JOURNAL OF FOODBORNE AND ZOONOTIC DISEASES
Journal homepage: www.jakraya.com/journal/jfzd

RESEARCH ARTICLE

Sero-prevalence of Brucellosis among Veterinarians and Livestock in Junagadh Region of Gujarat State

M. Suman Kumar[a*], S. H. Sindhi[b], H. Dhanze[a] and B. S. Mathapati[b]

[a]Division of Veterinary Public Health, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly – 243122 (U.P.), India.
[b]College of Veterinary Science and Animal Husbandry, Junagadh Agricultural University, Junagadh-362001, Gujarat, India.

*Corresponding Author:

M. Suman Kumar

Email: sumanvph@gmail.com

Received: 03/06/2015

Revised: 21/06/2015

Accepted: 24/06/2015

Abstract

Brucellosis is one of the most wide-spread zoonoses and is believed to be a re-emerging disease affecting more than half a million humans each year. The disease is common among ruminants, which act as major reservoirs of the organism. The present study was carried out to find out the sero-prevalence of Brucellosis amongst veterinarians and animals in and around Junagadh district of Gujarat state. All the serum samples were initially screened by Rose-bengal plate test (RBPT) and further analyzed by standard tube agglutination test (STAT). A titre of more than 80 IU/ml or greater in human serum samples, 40 IU/ml or greater in cattle serum samples and 20 IU/ml or above in goat serum samples were considered as serologically positive. A total of 75 serum samples were collected from veterinarians working in the region. The animal serum samples comprised of 168 cattle sera samples and 45 sheep sera samples. The overall prevalence by RBPT and STAT were 9.3% and 5.3% in human samples and, 7.9% and 7% in animals, respectively. Since this infection is a proven occupation-related disease, extension education campaigns are needed to raise awareness on the risk to veterinarians. Besides, regular surveillance of the disease needs to be undertaken at local and national level.

Keywords: Brucellosis, Sero-prevalence, RBPT, STAT, Occupation-related disease.

1. Introduction

Brucellosis is one of world's major zoonoses accounting for enormous economic losses and significant human morbidity in endemic areas. The disease has been discussed since ancient times and proof exists in the writings of Hippocrates in 450 BC. Brucellosis was first described in the 19th century when J. A. Marston called it as Mediterranean gastric remittent fever in 1861 from his base in Malta (Marston, 1861). Sir David Bruce described the cause of the disease in 1887 and reported numerous small coccal organisms in stained sections of spleen from a fatally infected soldier. The relationship between contagious bovine brucellosis and human brucellosis was confirmed by Meyer and Shaw in 1920. In India, the presence of brucellosis was first established early in the previous century and since then reported from almost all states of the country (Renukaradhya *et al*., 2002).

Animal brucellosis is endemic worldwide and bovine brucellosis, caused by *B. abortus*, remains the most widespread form in animals. Brucellosis causes considerable economic losses through reduced productivity, abortions and weak offspring of livestock, which is a major hurdle for trade and export. Human brucellosis is mainly caused by *B. melitensis*, *B. abortus*, *B. suis* and *B. canis*. Although *B. ovis* is widespread in sheep, it has not been identified in humans. *B. melitensis*, which has been widely reported in goats and sheep, is reported to be the principal cause of human brucellosis worldwide and may account for up to 90% of all brucellosis cases. *B. melitensis* type 1 predominates in India (Mantur *et al*. 2006). The infective dose of *B. melitensis* is very low (10 organisms). Human brucellosis is traditionally described as a disease of variable manifestations. It is a severely debilitating disease manifesting numerous complications that require prolonged treatment with a combination of antibiotics leading to considerable medical expenses in addition to loss of income due to

reduced working hours. The disease is an occupational hazard for livestock owners, abattoir workers, dairy workers, shepherds, farmers, veterinarians and laboratory workers (Madhavaprasad *et al*., 2014). With the increase in global tourism, brucellosis is emerging as a common imported disease in the developed world (Memish and Balkhy, 2004). The present study was carried out to find out the sero-prevalence of Brucellosis amongst veterinarians and animals in and around Junagadh district of Gujarat state.

