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Prevalence of bovine tuberculosis in Assam, India

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Abstract

Bovine tuberculosis (BT) is a serious animal health problem and cause enormous economic loss to the dairy sector in India. In this study, prevalence of bovine tuberculosis in Assam was studied on the basis of Tuberculin skin test (TST) and cultural examination of samples with lesions collected from slaughtered animal and necropsied animals. Prevalence of BT was found to be 28%, in suspected animals, 2.16% in slaughtered animals and 12% in necropsied animals. Higher prevalence was recorded in female (32.43%) than in male (15.83%). In respect of age group, prevalence was highest in animals of 6-9 years of age (40%). Animals with poor health status showed highest prevalence (46.15%) of bovine tuberculosis.

Keywords: Bovine, Tuberculosis, Prevalence, Tuberculin Skin Test (TST), Necropsied

Introduction

Bovine Tuberculosis (BTB) caused by *Mycobacterium bovis* is one of the most important disease, which cause major economic losses as well as enormous public health threat. It is a chronic disease and occurs in diverse group of animal (domestic, certain free and captive wild species) that can allow the host to survive for many months, even years, without any clinical symptoms (O'Reilly and Daborn, 1995; De Lisle *et al.*, 2002) [12, 5]. BTB has been included in the "List- B" diseases of Office International-des-Epizooties (OIE) (OIE-2009) [13]. It is also a major zoonotic disease mainly occurring amongst farm workers on dairy farms, veterinarians, slaughter house workers and consumers who consume contaminated raw milk and other products. As per National Family Welfare Survey (1998-99) the overall prevalence human tuberculosis in India is 544/100000 population. In Assam the prevalence is 710/ 100000 population which is much higher than the all India average.

It is caused by *Mycobacterium bovis* that belongs to the Mycobacterium Tuberculosis Complex (MTC). In animal, pathological lesions are mainly distributed in upper & lower respiratory tract and associated lymph nodes (Neil *et al.*, 1994) [10], Whipple *et al.*, 1996) [19]. Tuberculin skin test (TST) has traditionally been used to determine the prevalence of infection in human & animals by using the purified protein derivatives (PPD) of *Mycobacterium bovis*.

The present was carried out with the purpose to investigate the prevalence of bovine tuberculosis in organized and unorganized cattle farm, slaughtered animals and necropsied animals in Assam.

Materials and Methods**Source of the materials**

The present investigation was carried out during the period from January, 2014 to February, 2015. Prevalence of bovine tuberculosis was studied on the basis of tuberculin skin test, lesions (gross and histopathological) of tuberculosis in necropsied and slaughtered animals. Association of various host factors such as age, sex, breed and health status of animals were evaluated.

Samples collected for gross and histopathological study were lungs, lymph nodes, liver from dead animals necropsied in the Department of Pathology, College of Veterinary Science, AAU, Khanapara, Guwahati and lungs, lymph nodes, liver from slaughtered animal from different slaughter houses in an around Guwahati city, Assam

Tuberculin skin test (TST)

For Tuberculin Skin Test (TST), approximately an area of 4cm² at the middle of the neck of the animals was shaved and skin thickness was measured (in mm) with vernier calipers before the injection of tuberculin. Approximately 0.1 ml or 2000 I.U. (1 mg protein/ml) of bovine

PPD tuberculin (Indian Veterinary Research Institute, Bareilly, UP.) was injected into the dermis of the skin of each animal. After 72 hours, the thickness at the injection site was measured again. An increase in skin thickness by five mm or more was considered as positive, two to four mm as doubtful and less than two mm as negative (OIE, 2009) [13].

Tuberculin tested animal was divided into 4 age groups i.e. 6 months to 3 yrs, 3-6 yrs, 6-9 yrs and 9-12 yrs as recommended by Thakur *et al.* (2010) [17] to determine prevalence in relation to age. Prevalence in respect of breeds / genetic groups of the cattle was studied in- Jersey, Holstein-Friesian, Crossbred and Indigenous cattle. As per the health status, the tested animals were categorized in three (3) Groups i.e. Group I (Poor), Group II (Satisfactory) and Group III (Good).

