Incidence of Tuberculosis in and around Banglore

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Abstract

Incidence of Tuberculosis is higher in developing countries due to absence of National control and Eradication programme. Incidence is higher due to close contact with infected animal or human being. In the present study, 2668 bovines were screened for tuberculosis by single intradermal test from 15 different organized government and private farm. Currently, the SID test is used worldwide to determine whether an animal is sensitized to Mycobacterial antigens or not and the test is approved by OIE. Out of which, incidence of 2.89% in HF cross breeds, 0.69% in Jersey cross bred animals and none were shown reactor to Single Intradermal test in Indigenous animals. The higher incidence of 3.26% was found in female and 0.48% found in male. The calves which were below two year of age were found 1.56% reactor.

Keywords: Incidence, Eradication programme, Intra dermal test, Zoonosis.

Introduction

Tuberculosis is one of the most widespread common chronic infectious and debilitating bacterial disease due to Mycobacterium tuberculosis, leading cause of death due to a single infectious agent among adults in the world, but an unknown proportion of cases are due to Mycobacterium bovis and M.africanum has been prevalent since ancient times which is. clinically indistinguishable (Buddle et al., 2005. Hein et al, 2003 and Orme, 2003).

There is considerable and continuing public health significance of M.bovis infection in humans and animals and the disease has emerged as a major zoonotic problem in many countries. The bacterium can be discharged through saliva, milk and other discharges of infected animals. Young animals and humans can contract the disease either by drinking raw milk from infected dams or due to close proximity with the infected animal. Man can contract tuberculosis from different animal species and equally, can transmit the infection to different animals. India possesses enormously large bovine population comprising more than 200 million cattle and 80 million buffaloes. The incidence of disease is not only higher in the developing nations but in the absence of any national control and eradication program, is increasing in most of the countries worldwide.

Of the total Asian cattle and buffalo populations, 94% of the cattle and more than 99% of the buffalo populations in Asia are either only partly controlled for bovine TB or not controlled at all. Thus, 94% of the human population lives in countries where cattle and buffaloes undergo no control or only limited control for bovine TB. Therefore, the global incidence of TB is greatly underestimated. In 2005, 3.3 million cases were reported to the Global tuberculosis Programme of WHO, whereas a more likely number is 8.8 million. The total number of new cases will double by the year 2010, because of the HIV epidemic, while demographic factors, such as population growth and changes in population structure, will largely account for the expected increase in TB incidence worldwide.

M.tuberculosis have been isolated from 17 tuberculin reacting cattle in 10 herd in Great Britain (Lesslie,1960; Lessilie and Birn,1967). In all of the herds, a history of an infected person working in contact with the cattle was confirmed. Ameni et al., (2006), Buddle et al., (2005) and Buchan et al., (1990) have reported different cases where cows have been infected with tubercle from human source. Taneja (1955) carried out the double intradermal tuberculin test in 102 Haryana breed of cattle of Agrova Goshala in Punjab and observed that the animal in the age group of 1-3 years showed an incidence of less than eight percent, where as four years and older age group animals had an incidence of more than 45%. Nandy, (1958) found 17%positive reactors in calcutta , Basu et al., (1966) reported 2.12% among milch cattle from Westbengal, Nagaraja et al. (1973) reported 31.42% of tuberculin reactors from Karnataka, Prakash (1995)

Table-1. Single intradermal test carried out in cattle farms and Breed wise prevalence of tuberculosis

Name of the Farm	Overall Incidnece			Jersey×			HF×			Indigenous		
	No.of animal Tested	Positive reactors	% of reactors	No.of animal Tested	Positive reactors	% of reactors	No.of animal Tested	Positive reactors	% of reactors	No.of animal Tested	Positive reactors	% of reactors
FARM- A	40	4	10.00	2	1	50	36	3	8.34	2	0	0
FARM- B	180	6	3.34	53	0	0	124	6	4.84	3	0	0
FARM- C	27	6	22.00	8	2	25	18	4	22.23	1	0	0
FARM- D	21	1	4.76	6	0	0	13	1	7.69	2	0	0
FARM- E	145	0	0.00	38	0	0	104	0	0	3	0	0
FARM- F	255	43	16.86	38	1	2.64	214	42	19.63	106	0	0
FARM- G	44	0	0.00	5	1	20	437	2	0.46	1	0	0
FARM- H	145	1	0.69	18	0	0	126	1	0.79	1	0	0
FARM- I	130	0	0.00	8	0	0	121	0	0	1	0	0
FARM- J	187	0	0.00	212	1	0.48	141	0	0	29	0	0
FARM- K	65	0	0.00	14	0	0	51	0	0	0	0	0
FARM- L	92	0	0.00	26	0	0	63	0	0	3	0	0
FARM- M	235	0	0.00	145	0	0	72	0	0	18	0	0
FARM- N	347	0	0.00	133	0	0	148	0	0	66	0	0
FARM- O	755	3	0.41	17	0	0	38	0	0	3	0	0
TOTAL	2668	64	2.41	723	5	0.69	2106	59	2.81	239	Nil	Nil

