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RESEARCH ARTICLE

SEROEPIDEMIOLOGICAL STUDY OF BRUCELLOSIS IN ANIMALS OF ROHILKHAND REGION, U.P., INDIA AND ITS OCCUPATIONAL SIGNIFICANCE

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ABSTRACT

A total of 1500 blood samples from animals including 725 of cattle, 393 of buffaloes, 180 of goats, 202 of dogs and 100 from veterinarians of Rohilkhand region, U.P., India were screened for seroprevalence of brucellosis. Of the two tests employed, STAT detected comparatively higher percentage of seropositive animals (10.2%) as compared to RBPT (9.5%) and 6 veterinarians by RBPT (6%)and 18 by STAT(18%). Highest seroprevalence was found in cattle (11.6%) followed by buffaloes (10.9%), goats(5.0%) and dogs(2.5%). Demographically, the highest seroprevalence of animal brucellosis was seen in Moradabad district (12.4%) followed by Shahjahanpur (11%), Badaun (10%), Pilibhit (9.4%), Rampur (8.6%) and Bareilly (8%) whereas veterinarians of Pilibhit district showed highest seroprevalence rate (25%). Cattle, buffalo and goats showed highest seroprevalence during rainy season whereas dogs during summer season (3.6%). Seasonal pattern of seroprevalence among veterinarians was same as that of animals. In all the animals, seroprevalence was higher in females in comparison to males. In contrast more number of male veterinarians (18.6%) were found positive than the female veterinarians (11.1%). In cattle, buffaloes and goats seroprevalence was higher in adults in comparison to young animals but it was more in young dogs in comparison to adult dogs.

INTRODUCTION

Brucellosis is a major problem of both animals and humans and its impact on social and economic life is well understood. The economic losses due to Brucellosis in animals are mainly due to chronicity of infection leading to loss of reproductive efficiency. The disease is characterized by abortion in female and to a lesser extent, orchitis and infection of accessory sex glands in the male and infertility in both the sexes. It has zoonotic importance in terms of its transmissibility to human beings attending infected animals or consuming contaminated products from infected livestock. The symptoms are in the form of low grade undulant fever, night sweating, early fatigue, joint pain leading to spondylitis and orchitis and are commonly known as 'Undulant fever' or 'Malta fever'. The prevalence of brucellosis in different geographical areas varies with standards of personal and environmental hygiene, animal husbandry practices, and species of the causative agent and local methods of food processing. *Brucella melitensis* is the prevalent species seen in man and causes a more severe form of disease. Dogs are carriers of *Brucella canis* which can be transmitted to humans.

MATERIALS AND METHODS

During the period of 2008-2010, a total of 1500 blood samples including 725 samples of cattle, 393 of buffaloes, 180 samples of goats and 202 samples of dogs were collected from six districts of Rohilkhand region of U.P., India. Serum samples were tested for brucella antibodies using two tests- Rose Bengal Plate Test (RBPT) and Standard Tube Agglutination test (STAT). RBPT is recommended as a screening test by OIE (Office International Des Epizootics) whereas STAT is highly sensitive test for the diagnosis of brucellosis and is used in most of the serological studies. The RBPT and STAT were performed as per the method described by Alton *et al.* (1988). STAT titres of 1:40 or more were taken as positive in cattle, buffaloes, dogs and veterinarians whereas titre of 1:20 or more was taken as positive in goats.

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RESULTS AND DISCUSSION

Results of the two serodiagnostic tests showed that STAT detected comparatively higher percentage of seropositive animals (10.2%) as compared to RBPT (9.5%). The total seroprevalence of brucellosis by both the tests in animals of Rohilkhand region was 141 out of 1500 (9.4%) as shown in Table 1. Similar prevalence of brucellosis in India has been reported by many workers (Kaushik *et al.*, 2010; Kumar *et al.*, 2009). Among veterinarians total of 6 serum samples were found positive by RBPT and 18 serum samples positive by STAT (Table 6). Similar pattern of sensitivity of RBPT and STAT has been reported by other workers (Ghodasara *et al*., 2010; Kanani, 2007). Though reverse pattern of sensitivity has also been reported by some workers (Brahmabhatt *et al*., 2009; Kaushik *et al*., 2010) who have reported more number of samples positive by RBPT than the STAT.