2. Materials and Methods

2.1 Sample Collection

A total of 75 serum samples were collected from veterinarians working in and around Saurashtra region of Gujarat state. All the samples were collected after taking a written consent. The animal serum samples comprised of 168 cattle sera and 45 goat sera samples. Approx. 10 ml blood was collected in a sterile serum tube (BD Vacutainer®) and serum was separated by centrifugation at 3500 rpm for 10 min. The serum samples were stored at -20^{o}C till further use.

2.2 Serological Tests

2.2.1 Rose Bengal Plate Test (RBPT)

The standard technique was carried out and results interpreted as described by Alton *et al*. (1975). *B. abortus* S99 colored antigen procured from Institute for Veterinary Preventive Medicine (IVPM), Ranipet, Vellore, India, was used in the assay. Formation of agglutinate within 4 min with antigen was recorded as a positive reaction.

2.2.2 Standard Tube Agglutination Test (STAT)

The samples that were found positive by RBPT were further subjected to standard tube agglutination test (Alton *et al*., 1975) to measure the antibody titres. The Brucella plain antigen used in this assay was procured from the Institute of Veterinary Preventive Medicine (IVPM), Ranipet, Vellore, India. The highest dilution of the serum which showed 50 per cent agglutination was taken as end titre. A titre of more than 80 IU/ml or greater in human serum samples, 40 IU/ml or greater in cattle serum samples and 20 IU/ml or above in goat serum samples were considered as serologically positive.

3. Results and Discussion

Out of the 75 human serum samples tested, 7 (9.3%) were positive by RBPT. These samples were further validated by performing STAT, which revealed that 4 (5.3%) samples were serologically positive for brucellosis. The STAT titres were between 1:80 and 1:640. Mathur (1964) reported 8.5% seroprevalence of brucellosis among dairy personnel in contact with infected animals and isolated *Brucella* from 7 cases. In Gujarat, 8.5% prevalence of *Brucella* agglutinins was recorded in human cases (Panjarathinam and Jhala, 1986). Hemashettar and Patil (1994) found that 24 (8.2%) veterinary workers showed *Brucella* specific antibodies in significant titres. Thakur and Thapliyal (2002) observed a prevalence rate of 4.97% in samples obtained from persons exposed to animals with a markedly higher prevalence of 17.39% among field veterinarians. Mudaliar *et al*. (2003) detected the presence of *Brucella* antibodies in 5.33% of animal handlers of which 4.51% were dairy farm workers and 14.63% were veterinary doctors. High seroprevalence rate was also noted in specific risk groups such as abattoir workers (Chadda *et al*., 2004). Mantur *et al*. (2006) reported brucellosis in 495 adults with a prevalence rate of 1.8% by testing blood samples of 26,948 adults in Bijapur during a period of 16 years from 1988 to 2004. Agasthya *et al*. (2007) reported brucellosis in high risk group individuals with disease prevalence at 41.23% in veterinary inspectors, 30.92% in veterinary assistants, 12.37% in veterinary officers, 6.18% in veterinary supervisors, 6.18 % in group-D workers, 2.06% in shepherds and 1.03% in butchers. In a similar study in Goa, seropositivity of 4.25% and 3.54% was detected by RBPT and SAT, respectively (Pathak *et al*., 2014). The true incidence of human brucellosis in India is not known. It has been estimated that the true incidence may be 25 times higher than the reported incidence due to misdiagnosis and underreporting.