Results and Discussion

In the present study, the prevalence of Bovine Tuberculosis (BTB) on the basis of Tuberculin Skin Test (TST) was recorded as 28 percent (14/50) (TABLE. 1). Almost similar prevalence rate (28.8%) was reported by Bassessar *et al.* (2014) [4] at Jabalpur, Madhya Pradesh. In the contrary, lower prevalence rate was reported by Kumar *et al.*, 2013 [6] (23.63%) in Punjab and Thakur *et al.*, 2010 [17] (14.31%) in Himachal Pradesh. Stages of infection, anergy and immune system of individual animal can be responsible for sensitivity and specificity of tuberculin test in different animals and areas. The chronic nature of the tested animals in the present study might be resulted in higher prevalence rate.

A high association between age and prevalence of BTB was recorded in the present study. A highest (40%) prevalence was recorded in Group-III (6-9 years) followed by Group-II (3-6 years) and Group I (3 months-3 years) (FIGURE.1 & TABLE. 2). Several workers (Thakur *et al.*, 2010; Trangadia *et al.*, 2013; Noorrahim *et al.*, 2015) [17, 18, 11] reported highest prevalence in the adult animal. The higher rate in older animals may be due to prolonged closed confinement with positive reactors. The increase in the likelihood of encountering *M. bovis* over a long exposure period has been suggested (Barwinek and Taylor, 1996) [3]. No positive reaction in the Group IV (9-12 years) might be due to less number of tested animal (n=2) in the study. All the animals in this group showed doubtful reaction. The lower rate in young calves might be due to influence of T-cells, which are predominantly found in the circulation of young calves (Mackay and Hein, 1989) [7]. The role of T-cells in antimycobacterial immunity was well established (Stamp, 1948) [16].

In the investigation, highest prevalence of BTB was observed in Holstein-Friesian (42.85%) followed by Jersey (29.62%). Phaniraza *et al.* (2010) [4] also recorded 2.89% and 0.69% in HF-crossbred and Jersey crossbred respectively (FIGURE.2 & TABLE. 3). Higher prevalence of BTB in crossbred animals in tropical country like India was reported earlier (Selman, 1981) [15]. High production potential of crossbred animals and birth to a considerable number of young one, which is directly related to degree of stress on animals. Hence, the animal may succumb to active disease (Trangadia *et al.*, 2013) [18]. Tuberculin negative in indigenous animal as also reported by Phaniraza *et al.* (2010) [14] might be due to higher disease resistance capability of indigenous cattle.

Sex wise higher prevalence was recorded in female (32.43%) in comparison than male (15.38%) (FIGURE. 3 & TABLE. 4). Similar observation was also reported by Trangadia *et al.*, (2013) [18] and Noorrahim *et al.*, (2015) [11]. Males were

generally housed in isolated pan, whereas female were housed in herd and likelihood of spread of the disease increases as the healthy animals are held in close confinement with the infected ones for a long period. Another factor that could have contributed to elevated prevalence rate could be associated with high milk production stress in cows in tropical conditions (Mukherjee, 2006) [8].

Health-status wise highest prevalence of BTB was recorded in Group I (46.15%) with poor health status followed by Group-II (24%) with satisfactory health and Group-III (16.66%) with good health status animals (FIGURE. 4 & TABLE. 5). Arshad *et al.*, (2012) [2] and Noorrahim *et al.*, (2015) [11] also reported higher prevalence in animals with poor physical condition than the good health condition. Lower level of protective immunity in poor health grouped animals might be the cause of higher prevalence rate.

