Prevalence ofTuberculosis in Goat at Dinajpur District of Bangladesh

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Abstract
Tuberculosis of goat is a zoonotic, highly infectious bacterial diseases caused by Mycobacterium tuberculosis complex subsp. caprae. The duration of the study was fromJanuary to June, 2017. According to this study there was no significant different of the disease between male and female (p=0.746). The highest number of positive TB was found in female goats that are equivalent to 7.14%, while Inclusive was 11.43% and the negative was 81.43%. In terms of males the positive rate was 4.44%, the inclusive test was 8.89% whereas the negative case was 86.67%. In this study showed there was non-significant difference of the disease among goat breeds (P=0.215) as demonstrated in (table 4.2). The highest prevalence rate11.42% was recorded in the breed of Jamunapari followed by Cross breed 6.90% in spite of the lowest prevalence 2.85% was found in indigenous breed. On the other result of the present that the highest number of positive TB in goat 10.00% was found in Mirjapur while the lowest positive rate (3.08%) was noted in Nayanpur. According to the previous history of tuberculosis and PPD test performed, most of the farmers 102 88.7% reported that there was no previous history of tuberculosis and 91(79.1%) of the farmers stated that there was no PPD test performed although13 (11.3%) of the farmers reported that there was previous history of tuberculosis 24 (20.9%) of them replied that there was PPD test performed. According to the positive case, females were higher and more susceptible than males. So the current investigation should be concluded that female goats were higher prevalence of tuberculosis than the males, body conditions of the studied goats were in poor condition, poor management practice such as housing system, nutrition and ventilation.
Keywords:*Prevalence, Tuberculosis, Goat, tuberculin, Dinajpur, Bangladesh*

I.   Introduction

Tuberculosis (TB) in the domestic goat (*Capra hircus*), mainly caused by *Mycobacterium caprae*[1], is an endemic disease in the Arabian berianPeninsula. *M. caprae* is widespread in goat herds and is an emerging infectious agent in cattle[2,3].*Mycobacterium* belongs to the Kingdom of Bacteria; Phylum of Actinobacteria; Order of Actinomycetals; Family of *Mycobacteria*ceae[4,5]. They are grouped in the suprageneric rank of actinomycetes that, usually, have a high content(61–71%) of guanine plus cytosine (G+C) in the genomic deoxyribonucleic acid (DNA), and a high lipid content in the wall, probably the highest among all bacteria[6]. The *Mycobacteria* comprise more than 80 species, within the complex ofrelated and poorly studied organisms[7]. Most of them live and replicate freely in natural ecosystems and seldom, if ever, cause disease. Only a few*Mycobacteria* become successful pathogen of higher vertebrates, preferentially inhabiting the intracellular environment of mononuclear phagocytes. The host-dependent *Mycobacteria* that cannot replicate in the environment are *M. leprae, M. lepraemurium, M. avium subsp. paratuberclosis*, and the members of the *M. tuberculosis* complex[6].Tuberculosis is an infectious disease with distinctive clinical and pathological features. Tuberculosis occurs in humans and many animal species including species of animals used for production of food (milk or meat) for human consumption (cattle, sheep, goats and deer). The principal microorganism associated with human tuberculosis is *M. tuberculosis. M. bovis* is the causative agent of tuberculosis in animals used forproduction of food and accounts for a relatively small proportion of human cases. In a proportion of human or animal hosts infected with these microorganisms, the infection may ultimately progress to severe systemic illness. Pulmonary disease is the classical feature and ultimately the disease may progress to death of the host if untreated. The classical pathological feature of the disease in humans is the caseating granuloma. This is an organized aggregation of macrophages surrounding an area of caseous necrosis (Food Safety Authority of

Ireland[8].*Mycobacterium bovis* and *M. caprae* are primarily a cattle pathogen; however, they have been isolated from goats, camels, horses, pigs, dogs, and cats amongst other animals including human being[9].Houlihan *et al.* (2008), carry out the World Organization for Animal Health OIE published guidelines and standards for BTB testing in cattle, but does not have specific guidelines for small ruminants (sheep and goat)[10]. BTB is increasingly reported in small ruminants in European countries, and although usually lowin prevalence it is nonetheless associated with severe pathology. This disease has socio-economic and public health importance and is of great significance to international trade of animals and animal products[11].TB in goat is caused by members of *Mycobacterium tuberculosis* complex predominantly by *Mycobacterium bovis* and *Mycobacterium caprae[12],* and few caused by *Mycobacterium tuberculosis* schopp[13]. Tuberculosis is an important disease in many countries including Bangladesh. Tuberculosis in cattle and other domestic animals is caused by two members of *Mycobacterium tuberculosis* complex (*MTC*): *M. bovis* and *M. caprae[14].*In the region of Dinajpur district, no such study was performed to investigate the prevalence of Goat tuberculosis under these circumstances, it is necessary to explore a study to detect the prevalence of TB infection in goat. However, the present study was conduct with aim and fulfillment of the following objectives:

 To determine the prevalence of GTB in the villages of SadarUpazilla of Dinajpur.
 To find out the tuberculin positive test in relation to sex, breed of goat at Dinajpur district.
 To evaluate the spread of the disease in endemic area.
 To observe the management practice of goat in that area.

