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Seroprevalence of ovine brucellosis in Kashmir valley, a prospective and retrospective study

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Abstract
A prospective and retrospective study was conducted to determine the seroprevalence of ovine Brucellosis in Kashmir valley. The data spanning over five years (2015-16 to 2019-20) maintained at Disease Investigation Laboratory Nowshera, Srinagar, were collected and utilized to estimate seroprevalence of ovine Brucellosis in Kashmir valley. A total of 20165 sera samples were collected from organized and unorganized sectors of Kashmir valley. The samples were screened serologically using modified Rose Bengal Plate Test (mRBPT), Micro Agglutination Test (MAT) and Indirect Enzyme Linked Immunosorbent Assay (iELISA). The overall seroprevalence of ovine brucellosis of 17.38% in Kashmir valley was observed in the present study. The seroprevalence of 11.03%, 19.13%, 24.88%, 13.07% and 12.64% was observed during 2015-16, 2016-17, 2017-18, 2018-19 and 2019-20, respectively. The prevalence of ovine brucellosis was significantly ($p<0.01$) higher in organized sector (18.69%) than un-organized sector (16.00%). The effect of year was also highly significant ($p<0.01$) on the seroprevalence of ovine brucellosis. The results suggested a high prevalence of ovine brucellosis in Kashmir valley. Therefore, an appropriate control policy is required at ground to reduce its economic and zoonotic impact.

Keywords: Brucellosis, iELISA, MAT and seroprevalence

1. Introduction
The Jammu and Kashmir is ideally suited for rearing of sheep and goat owing to favourable agro-climatic and geo-physical conditions, rich alpine pastures and host of other natural endowments [1]. Sheep husbandry is an important income generating venture and provides nutritional security at crises to poor farmers and landless labourers [2]. The efficient income generation from sheep husbandry depends on growth rate and ewe reproduction performance i.e. conception rate and litter size. Therefore, conception rate and litter size are important traits in sheep enterprise [3]. However, mortality particularly during prenatal [4] stages of life cycle and abortion put a drag on the litter size, hence on economy poor farmers. Although abortions are caused by various infectious and noninfectious agents but Brucellosis remains main cause in Kashmir valley. Brucellosis is a highly contagious zoonotic disease caused by various species of the genus Brucella. Over half a million cases of the disease are reported annually [5, 6]. The brucellosis causes heavy economic losses to the livestock industry throughout globe through abortion, infertility and decrease in production [7]. Brucellosis is a zoonosis of man, domestic and wild animals also known as “undulant fever”, “Mediterranean fever” or “Malta fever”. The infection is transmitted by direct or indirect contact with infected animals or their products. People of all ages and both sexes are affected by brucellosis. Brucellosis is an infection of certain animals also transmitted to humans either by direct contact or by ingestion of contaminated animal products from infected animals [19]. Clinical diagnosis of brucellosis is very difficult. Therefore, laboratory diagnosis is very important tool for identification, detection and confirmation. The confirmatory diagnosis is made by isolation and identification of bacteria. The isolation of bacteria needs expert and is also time consuming process. Therefore, serological tests are preferred for diagnosis and control. Serodiagnosis of brucellosis is carried out by detection of antibodies generated against lipopolysaccharide (LPS) or whole-cell bacterial extracts by ELISA or agglutination tests using colorimetry [19]. With this back ground present study was undertaken to understand prevalence of ovine brucellosis in Kashmir valley

2. Materials and methods

A retrospective and prospective study was conducted on Seroprevalence of ovine Brucellosis in Kashmir. The data spanning over the last five years (2015-2020), maintained at Disease Investigation Labaratory, Nowsharah, Kashmir were used for the present study. A total of 20165 blood samples from different districts and Government Sheep Breeding Farm of Kashmir valley were collected and tested for brucellosis. About 3–5 ml of blood was collected from jugular vein of sheep. The blood samples were kept in a slanting position overnight at room temperature to harvest serum [8]. The harvested serum samples were tested by modified Rose Bengal Plate Test (mRBPT), Micro Agglutination Test (MAT) and Indirect Enzyme Linked Immunosorbent Assay (iELISA). [9]. The data was classified and analyzed by using SPSS statistical software (IBM SPSS Statistics 20).