Among the animal serum samples, a total of 168 cattle sera and 45 goat sera samples were screened in the study. The results revealed that 13 (7.7%) and 12 (7.1%) cattle serum samples were positive by RBPT and STAT, respectively. Isloor *et al*. (1998) reported an overall prevalence of 1.9% in cattle. A national survey of bovine brucellosis from 1994-2001 recorded a national average of 5% sero-prevalence of brucellosis in cattle (Renukaradhya *et al*., 2002). This survey indicated a sero-prevalence of 23% in Punjab, 16% in Gujarat and 6.3%, 2.4% and 1.7% in states of Goa, Maharashtra and Andhra Pradesh, respectively. Ghodasara *et al.* (2010) studied prevalence in cattle and buffaloes in Gujarat and reported that RBPT and STAT revealed 11.21% and 16% sero-prevalence in cows and 9.59% and 12.33% in buffalos, respectively. A study on sero-prevalence of brucellosis in slaughter cattle reported a prevalence of 7.74% on performing RBPT (Raghunath Reddy *et al*., 2014). In a study carried out in Buffalos in North Gujarat, Patel *et al*. (2015) reported a prevalence of 40.67%. Although the present

study was restricted to a small geographic area, our findings are in agreement with the above reports.

With a sizable population of sheep and goat in the country, prevalence of brucellosis in small ruminants is significant. The free grazing and movement with frequent mixing of flocks of sheep and goats are the main mode of disease transmission resulting in high prevalence and wide distribution of brucellosis in these animals. In the present study, 45 goat sera samples were examined, which revealed 4 (8.8%) samples positive by RBPT and 3 (6.7%) by STAT. Shome *et al*. (2008) reported an overall prevalence of brucellosis in both sheep and goats as 9.95% and 5.67%, by RBPT and STAT, respectively. The same study reported that the prevalence of the disease was found highest in the state of Gujarat, (26.08% and 17.30%) followed by Karnataka (14.93% and 7.23%) and lowest in Rajasthan (5.53% and 4.11%) by RBPT and STAT, respectively. In another study, Muttannagouda *et al*. (2014) reported a sero-positivity of 10.43% by RBPT and 9.5% by STAT. In a study in North Gujarat, Sadhu *et al.* (2015) reported an overall seroprevalence of brucellosis in small ruminants (sheep and goat) as 11.30% and 11.10%, by RBPT and STAT, respectively. Higher sero-prevalence was found in sheep (14.64% and 14.43%) than in goats (8.15% and 7.96%) by RBPT and STAT. These results show that brucellosis is endemic at lower level in sheep and goats but lesser in prevalence than that in cattle. A wider picture regarding the status of brucellosis in small ruminants in the country can be known through effective sero-monitoring by employing suitable serological tests.

The risk factors such as management practices, population dynamics and biological features largely influence the epidemiology of *Brucella* spp. (Hossaina *et al*., 2014). The prevalence of the infection in domestic animals and veterinarian's calls for public health education to the target groups, along with better understanding of the risk factors, better management practices such as bio-safety, prompt diagnostic services and multisectoral collaboration amongst the medical professionals and veterinarians.

4. Conclusion

Brucellosis is the most widely occurring zoonotic disease worldwide. The presence of this disease in domestic animals and veterinarians reconfirms the occupation related risk of this disease. The knowledge of risk factors and the modes of transmission are vital in control and prevention programmes. An extensive public awareness campaign along with a strict and mandatory animal movement control is needed to rein in this disease. Extension education campaigns are needed to raise awareness on the risk to veterinarians and animal owners. Besides, regular surveillance of the disease needs to be undertaken at local and national level.

References

Agasthya AS, Isloor S and Prabhudas K (2007). Brucellosis in high risk group individuals. *Indian Journal of Medical Microbiology*, 25: 28-31.

Alton GG, Jones LM and Pietz DE (1975). Laboratory techniques in brucellosis. *World Health Organization, Geneva*.

Chadda VS, Soni PK, Gupta A, Gupta BK, Chadda S and Nayak KC (2004). Incidence of brucellosis in arthritis and chronic low back pain in high risk group. *Journal of Association of Physicians of India*, 52: 338.

Ghodasara SN, Roy A and Bhanderi BB (2010). Comparison of Rose Bengal Plate Agglutination, Standard tube agglutination and Indirect ELISA tests for detection of *Brucella* antibodies in cows and buffaloes. *Veterinary World*, 3(2): 61-64.