II. Material and Methods

Experimental animals, areas duration and experimental protocol

This study was design to focus the prevalence of *Caprine* tuberculosis in SadarUpazilla farm and villages in Dinajpur distract (Nayanpur and Mirjapur). The experiment was performed in the Department of Pathology and Parasitology Faculty of Veterinary and Animal Sciences, Hajee Mohammed Danesh Science and Technology University (HSTU), Dinajpur, Bangladesh, the duration of the study was January to June, 2017

Selection and grouping of animals

To determine the prevalence of goat tuberculosis infection in 115 goats from different housekeeping goat in Dinajpur district was selected using CFT test. Of the 115 goat 45 male and 70 females, according to area sex, and breed other managemental information was record by questionnaire.

Figure no 1 Experimental layout
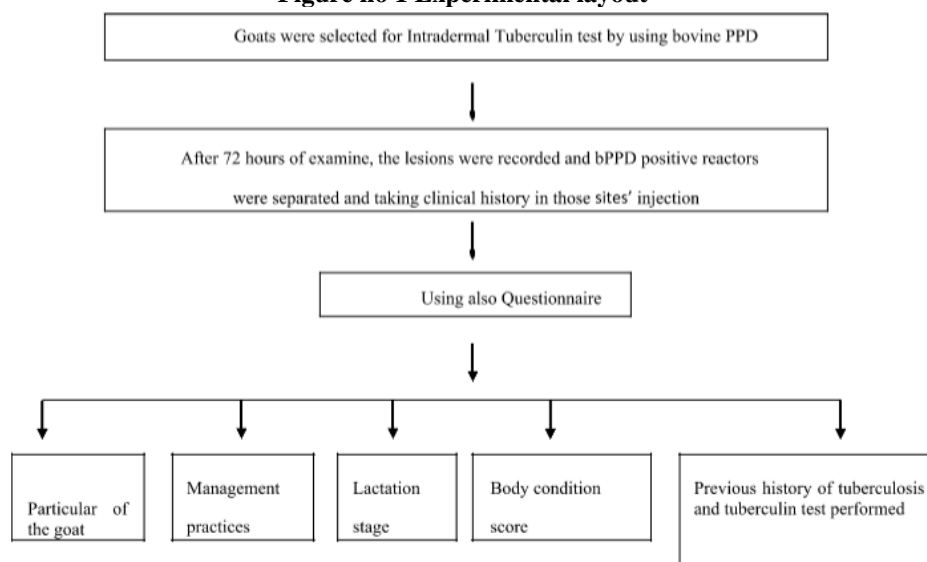
Test procedure

The test used is the single intradermal injection of bovine tuberculin purified proteinderivative (PPD) (SID test), commonly known as the tuberculin skin test, which is also used to screen cattle for TB.

Tuberculin is a mixture of proteins extracted from cultures of the bacterium that causes

TB. The skin test involves injecting a small amount of ‗bovine 'tuberculin derived from

*M. bovis*and ‗avian 'tuberculin derived from *M. avium* (the bacterium that causes tuberculosis in birds) into the deep layer of the skin.

The skin is first clipped and the thickness of the skin fold measured in millimetres using

special callipersbefore the tuberculin 's is injected in the middle of the neck 0.1 ml. After 72 + 4 hours, the Veterinary surgeon returns and re-measures the skin at the site of the injections to determine if the animal is classified as a reactor, inconclusive or pass.

Table 1: Schedule and procedure of inoculation:

Test	Reagent	Site	Rout	Dose	Time of observation post incubation
Single intradermal injection test	bPPD	Skin fold	i/d	0.1 ml	72

Reading of the results of inoculations
In CFT test the reading was take 72 hours after the inoculation. The positive tuberculin reaction was evident from an inflammation of sensitive nature at the point of inoculation.
The swelling was either soft and edematous or somewhat hard in nature.
The results were interpreted according to OIE standards[15]

If the reaction is ≥ 4.0 mm greater than the test is considered reactor.
b. If the reaction is between 3.0 and < 4.0 mm than the test is considered suspect.
c. If the reaction is < 3.0 mm than the test is considered negative.
The swelling was felt and estimate by palpation at the site of inoculation, while animal expressed the sign of pain.