Prevalence of BTB in slaughtered animals during the period from January, 2014 to February, 2015 in and around Guwahati city was recorded as 2.16 percent. Muller *et al.* (2008) [9] and Youssef and Ahmed (2014) [20] reported a slight lower prevalence of BTB in slaughtered animal, which were 1.8% and 0.6% respectively. Prevalence in Crossbred animals higher than indigenous animals (TABLE. 6). Amongst the slaughtered animals also the prevalence rate found to be higher in female than male (TABLE. 7). Prevalence of BTB in slaughtered animals indicated a potential risk of spreading of the disease to human and other animals.

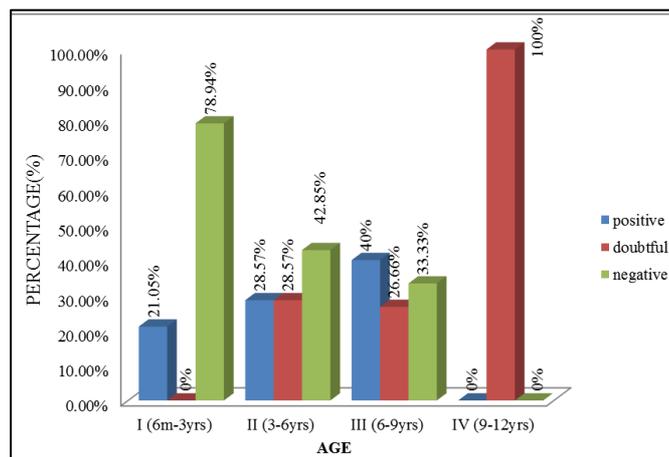


Fig 1: Age-wise Prevalence of bovine tuberculosis

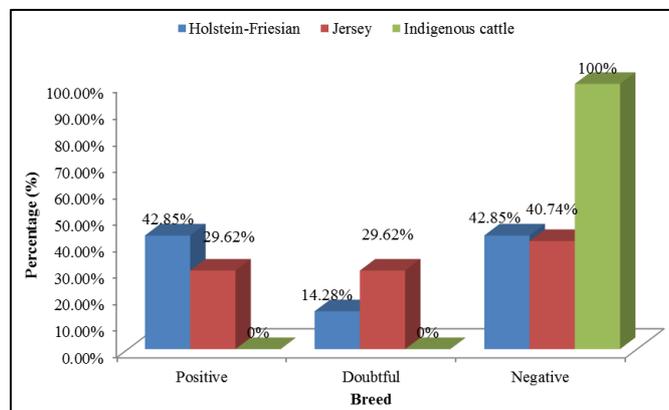


Fig 2: Breed-wise prevalence of bovine tuberculosis

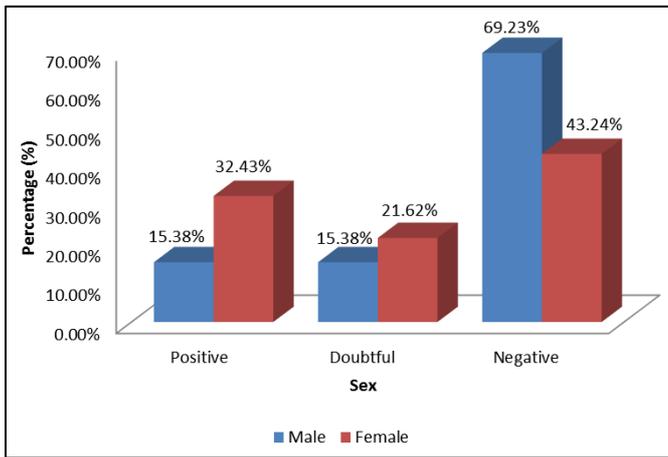


Fig 3: Sex-wise prevalence of bovine tuberculosis

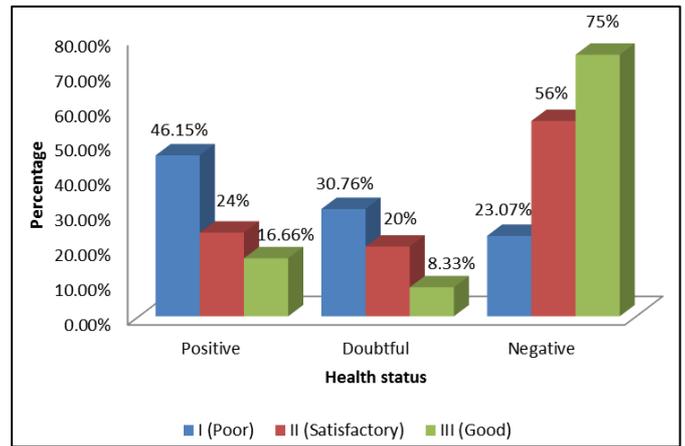


Fig 4: Health status-wise prevalence of bovine tuberculosis

Table 1: prevalence of bovine tuberculosis based on tuberculin skin test

Total nos. of tested animal	Positive	Doubtful	Negative
50	14 (28%)	10 (20%)	26 (52%)

Table 2: Age-wise Prevalence of bovine tuberculosis

Group	Age (Years)	Total Nos.	Positive	Doubtful	Negative
I	6 months - 3	19	4(21.05%)	0(00%)	15(78.94%)
II	3-6	14	4(28.57%)	4(28.57%)	6(42.85%)
III	6-9	15	6(40%)	4(26.66%)	5(33.33%)
IV	9-12	2	0(00%)	2(100%)	0(00%)
Total		50	14	10	26

Table 3: Breed-wise prevalence of bovine tuberculosis

Breed/ Genetic group	Total nos.	Positive	Doubtful	Negative
Holstein-Friesian	14	6(42.85%)	2(14.28%)	6(42.85%)
Jersey	27	8(29.62%)	8(29.62%)	11(40.74%)
Indigenous	9	0(00%)	0(00%)	9(100%)
Total	50	14	10	26

Table 4: SEX-wise prevalence of bovine tuberculosis

Sex	Total Nos.	Positive	Doubtful	Negative