tested reported 14.83% incidence in and around Bangalore and Lall et al., (1969) reported incidence of 1.93% and 6.39% among cattle and buffaloes from Maharastra, Shrikrishna et al., (2006) reported a high incidence of 9% of tuberculosis in and around Bangalore especially in Holstein cross breed than local breeds such as Hallikar, Amrutmahal and Deoni.

Moussou and Mantoux (1908) were the first to describe the intradermal test in cattle using caudal fold site. The skin of the neck was considered to be more sensitive than the caudal fold (Patterson,1959, Suther et al., 1974). Pakhomov (1986) reported that injection of 0.2ml (10,000 units) bovine PPD tuberculin on five occasions at a week apart failed to render sensitive to tuberculin. Ovdienko et al. (1987) reported that the best procedure of tubercullin testing was a single injection of tuberculin and recording the result after 72 hrs by measuring the skin thickness.

Materials and Methods

A preliminary study was undertaken to study the incidence of bovine TB by using single intradermal test in and around Bangalore in organized Government and private cattle farms. The test was carried out by using the PPD in the neck region as specified. The skin fold after shaving the marked area was measured using Vernier calipers prior to injection. The site selected was seven cms in the middle of the neck. Using tubercullin syringe and needle, 0.1 ml of tuberculin (200 International Units or 100ug) was injected into the dermis of skin. Then the thickness of the skin was measured 72 hrs after the injection. 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 reaction. A total of 2668 cattle from 15 government and private cattle herd in and around Bangalore were used. Purified protein derivative (PPD) prepared from Mycobacterium bovis (M.bovis) strain AN-5 containing 1mg PPD per ml (2000 international units/ml) was obtained from Indian Veterinary Research Institute, Izatnagar, UP.

Results and Discussion

The SID tuberculin test used for diagnosis of Tuberculosis was based on Type-IV immune reaction to the purified protein derivative (PPD) when injected intradermally to the animal. Currently, the SID test is used worldwide to determine whether an animal is sensitized to mycobacterial antigens or not and the test is approved by OIE. A total of 2668 animals from fifteen private and government dairy farms were screened by SID test, of which 64 showed positive reaction indicating the overall percentage of incidence at 2.4% (Table.1). Among these, a private farm (Herd-F) with 255 animals, 43 animals showed as positive reactors corresponding to 16.86%. In Farm-C (Govt), where only 21 animals were maintained, 6 animals were positive which corresponded to incidence of 22 percent, and was the highest among all the farms screened. In Farm-E & F, which were private well maintain farms, out of 145 animals screened, none of the animals were found positive for the test. No reactors were detected in the remaining Govt farms except in Farm-A and O (Table.1) wherein 4 and 3 animals were positive out of 40 and 755 respectively. Further, a detailed analysis of results of SID test (Table.1 & 2) revealed that, out of 1716 female animals screened, 56 showed positive reaction when compared to 6 animals out of 620 male animals screened (Table.2). Irrespective of the sex, 5 calves below the age group of below one year were positive out of 332 screened. Similarly, among different breeds (Table.1), out of 2106 Holstein

Table-2. Table showing the prevalence of tuberculosis with respect to sex of the animal tested.

Name Of the Farm	Male			Female			Calf		
	No. Of tested	No. Of reactors	% of reactors	No. Of tested	No. Of reactors	% of reactors	No. Of tested	No. Of reactors	% of reactors
FARM- A	4	0	0	34	4	11.2	2	0	0
FARM- B	3	0	0	161	5	3.10	16	1	6.25
FARM- C	0	0	0	22	5	22.7	5	1	20
FARM- D	2	0	0	16	1	6.25	3	0	0
FARM- E	2	0	0	126	0	0	17	0	0
FARM- F	16	3	18.8	192	37	19.3	47	3	6.39
FARM- G	1	0	0	38	0	0	5	0	0
FARM- H	0	0	0	132	1	0.76	13	0	0
FARM- I	54	0	0	68	0	0	8	0	0
FARM- J	155	0	0	0	0	0	32	0	0
FARM- K	0	0	0	49	0	0	16	0	0
FARM- L	10	0	0	55	0	0	27	0	0
FARM- M	117	0	0	59	0	0	59	0	0
FARM- N	194	0	0	122	0	0	31	0	0
FARM- O	62	0	0	642	3	0.47	51	0	0
TOTAL	620	3	0.48	1716	56	3.26	332	5	1.56

crossbred animals screened, 59 were positive, whereas, out of 723 Jersy crossbred animals, only 5 were positive and out of 239 local breeds of animals namely Hallikar, Amrutmahal and others, none were positive. Indicating, high prevalence of disease was noticed only in HF crossbred animals.