III. Results

A Purified Protein Derivative (PPD) Skin Test
According to this study there was no significant different of the disease between male and female (p=0.746) (Table 1). The highest number of positive TB was found in female goats that are equivalent to 7.14%, while Inclusive was 11.43% and the negative was 81.43%. In terms of males the positive rate was 4.44%, the inclusive test was 8.89% whereas the negative case was 86.67%.

Table 2: Purified Protein Derivative (PPD) Skin Test based on sex

Sex	No. of Tested	Positive cases		Inclusive cases		Negative cases		Chi-Square
		No. of Positive	Percentage (%)	No. of goat Inclusive	Percentage (%)	No. of goat Negative	Percentage (%)	
Male	45	2	4.44	4	8.89	39	86.67	
Female	70	5	7.14	8	11.43	57	81.43	0.587(0.746)
Total	115	7	11.58	12	20.32	96		

Purified Protein Derivative (PPD) Skin Test based on breed
According to this study there was non-significant difference of the disease among goat breeds (P= 0.215) as demonstrated in (table 4.2). The highest prevalence rate (11.42%) was recorded in the breed of Jamunapari followed by Black Bengal breed (6.90%) in spite of the lowest prevalence (2.85%) was found in indigenous breed.

Table 3: Purified Protein Derivative (PPD) Skin Test based on breed

Breed	No. of observed	Positive cases		Inclusive cases		Negative cases		Chi-Square
		No.	(%)	No.	(%)	No.	(%)	
Black bengal	51	1	2.85	3	0.06%	47	97.09	
Jamunapari	35	4	11.42	5	14.29	26	74.29	5.797(0.215
Cross breed	29	2	6.90	4	13.79	23	79.31	

Purified Protein Derivative (PPD) Skin Test based on Area

According to this study there was no significant different of the disease between Nayanpur and Mirjapur (p=0.126) (Table 2). The highest number of positive TB in goats (10.00%) was found in Mirjapur in contrast, the lowest positive rate (3.08%) was noted in Nayanpur.

Table 4: Effect of T.B in goats in the study Area

Area	No. of observed	No. of positive		No. of negative		Chi-square
		No.	%	No.	%	
Nayanpur	65	2	3.08	63	96.92	2.370(0.126)
Mirjapur	50	5	10.00	45	90.00	

Previous history of tuberculosis and PPD test performed: According to the previous history of tuberculosis and PPD test performed, most of the farmers 102 (88.7%) reported that there was no previous history of tuberculosis and 91(79.1%) of the farmers stated that there was no PPD test performed although13 (11.3%) of the farmers reported that there was previous history of tuberculosis and 24(20.9%) of them replied that there was PPD test performed. This may be that there was no prevalence of tuberculosis in this area or may be no accurate examination done on this area.

Table 5: Pervious history of tuberculosis and PPD test performed

Characteristics	No. TB in Previous History	Percentage (%)	PPD Test Performed Previously	Percentage (%)
Yes	13	11.3	24	20.9
No	102	88.7	91	79.1
Total	115	100.0	115	100.0

Housing system

Housing is one of the most important for the animal, which protect against predators, temperature, and other factors. According to this study most of the animal owners practice Semi-intensive system which was 87 out 115 that is equivalent to 75.7 %, while 21 farmers representing 18.3% of the study used other system for

goat housing, and finally 7 farmers that is 6.1% used for intensive system. This study showed that most of farmers used semi-intensive system because it cheaper than the other systems and needs less labor.

Table 6: Housing System

Characteristics	Frequency	Percent	Cumulative Percent
Intensive	7	6.1	6.1
Semi-Intensive	87	75.7	81.7
Other	21	18.3	12.2
Total	115	100.0	100.0

Housing floor condition

Housing floor is very important for goat farming business, for staying at night, security, preventing them from adverse climate, cold, sunlight. According to the housing floor system, the majority of the farmers 41 (35.7%) used for concrete in floor condition but 29 (25.2%) of the farmers under study used cage and 26 (22.6%) of them used other condition. However, 19 farmers which was (16.5%) of the study used mud (over the ground). The data showed that most of the farmers under this study used concrete for flooring system and it is easy to clean although it is expensive compare to other systems followed by cage system.

