districts of Southeastern Bulgaria and showed 57.93% of the ticks were collected from cattle of which *R. sanguineus* (4.43%). The differences among the results of present and earlier study might be due to variation in the geographical locations, climatic conditions of the experimental area, region, and methods of study and selection of samples.

Table 1. Overall prevalence of ticks of cattle in Chittagong.

Name of ticks	No. of cattle affected (%) N=380	Tick burden	
		Range	Mean ± SE
B. microplus	95 (25)	1-7	2.77±0.18
R. sanguineus	52 (13.68)	1-5	1.03±0.12
H. bispinosa	48 (12.63)	l-4	0.83 ±0.10
Total	138* (36.31)	1-7	2.69 ±0.16

N **=** Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks.

Table 2. Age related prevalence of ticks in cattle.

Age of animals	Name of parasites	No. of animals affected (%)	Tick burden		Odds ratio
			Range	Mean±SE	
Young (1.5 year) n=175	*B. microplus*	62 (35.42)	1-7	4.45±0.15	Young vs adult=2.23
	R. sanguineus	31 (17.71)	1-3	2.25±0.07	
	H bispinosa	29 (16.57)	1-3	2.38±0.08	
	Sub total	81*(46.28)	1-7	4.05±0.15	
Adult(1.5year or above) n=205	*B. microplus*	33 (16.09)	1-5	3.22±0.18	
	R. sanguineus	21 (10.24)	1-3	2.11±0.11	
	H. bispinosa	19 (9.26)	1-3	2.00±0.12	
	Sub total	57*(27.80)	1-5	2.87±0.16	
Level of significance			P = 0.0009 **		

n = Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

Age factor: Prevalence of ticks was relatively higher in young cattle (46.28%) followed by in adult (27.80 %). Young cattle were 2.23 times more susceptible to tick infestation than adult animals. Prevalence of tick in young cattle (1.5 year) were higher in case of *B. microplus* (35.42%) followed by that of *R. sanguineus* (17.71%) and *H. bispinosa* (16.57%) and in adult cattle (>1.5 year), prevalence of *B. microplus* (16.09%) was higher followed by *R. Sanguineus* (10.24%) and *H*. *bispinosa* (9.26%) (Table 2). But Yakhchali and Hasanzadehzarza (2004) found that tick infestation was higher in adult cows (60.8%) than in calves (20%) in Oshnavich. The percentage of infestation of ticks on adult cattle was higher than in the young cattle as observed by Razzak and Shaikh (1969). It is very difficult to explain exactly the frequent occurrence of tick infestation in calves and adult animals. Moreover, ticks are voracious blood sucker for their survived and reproduction which may be responsible for higher prevalence of tick infestation in young cattle, respectively.

Sex factor

In this study, it was detected that prevalence of tick was significantly (p<0.01) higher in female 95 (59.37%) than the male 43 (35.83%) cattle. Female cattle were 2.61 times more susceptible to tick infestations than males. In male cattle prevalence was higher in case of *B. microplus* (21.66%) followed by *R. sanguineus* (12.05%) and *H*. *bispinosa* (11.66%). In female cattle, prevalence was higher in case of *B. microplus* (43.12%) followed by *R. sanguineus* (23.12%) and *H. bispinosa* (21.25%) (Table 3). Although, the exact cause of higher prevalence of tick infestation in female cattle can not be explained but it can be hypothesized that some hormonal influences may be associated with this phenomenon. Lloyd (1983) reported that higher level of prolactin and progesterone hormones make the individual more susceptible to any infection. Moreover, stresses of production such as pregnancy and lactation make the female animals more susceptible to any infection.

Breed factor

In this study, it was detected that prevalence of tick was significantly (p<0.01) higher in local cattle 103 (43.82%) than the crossbred 35 (24.13%) cattle. Local cattle were 2.45 times more susceptible to tick infestations than crossbred cattle. In local cattle prevalence was higher in

Table 3. Sex related prevalence of ticks in cattle.

Sex	Name of ticks recovered	No. of cattle Affected (%)	Tick burden		Odds ratio
			Range	Mean±SE	
Male n=120	*B. microplus*	26 (21.66)	1-5	3.42±0.16	Female vs Male =2.61
	R. sanguineus	15 (12.5)	1-3	2.25±0.25	
	H. bispinosa	14 (11.66)	1-3	2.18±0.23	
	Sub total	43* (35.83)	1-5	3.15±0.16	
Female n=160	*B. microplus*	69 (43.12)	1-7	4.25±0.16	
	R. sanguineus	37 (23.12)	1-3	2.19±0.13	
	H. bispinosa	34 (21.25)	1-3	2.22±0.15	
	Sub total	95* (59.37)	1-7	3.83±0.15	
Level of significance			P= 0.0045 **		

n = Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

Table 4. Breed related prevalence of ticks in cattle.