Male	13	2(15.38%)	2(15.38%)	9(69.23%)
Female	37	12(32.43%)	8(21.62%)	17(43.24%)
Total	50	14	10	26

Table 5: Health status-wise prevalence of bovine tuberculosis

Group	Particulars	Total nos.	Positive	Doubtful	Negative
I	Poor	13	6 (46.15%)	4 (30.76%)	3 (23.07%)
II	Satisfactory	25	6 (24%)	5 (20%)	14 (56%)
III	Good	12	2 (16.66%)	1 (8.33%)	9 (75%)
Total		50	14	10	26

Table 6: Breed/ genetic group-wise prevalence of bovine tuberculosis in slaughtered animals

Breed/ Genetic Group	Total nos. of animals examined	No. of animal samples collected	Nos. tuberculosis positive animals
Crossbred	255	13	8 (3.13%)
Indigenous	669	20	12 (1.79%)
Total	924	33	20 (2.16%)

Table 7: sex-wise prevalence of BTB in slaughtered animals

Breed/ Genetic Group	Total	Sex	
		Male	Female
Crossbred	8	2 (25%)	6 (75%)
Local	12	6 (50%)	6 (50%)
Total	20	8 (40%)	12 (60%)

Summary and Conclusion

In the present study, the prevalence of Bovine Tuberculosis (BTB) on the basis of Tuberculin Skin Test (TST) was recorded as 28 percent. The higher rate in older animals may be due to prolonged closed confinement with positive reactors. Prevalence of BTB in crossbred animals may be high production potential of crossbreed animals and birth to a considerable number of young one, which is directly related to degree of stress on animals. Higher prevalence in female because they housed in herd and likelihood of spread of the disease increases as the healthy animals are held in close confinement with the infected ones for a long period. Lower level of protective immunity in poor health grouped animals might be the cause of higher prevalence rate. Prevalence of BTB in slaughtered animals indicated a potential risk of spreading of the disease to human and other animals.

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