Table 7: Housing Floor Condition

Characteristics	Frequency	Percentage (%)	Cumulative Percent
Mud	41	35.7	81.7
Concrete	19	16.5	6.1
Cage	29	25.2	100.0
Other	26	22.6	
Total	115	100.0	

Ventilation Facilities

Good ventilation is an important part of any livestock housing system, the collected data from the farm owners exhibited that most of them 93 (80.9%) practiced poor ventilation facilities for animal herd while 22 (19.1%) adopted good ventilation. This may be poor economic condition of the farmers who are not able to build houses with good ventilation.

Table 8: Ventilation Facility

Characteristics	Frequency	Percent	Cumulative Percent
Good	22	19.1	19.1
Poor	93	80.9	100.0
Total	115	100.0	

Lactation Stage for goats

The examined animal included different lactation period, 34 (29.6%) Out of 115 are lactating stage while28 (24.3%) non-lactating period and remaining others are Heifers 53 (46.1%).

Table 9: Lactation Stage for goats

Characteristics	Frequency	Percent	Cumulative Percent
Lactating	34	29.6	29.6
Non Lactating	28	24.3	53.9
Heifer	53	46.1	100.0
Total	115	100.0	

Body Condition Score

Body conditionscore has shown the animal condition weather normal condition or abnormal condition, so the studied animal showed that the highest number of the examined animal which is 57 (49.6%) are poor body condition whereas 37 (32.2%) medium condition and 21(18.3%) are good body condition. Nearly half of the studied animals were poor condition and this may be poor healthy condition of the goats.

Table 10: Body Condition Score

Level	Frequency	Percent	Cumulative Percent
Poor	57	49.6	49.6
Medium	37	32.2	81.7
Good	21	18.3	100.0
Total	115	100.0	

IV. Discussion

The current study presented that the overall prevalence rate of *M. caprae* tuberculosis was (11.58%). My result is higher than the result of Pignata*et al.,* (2009) who reported the prevalence of tuberculosis in goats was 0.47% in Brazil [16]. while another study reported 0.5% in goats[17]. Rahman *et al.* (2013) also undertook a study to investigate the occurrence of bovine and avian tuberculosis in sheep and goat population in Bangladesh. They found that the percentage of responders to CFT test in sheep and goat were 9.15% and 1.29% respectively. And the overall percentages of reactors to CCT test in sheep and goats were 1.46% and 1.29% respectively[18].In this study there was no significant different of the disease between male and female (p=0.746). The highest number of positive TB was found in female goats that are equivalent to 7.14%, while Inclusive was 11.43% and the negative was 81.43%. In terms of males the positive rate was 4.44%, the inclusive test was 8.89% whereas the negative case was 86.67%. Offiong*et al.* (2014) conducted a study, they found that female goats had the highest level of infection with TB with number of 68 (53.1%) whiles the male 60 (46.9%)[19]. Female animals had higher infection were found to be mostly infected which may be due to some physiologic conditions such as pregnancy, lactation etc. that rendered the animal vulnerable to disease conditions[20].According to this study there was non-significant difference of the disease among goat breeds (P= 0.215) as demonstrated in (table 4.2). The highest prevalence rate (11.42%) was recorded in the breed of Jamunapari followed by cross breed (6.90%) in spite of the lowest prevalence (2.85%) was found in inigenous breed. Jamunapari (2.85%) breed of goat had 3.5 times higher percentage of reactors as compared to indigenous breed (0.83%). According to the previous history of tuberculosis and PPD test performed, it was found in this study that most of the farmers 102 (88.7%) reported that there was no previous history of tuberculosis and 91(79.1%) of them stated that there was no PPD test performed although 13(11.3%) of the farmers reported that there was previous history of tuberculosis and 24 (20.9%) of them replied that there was PPD test performed. This may be that there was no prevalence of tuberculosis in this area or may be no accurate examination done on this area. conducted a study and found 9.6% of prevalence of tuberculosis in Ethiopia [21]. The presently recorded prevalence was almost similar to previous studies[22,23]

V. Conclusion and recommendations

Tuberculosis is zoonotic high contagious diseases caused by *Mycobacterium tuberculosis* complex (MTC or MTBC) occurs both human animals, so the current investigation should be concluded that female goats were higher prevalence of tuberculosis than the males, body conditions of the studied goats were in poor

condition, poor management practice such as housing system, nutrition and ventilation and it is also recommended the following:

- To identify and diagnosis detail about the specific strain of goat tuberculosis.
- To make proper management practices such as housing, ventilation, and nutrition
- To separate infected and non-infected animal.
- To determine further investigation on Tuberculosis strain to get the most suitable treatment.
- To give relevant treatment to the goats affected by tuberculosis.

Acknowledgement

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