Name of breeds	Name of parasites	No. of animals affected (%)	Tick burden		Odds ratio
			Range	Mean±SE	
Local n = 235	*B. microplus*	73 (31.06)	1-7	4.26±0.15	Local vs Cross = 2.45
	R. sanguineus	40 (17.02)	1-3	2.22±0.15	
	H bispinosa	37 (15.74)	1-3	2.31±0.20	
	Sub total	103*(43.82)	1-7	3.84±0.15	
Cross n = 145	*B. microplus*	22 (15.17)	1-5	3.50±0.19	
	R. sanguineus	12 (8.27)	1-3	2.33±0.33	
	H. bispinosa	11 (7.58)	1-3	2.10±0.18	
	Sub total	35* (24.13)	1-5	3.20±0.20	
Level of significance			P= 0.0071 **		

n =Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks.** = Means p <0.01.

case of *B. microplus* (31.06%) followed by *R. sanguineus* (17.02%) and *H. bispinosa* (15.74%). In crossbred cattle, prevalence was higher in case of *B. microplus* (15.17%) followed by *R*. *sanguineus* (8.27%) and *H*. *bispinosa* (7.58%) (Table 4). Tomassone et al. (2004) studied that N'Dama breed of cattle of Guinea and he reported *Boophilus* sp. was the most numerous adults ticks (57.1%) while *Rhipicephalus* sp.were (12.4%). Although the exact cause of higher prevalence of tick infestation in local cattle can not be explained but it can be assumed that it might be lack of interest to the farmer about local cattle as well as taking more care to cross-bred than local cattle.

Seasonal factor

Prevalence of tick was higher in summer season (41.66%) followed by in winter season (31.5%). In summer season, prevalence was higher in case of *B. microplus* (31.11%) followed by *R. sanguineus* (17.22%) and *H. bispinosa* (15.55%). In winter season, prevalence was the highest in case of *B. microplus* (19.05%) followed by *R. sanguineus* (10.5%) and *H. bispinosa* (10%) (Table 5). Similar studies were conducted by some other researcher in different countries. Stuti-Vatsya et al. (2008) reported that the animals were infested with ticks throughout the year, with maximum infestation during the rainy season then during summer and the least during winter. Sanjay et al. (2007) reported that tick infestation in cattle were higher in rainy followed by summer and winter, respectively. Islam et al. (2006) found that *B. microplus, R. sanguineus, H. bispinosa* infestation was higher during summer season in cattle in Bangladesh. Generally tick population remains low during drought (Urquhart, 1996).

Management factor

In this study, it was detected that prevalence of tick was

Table 5. Seasonal prevalence of ticks in cattle.

Seasons	Name of ticks	No. of cattle affected (%)	Tick burden		Odds ratio
			Range	Mean±SE	
	B. microplus	39 (19.5)	1-5	3.30±0.15	
Winter	*R. sanguineus*	21 (10. 5)	1-3	2.20±0.23	
n = 200	*H. bispinosa*	20 (10)	1-3	2.00±0.31	
	Sub total	63* (31.5)	**1-5**	3.02±0.16	Summer vs Winter = 1.55
	B. microplus	56 (31.11)	1-7	4.54±0.14	
Summer	*R. sanguineus sanguineus*	31 (17.22)	1-3	2.20±0.13	
n = 180	*H. bispinosa*	28 (15.55)	1-3	2.47±0.15	
	Sub total	75* (41.66)	1-7	4.12±0.18	
Level of significance			P= 0.0014 **		

n =Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

Table 6. Management related prevalence of ticks in cattle.

Systems of management	Name of parasites recovered	No. of animals affected (%)	Tick burden		Odds ratio
			Range	Mean±SE	
Stall-feeding; n = 125	*B. microplus*	18 (14.4)	1-5	3.22±0.22	
	R. sanguineus	11 (8.8)	1-3	2.40±0.21	
	H bispinosa	10 (8)	1-3	2.00±0.21	Grazing vs Stall feed = 2.19
	Sub total	31* (24.8)	1-5	2.83±0.18	
Grazing; n = 255	*B. microplus*	77 (30.19)	1-7	4.21±0.14	
	R. sanguineus	41 (16.07)	1-3	2.15±0.11	
	H. bispinosa	38 (14.90)	1-3	2.29±0.12	
	Sub total	107*(41.96)	1-7	3.81±0.14	
Level of significance			P = 0.0015 **		

n = Total animals examined. * = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

higher in grazing cattle 107 (41.96%) than the stall-feeding 31(24.8%) cattle. Grazing cattle were highly significant (p<0.01) and 2.19 times more susceptible to tick infestations than stall-feeding cattle. In grazing cattle prevalence was higher in case of *B. microplus* (30.19%) followed by *R. sanguineus* (16.07%) and *H. bispinosa* (14.90%). In stall-feeding cattle, prevalence was higher in case of *B. microplus* (14.4%) followed by *R. sanguineus* (8.8 %) and *H. bispinosa* (8%) (Table 6). Hussain and Kumar (1986) recorded the *B. microplus* in cattle, those who pastured in irrigated or river delta regions. Although the exact cause of higher prevalence of tick infestation in cattle can not be explained but it can be hypothesized that regular washing of barn and animal, regular treatment of acaricide will reduce the susceptibility of tick infestation in stall-feeding animal whereas grazing cattle are move anywhere for grazing, so susceptibility of tick infestation is higher.