Hemashettar BM and Patil CS (1991). Brucellosis among practicing veterinarians. *Indian Journal of Medical Microbiology*, 9: 45-47

Hossaina MM, Uddinb MB, Hassan AA, Islam MR and Cho H (2014). Potential risk factors analysis of dairy cattle management against brucellosis. *Veterinary Research International*, 2(4): 96-102.

Isloor S, Renukaradhya GJ and Rajasekhar MA (1998). Serological survey of bovine brucellosis in India. *Revue Scientifique Technique OIE*, 17: 781-785.

Madhavaprasad CB, Bagalakote PS, Karabasanavar NS and Sajjan SA (2014). Strategies for control and eradication of brucellosis from endemic regions and infected herds. *Journal of Foodborne and Zoonotic Diseases*, 2(3): 30-35.

Mantur BG, Akki AS, Mangalgi SS, Patil SV, Gobbur RH and Peerapur BV (2004). Childhood brucellosis – a microbiological, epidemiological and clinical study. *Journal of Tropical Pediatrician*, 50: 153-157.

Mantur BG, Biradar MS, Bidri RC, Mulimani MS, Veerappa, Kariholu P, Patil SB and Mangalgi SS (2006). Protean clinical manifestations and diagnostic challenges of human brucellosis in adults: 16 years' experience in an endemic area. *Journal of Medical Microbiology*, 55: 897-903.

Marston JA (1861). Report on fever (Malta). *Great Britain Army Medical Department Report*, 3: 486.

Memish ZA and Balkhy HH (2004). Brucellosis and International Travel. *Journal of Travel Medicine*, 11: 49-55.

Mudaliar S, Bhore A and Pandit D (2003). Detection of antibodies to Brucella abortus in animal handlers. *Indian Journal of Medical Sciences*, 57: 181-186.

Muttannagouda RB, Veeregowda BM, Shome R, Leena G, Isloor S, Ansar Kamran C, Apsana K and Krithiga N

(2014). Serodiagnosis of brucellosis in cattle and goats in organized farms of Karnataka. *Indian Journal of Comparative Microbiology, Immunology and Infectious Diseases*, 35(1): 30-33.

Panjarathinam R and Jhala CI (1986). Brucellosis in Gujrat state. *Journal of Pathology and Microbiology*, 29: 53-60.

Patel BC, Chauhan, HC, Chandel BS, Dadawala AI and Jain BK (2015). Seroprevalence and Molecular Characterization of *Brucella* spp. in Buffalo from North Gujarat, India. *International Journal of Current Microbiology and Applied Sciences*, 4(4): 174-180.

Pathak AD, Dubal ZB, Doijad S, Raorane A Rodrigues S, Naik R, Naik-Gaonkar S, Kalorey DR, Kurkure NV, Naik R and Barbuddhe SB (2014). Human brucellosis among pyrexia of unknown origin cases and occupationally exposed individuals in Goa Region, India. *Emerging Health Threats Journal*, 7: 23846 - http://dx.doi.org/10.3402/ehtj.v7.23846

Raghunatha Reddy R, Prejit, Sunil B,Vinod VK and Asha K (2014). Seroprevalence of brucellosis in slaughter cattle of Kerala, India. *Journal of Foodborne and Zoonotic Diseases*, 2(2): 27-29.

Renukaradhya GJ, Isloor S and Rajasekhar M (2002). Epidemiology, zoonotic aspects, vaccination and control/eradication of brucellosis in India. *Veterinary Microbiology*, 90: 183-95.

Sadhu DB, Panchasara HH, Chauhan HC, Sutariya DR, Parmar VL, Prajapati HB (2015). Seroprevalence and comparison of different serological tests for brucellosis detection in small ruminants. *Veterinary World*, 8(5): 561-566.

Shome R, Shome BR, Deivanai M, Desai GS, Patil SS, Bhure SK and Prabhudas K (2006). Seroprevalence of brucellosis in small ruminants. *Indian Journal of Comparative Microbiology, Immunology and Infectious Diseases*, 27(1): 13-15.

Thakur SD and Thapliyal DC (2002). Seroprevalence of brucellosis in man. *Journal of Communicable Diseases*, 34: 106-109.