3. Results

A total of 20165 sera samples were screened by mRBPT, MAT and iELISA for prevalence of ovine brucellosis in Kashmir valley. An overall seroprevelance of 17.38% (Table 1) was observed in present study. The yearly variation differed significantly in the present study and it was found that seroprevalence showed an increasing trend from 16.82% (2015-16) to 25.51% (2017-18) followed by a decrease to 12.52% (2019-20) (Table 1). The highest and lowest prevalence of 25.51% and 11.57% was observed during 2017-18 and 2018-19, respectively. The prevalence was significantly (p<0.01) lower in unorganized sector (16.00%) than organized sector (18.69%) (Table 1). In the unorganized sector an overall increase in seroprevalence of brucellosis, from 11.03% (2015-16) to 12.64% (2019-20) was observed in the present study (Table 2). Among government sheep breeding farms (SBF) highest and lowest seroprevalence of 37.07% and 9.32% (Table 2) was observed in SBF Zawoora and SBF Hardwashia, respectively. This may be attributed to variation in breed environment, and other managemental practices adopted at different farms. Among farms with more than 1000 samples collected and tested, highest and lowest seroprevalence was observed in SBF Kralpathri (30.06%) and SBF Goabal (11.11%) respectively (Table 2). Among unorganized sector highest and lowest seroprevalence of 31.81% and 8.85 %, respectively was observed in Shopian and Bandipora districts.

4. Discussion

The seroprevalence of ovine Brucellosis in present study was found to be 17.38% which is in agreement with Hussain *et al*. (2019) [10]. However, lower seroprevalence of ovine brucellosis in J and K was reported by Lone *et al*. (2013) [11]. Whereas lower seroprevalence rates of 1.72% to 9.95% were reported in sheep by Rahman *et al*. (2011), Gumaa *et al*. (2014), Sadhu *et al*. (2015), Kumar *et al*. (2015) and Sharma *et al*.(2016) [12 to 16]. The variation could be due to different survey techniques employed by various workers. The difference among prevalence in different studies may be due to variation in sample size and research methodology. However, larger sample size distributed over five years representative of all areas and farms of valley was included in the present study. Seroprevalence of 29.7% and 29.0% in Rajasthan and Uttar Pradesh, respectively was reported by Kumar *et al*. (1997) [17]. The prevalence of brucellosis was lower in unorganized sector than organized sector. In contrast to Lone *et al*. (2013) [11] reported higher in unorganized sector than organized sector. In a cross sectional study the seroprevalence of brucellosis and its risk factors Akhter *et al*. (2014) [18] screened 101 sheep and 113 goats and reported that 5.94% sheep, and 6.19% goats were positive for brucellosis. Higher prevalence of brucellosis was recorded in female sheep (7.54%) and goat (6.49%) as compared to male sheep (4.16%) and goat (5.50%), respectively. The sheep and goat above two years of age showed higher prevalence of brucellosis (8.69% and 6.45%) as compared to other ages. No risk factor was found to be statistically significant (p<0.01). Similar to findings of this study Akhter *et al*. (2014) [18] reported that higher seroprevalence of brucellosis in organized sector. Higher seroprevalence of brucellosis in Kashmir valley be attributed to large flock size and high livestock density. The decrease in the number of cases during last two years in organized sector can be attributed to testing and culling policy adopted by the Department of Sheep Husbandry. More or less similar distribution pattern among farms and districts was observed and reported by Lone *et al*. (2013) [11].

Table 1: Seroprevalence of brucellosis in organized and unorganized sectors of Kashmir

Year	Un organized sector			Organized sector			Overall		
	Samples tested	Samples positive	Prevalence (%)	Samples tested	Samples positive	Prevalence (%)	Samples tested	Samples positive	Prevalence (%)
	9862	1578	16.00	10303	1926	18.69	20165	3504	17.38
P. Valus			0.001			0.001			0.001
2015-16	517	57	11.03	3020	538	17.81	3537	595	16.82
2016-17	852	163	19.13	1557	331	21.26	2409	494	20.51
2017-18	2211	550	24.88	3007	781	25.97	5218	1331	25.51
2018-19	3236	423	13.07	1291	101	7.82	4527	524	11.57
2019-20	3046	385	12.64	1428	175	12.25	4474	560	12.52

Table 2: Seroprevalence of brucellosis among organized and unorganized sector in Kashmir

Unorganized sector	Samples tested	Samples positive	Prevalence (%)	Organized sector	Samples tested	Samples positive	Prevalence (%)
Anantnag	66	11	16.67	Dachigam	2053	360	17.54
Bandipora	565	50	8.85	Daksum	1354	175	12.92
Baramulla	826	80	9.69	Goabal	2223	247	11.11
Budgam	2534	527	20.80	Hardwashia	526	49	9.32
Ganderbul	1831	329	17.97	Kiwa	1026	139	13.55
Kulgam	194	27	13.92	Kralpathri	1700	511	30.06
Kupwara	789	120	15.21	Poshnar	601	141	23.46

Pulwama	531	86	16.20	Zowara	820	304	37.07
Shopiyan	415	132	31.81				
Srinagar	2111	216	10.23				

5. Conclusion

The results of present study suggest a much higher prevalence of ovine brucellosis in Kashmir Valley. Further, the prevalence was higher in unorganized sector than organized sector. Therefore, testing and slaughtering of positive cases to control the abortion storms caused by ovine brucellosis and therefore, economic losses to the poor and landless farmers of valley rearing sheep.

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