Animal body parts related factor

Ticks were distributed in different parts of the host body such as ear, base of the horn, neck, tail, ventral abdomen, mammary gland, udder, groin and perianal region. The range of tick burden was 1 to 7 per four square inch of heavily infested area in groin (48.75%) where as lowest in face and neck region (30.0%) (Table 7). Yakhchali and Hasanzadehzarza (2004) found that hard tick infestation on groin and mammary glands was most prevalent in cattle (52.2%), buffaloes, and sheep. Tick infestation of minor importance on head, ear and neck was 1.7, 1.3 and 1.2% in cattle, buffaloes and sheep, respectively. L'Hostis et al. (1994) reported that attachment sites were the axilla, udder/groin, neck, dewlap and flank. Udder/groin and axilla carried respectively 35.3 and 44.1% of the total tick burden. This is almost similar in this study; Rahbari et al. (2007) found 62% tick infestation in cattle.

Table 7. Prevalence of ticks at different body parts of cattle.

Body parts of cattle	No. of cattle examined	No. of cattle infested	Prevalence (%)	Tick burden	
				Range	Mean ± SE
Face and neck	70	21	30	1-4	2.25±0.25 [b]
Groin	80	39	48.75	1-7	3.37±0.26 [a]
Udder and mammary gland	80	25	31.25	1-4	2.29±0.23 [b]
Ear	80	29	36.25	1-5	1.96±0.17 [c]
Tail and perianal	70	24	34.28	1-5	2.78±0.30 [b]
Level of significance			P = 0.0243 **		

Values in the same columns having differ superscript are statistically significant (p<0.01).* = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

Table 8. Topography related prevalence of ticks in cattle.

Systems of management	Name of parasites	No.of animals affected (%)	Tick burden		Odds ratio
			Range	Mean ± SE	
Hilly area; n = 162	*B. microplus*	55 (33.95)	1-7	4.36±0.17	Hilly vs Plane=1.84
	R. sanguineus	29 (17.90)	1-3	2.25±0.14	
	H. bispinosa	26 (16.04)	1-3	2.43±0.14	
	Sub total	72* (44.44)	1-7	3.96±0.16	
Plane area; n = 218	*B. microplus*	40 (18.34)	1-6	3.55±0.18	
	R. sanguineus	23 (10.55)	1-3	2.11±0.20	
	H. bispinosa	22 (10.09)	1-3	2.00±0.20	
	Sub total	66* (30.27)	1-6	3.21±0.17	
Level of significance			P= 0.0037 **		

n = Total animals examined.* = Total no. of animals affected is less than the summation of individual infestation because same animal was infested by more than one type of ticks. ** = Means p <0.01.

He observed during the survey work that the majority ticks usually attached to the face and ears of the host, although they have been found on udder, scrotum, tail, leg and belly in cattle and in leg, udder, neck and flank in cattle which supported to the findings of Patton and Cragg (1913).

Topography factor

In this study, it was detected that prevalence of tick was significantly (p<0.01) higher in cattle reared in hilly area 72 (44.44%) than the cattle of plain area 66 (30.27%). Cattle of hilly area were 1.84 times more susceptible to tick infestations than plain area. In hilly area, prevalence was higher in case of *B. microplus* (33.95%) followed by *R. sanguineus* (17.90%) and *H. bispinosa* (16.04%). In plain area, prevalence was higher in case of *B. microplus* (18.34%) followed by *R. sanguineus* (10.55%) and *H. bispinosa* (10.09%) (Table 8). The difference in severity of infestations in hilly and plain zones was perhaps due to the presence of herb, shrub and species of imperata grass, which created a favourable sheltering place for egg laying and hatching of all ticks throughout the year (MacLeod, 1970). Kamal et al. (1996) also reported that 65.5% cattle were infested with ticks in hilly area. In hypothetically, cattle rearing in hilly area contain high amount of RBC cells in its blood volume due to its movement in hilly area and required high volume of oxygen level for their survive. Therefore, susceptibility of tick infestation is higher because ticks are vigorous blood sucker. Another factor assumed that in hilly area scarcity of water where as no scarcity of water in plain land. So regular bath and rubbing practice of animals in plain areas whereas it is rarely practiced in hilly areas.

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