Animal wise seroprevalence

Animal wise seroprevalence of brucellosis is given in Table 1. In cattle out of 725 serum samples, 84 serum samples showed positive reaction for brucellosis by RBPT (11.6%) and 90 (12.4%) serum samples were positive by STAT. The overall positivity of brucellosis in cattle by both the tests was, 84 (11.6%) which is in medium range as the prevalence of bovine brucellosis has been reported to be as low as only 0.6% (Adams, 1996) to as high as 38.90% (Chauhan *et al.*, 2000). In buffaloes, the positivity of samples by both the tests was 43(10.9%) among which 44 samples (11.1%) were found positive by RBPT and 49 samples (12.4%) by STAT. Patel (2007) has also reported 7.79% seropositivity by RBPT

and 18.61% by STAT in cattle and buffaloes. Similarly, Brahmabhatt *et al*. (2009) have also reported 12.75% and 11.16% seroprevalence by RBPT and STAT, respectively in buffaloes of Gujarat region. In goats, 9 (5.0%) samples were found to be positive by RBPT and 12 samples (6.6%) by STAT. The overall positivity of samples by both the tests in goats was 9 (5.0%) which is exactly similar to the prevalence reported by Sharma *et al.* (1979) from India. Dogs revealed a positivity of 5 (2.5%) by RBPT and 9 (4.4%) serum samples were found positive by STAT, whereas overall positivity by both the tests was found to be 5 (2.5%). Seroprevalence studies in canines in India are scanty but few studies have been done in other countries. Ahmed and Munir (1995a and b) have reported 9.33% seroprevalence of canine brucellosis from Pakistan.

Demographic seroprevalence

The prevalence of brucellosis in different geographical areas varies with standards of personal and environmental hygiene, animal husbandry practices etc. In this study the highest seroprevalence of animal brucellosis was seen in Moradabad district (12.38%) and least seroprevalence in Bareilly district (7.97%). However, animal wise distribution pattern of brucellosis in different districts was different and no definite pattern was observed (Table 2). Result of chi square test showed non significant effect of area on seroprevalence of disease.

Seasonal seroprevalence

Cattle, buffalo and goats showed highest seroprevalence of brucellosis during rainy season followed by summer, autumn, winter and spring season whereas dogs showed highest seroprevalence during summer season (3.6%) followed by rainy and autumn season. However no seroprevalence was recorded during winter and spring season in dogs (Table 3). The higher occurrence of human and sheep and goat brucellosis in spring and summer has been reported by Bokaie *et al*. (2008).

Sex wise seroprevalence

In all the animals, seroprevalence was higher in females in comparison to males (Table 4). These findings are in agreement with the findings of Ahmed (2009) who has reported higher prevalence of brucellosis in females than male cattle. This may be due to the fact that the presence of the tropism of *Brucella* to the male or female reproductive tract is thought to be by erythritol, a sugar alcohol, synthesized in the ungulate placenta which stimulates the growth of the organism.

Age wise seroprevalence

On comparing the age wise seroprevalence of brucellosis in different animals, it was found that in cattle, buffaloes and goats rate was higher in adults in comparison to young animals. But in dogs, seroprevalence was more in young dogs in comparison to adult dogs (Table 5). This finding is in unison with other findings such as of Edelsten *et al*. (1990) and Radolf (1994) who have reported brucellosis essentially a disease of the sexually mature animals, the predilection site being the reproductive tract, especially the gravid uterus. Ahmed and Munir, (1995b) have also reported that the antibody titre against *Br. abortus* appears to be associated with age, as low prevalence in young stock was reported than the adults. It appears that the high prevalence of brucellosis among older animals might be related to maturity with advancing age as young animals are often resistant.