The SID test is considered to be a reliable test in the cattle but problems associated with the intradermal tuberculin test, are the interval of testing and the cost factor. The animals have to be immobilized twice therefore making the test expensive and the test can only be done once every 3–4 months. Various workers have reported the incidence of tuberculosis in bovines based on tuberculin test in different parts of the country (Taneja, 1955; Basu et al., 1966; Lall et al 1969; Guha and Sarkar 1970; Nagaraj et al.,1973; Kulshreshta et al.,1980; Habibi 1986; Prakash 1995 and Ashwathanarayana, 1997).

In the present study, the response to tuberculin skin test to B-PPD was lower in local cattle (B.tarus indicus), than compare to Jersy cross bred cattle and Holstein cross cattle. At the same time, the response to skin test is also lower or nil in males than to calves and females. The high reaction was noticed in milch animals than other animals. Similar results were also reported by Ashwatnarayan et al., 1997 and Srikrishna isloor et al., 2006. A likely explanation could be that a higher proportion of Holstein cattle in India suffer from advanced disease. Since the test-and-slaughter-based control method is not applied in India, the disease could progress longer with a greater proportion of animals reaching a more severe disease status. Similarly, Ameni et al., 2006. Reports that, The level of IFN and intradermal tuberculin test to the mycobacterial antigens (PPD-B) was significantly lower in Aris cattle, a Zebu B.tarus indicus breed, than in Holstein cattle (*B.tarus tarus*) kept under the same husbandry conditions. The difference tuberculin skin test in Zebu cattle maintained under identical condition could be due to the different BoLA alleles in the two breeds affecting the recognition of mycobacterial antigens. It's also noteworthy that the response to skin test responses observed in Holstein cows in Ethiopia were considerably lower than those reported for Holstein cattle in United Kingdpm, Ireland, or New Zealand (Buddle et al., 2003 and Vordermeier. et al., 2002).

It can be speculated that animals with dormant infections fail to respond to PPD stimulation or that repeated testing of animals with PPD increase the number of animals failing to respond (Thoen and Bloom, 1995). However, there is also the possibility of a false positive reaction, especially in the animal with a negative M. bovis culture result. Francis, et al., (1978) reported on the sensitivity and specificity of the various tuberculin tests using bovine PPD and other tuberculins. In addition, multiple parasitic infections which prevail in the study population (personal observation), could also modulate skin test responses to mycobacterial antigens. For example, a previous study by Ameni et al., 2000 in Ethiopia showed that infection with either *Fasciola sp*. Or *Stronglus* sp. significantly reduced skin indurations in response to bovine PPD in *M.bovis*-infected heifers compared to *M.bovis*-infected heifers that had been dewormed before skin testing.

The intradermal tuberculin test was more successful in detecting true bovine reactors than when bovine PPD was used alone (Bengis, Skukuza 2001). Due to the presence of other mycobacterial species in the environment, most cattle show some reaction to the intradermal PPD injections. It is therefore important to differentiate between true bovine reactors and animals that react to the avian tuberculin as well. However, the intradermal tuberculin test was still confusing at times due to false positive as well as false negative reactions.

Menzies & Neill (2000) stated that *M. bovis* can only survive in the environment for a few weeks at most and that the mycobacterium is very rarely isolated from soil and pasture samples. Cattle-to-cattle transmission through naturally contaminated pasture also failed to cause disease. It can therefore be concluded that direct contact of an infected animal with a healthy animal is needed for the disease to be transmitted, hence the term nose-to-nose disease.

In addition to breed, cattle husbandry was found to be an important factor affecting the intensity and distribution of the pathology of bovine TB, as well as the strength of the antigen specific skin reaction. As it was recorded in present study that in few farm (private farm) considerably higher response to skin test were found. The severity of bovine tuberculosis was significantly greater in cattle kept indoors at a higher population density than in those kept in a pasture. Similar findings were recorded by Ameni et al., 2006. and Rodostitis. et al.,1994. As they reviewed that this is because, housing predisposes cattle to tuberculosis, the closer animals are packed together, the greater the chance that Tuberculosis will be transmitted. Apart from physical factors like close contact facilitating the transmission of ineffective aerosols between animals, it is also possible that stress caused by overcrowding or nutritional differences between housed and pastured animals contributed to the sever disease found in housed Holstein cattle.

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