Seroprevalence among Veterinarians

Veterinarians are more frequently exposed to many zoonotic infections owing to their occupation. Although there has been great progress in controlling the disease in many countries, there still remain regions including India where the infection persists in domestic animals and, consequently, transmission to the human population frequently occurs. In the present study, 100 veterinarians were tested for brucellosis, Out of which a total of 6 serum samples were found positive by RBPT and 18 serum samples were positive by STAT (Table 6). Out of these, 91 samples were of male veterinarians and 9 from female veterinarians among which 17 (18.6%) and 1 (11.1%) were positive for brucellosis in male and female veterinarians, respectively. Since males veterinarians are more frequently engaged in handling the clinical cases, especially gynaecological cases, therefore more exposed to the infection.

Table 1. Percent seroprevalence of Brucellosis in different animal species by different tests

Host species	Sample size	No. of samples positive by RBPT		No. of samples positive by STAT		No. of samples positive to both tests	
		+ve samples	%	+ve samples	%	+ve samples	%
Cattle	725	84	11.5	90	12.4	84	11.6
Buffalo	393	44	11.1	49	12.4	43	10.9
Goat	180	9	5.0	12	6.6	9	5.0
Dog	202	5	2.5	9	4.4	5	2.5
Total	1500	142	9.5	160	10.6	141	9.4

Table 2. Area-wise percent seroprevalence of Brucellosis in various animals

Host species	Bareilly			Pilibhit			Shahjahanpur			Badaun			Rampur			Moradabad		
	Total	+ve	%	Total	+ve	%	Total	+ve	%	Total	+ve	%	Total	+ve	%	Total	+ve	%
Cattle	250	23	9.2	100	12	12.0	150	22	14.7	95	14	14.7	75	5	6.6	55	8	14.5
Buffalo	152	17	11.1	56	5	9.7	65	7	10.7	61	5	8.2	37	5	13.5	22	4	18.1
Goat	50	2	4.0	25	1	4.0	40	2	5.0	29	1	3.4	18	2	11.1	18	1	5.5
Dogs	100	2	2.0	22	1	4.5	35	1	2.8	25	1	4.0	10	0	0.0	10	0	0.0
Overall	552	44	8.0	203	19	9.4	290	32	11.0	210	21	10.0	140	12	8.6	105	13	12.4

Table 3. Percent seasonal distribution of Brucellosis in different host species

Seasons	Cattle			Buffalo			Goat			Dog		
	Sample size	+ve samples	%	Sample size	+ve samples	%	Sample size	+ve samples	%	Sample size	+ve samples	%
Summer	70	4	5.7	30	2	6.6	50	3	6.0	55	4	7.2
Rainy	70	9	12.8	25	2	8.0	35	3	8.5	30	4	13.3
Autumn	50	5	10.0	20	2	10.0	35	1	2.8	25	3	12.0
Winter	40	2	5.0	15	1	6.6	30	1	3.3	20	2	10.0
Spring	20	1	5.0	10	0	0.0	30	1	3.3	20	1	5.0
Total	250	21	8.4	100	6	6.0	180	9	5.0	150	14	9.3

Table 4. Sex- wise distribution of Brucellosis in different animal host species

District	Cattle						Buffalo						Goats						Dogs					
	Male			Female			Male			Female			Male			Female			Male			Female		
	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%
Bareilly	75	9	12.0	175	30	17.1	22	1	4.5	130	16	12.3	10	0	0.0	40	2	5.0	45	1	2.2	55	1	1.8
Pilibhit	10	1	10.0	90	11	12.2	6	0	0.0	50	5	10.0	5	0	0.0	20	1	5.0	10	0	0.0	12	1	8.3
Shahjahnpur	15	2	13.3	135	20	14.8	10	1	10.0	55	6	10.9	10	1	10.0	30	1	3.3	15	0	0.0	20	1	5.0
Badaun	10	0	0.0	85	14	16.4	10	0	0.0	51	5	9.8	9	0	0.0	20	1	5.0	12	1	8.3	13	0	0.0
Rampur	5	0	0.0	70	5	7.14	5	0	0.0	32	5	15.6	2	0	0.0	16	2	12.5	4	0	0.0	6	0	0.0
Moradabad	5	1	20.0	50	7	14.0	2	0	0.0	20	4	20.0	3	0	0.0	15	1	6.6	5	0	0.0	5	0	0.0
Total	120	13	10.8	605	87	14.3	55	2	3.6	338	41	12.1	39	1	2.5	141	8	5.6	91	2	2.1	111	3	2.7

Table 5. Age-wise distribution of Brucellosis in different animal host species

District	Cattle						Buffalo						Goats						Dogs					
	< 3 yrs			>3yrs			< 3 yrs			>3yrs			< 1 yrs			>1yrs			< 6 months			>6 months		
	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%	Sample size	+ve	%
Bareilly	45	2	4.4	205	20	9.7	12	1	8.3	140	16	9.3	11	1	9.1	39	1	2.5	35	1	2.8	65	1	1.5
Pilibhit	7	0	0.0	93	12	12.9	5	0	0.0	51	5	9.8	6	0	0.0	19	1	5.2	5	0	0.0	17	1	5.8
Shahjahnpur	10	1	10.0	140	21	15.0	8	1	12.5	57	6	10.5	8	0	0.0	32	2	6.3	10	0	0.0	25	1	4.0
Badaun	8	0	0.0	87	14	16.1	9	0	0.0	52	5	9.6	7	0	0.0	22	1	4.5	10	0	0.0	15	1	6.6
Rampur	2	0	0.0	73	5	6.84	3	0	0.0	34	5	14.7	3	1	33.3	15	1	6.6	4	0	0.0	6	0	0.0
Moradabad	2	0	0.0	53	8	15.1	2	0	0.0	20	4	20.0	3	0	0.0	15	1	6.6	3	0	0.0	7	0	0.0
Total	74	3	4.0	651	80	12.2	39	2	5.12	354	41	11.5	38	2	5.2	142	7	4.9	67	1	1.5	135	4	2.9

Table 6. Seroprevalence of Brucellosis among Veterinarians

Sample size	Test- wise				Area-wise						Season-wise					Sex- wise	
	RBPT	STAT	Samples+ve by both tests	%	Bareilly	Pilibhit	Shahjahanpur	Badaun	Rampur	Moradabad	Summer	Rainy	Autumn	Winter	Spring	Male	Female
100	6	18	6	6.0	20.0	25.0	17.3	15.0	10.0	20.0	18.8	21.4	16.6	15.7	15.3	18.6	11.1

Veterinarians of Pilibhit district showed highest seroprevalence rate (25%) for *Brucella* antibodies in comparison to veterinarians of other districts. Seasonally, seroprevalence of brucellosis was higher in rainy (21.4%) and summer (18.8%) season, followed by autumn (16.6%), winter (15.7%) and spring (15.3%) season. Since seroprevalence of brucellosis in veterinarians is related with the prevalence of disease in animals, this kind of pattern is very much expected.

The results of univariate analysis of variance showed non-significant effect in the interaction of animals, veterinarians with area and area on prevalence while significant ($P<0.05$) effect was found in the interaction between animals, veterinarians and the prevalence of disease. Thakur and Thapliyal (2002) have reported almost similar seroprevalence of 17.39% in field veterinarians and abattoir workers. Agasthya *et al*. (2007) examined 618 sera from various professionals at risk and 15.69% tested positive. These studies clearly show a high prevalence of the disease in occupational groups in various parts of India. Thus the present study will be helpful in understanding the pattern of brucellosis in animals and professional groups which is critical for both the veterinary and public health services if sensible priorities are to be set and controls are to be implemented.

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