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Short communication

Risk of seroconversion to peste des petits ruminants (PPR) and its association with species, sex, age and migration

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ABSTRACT

The present investigation included a detailed description of risk of PPR in small ruminants and its association with various host and environmental factors. A total of 432 serum samples comprising of 216 samples (108 sheep and 108 goats) from migratory and 216 samples (108 sheep and108 goats) from non-migratory flocks of sheep and goat were screened for PPR antibodies using competitive-ELISA. The overall seroprevalence of PPR in migratory flocks (33.79%) was significantly ($p < 0.05$) higher as compared to non-migratory flocks (24.07%). The seroprevalence of PPR in sheep (29.16%) was higher than that of goat (28.70%) but the difference was non-significant, age wise seroprevalence was significantly ($p < 0.05$) higher in >12 months age group (39.58%) followed by 8–12 months (26.38%) and 4–8 months (20.83%) age group. On risk factor analysis, it was observed that at 95% confidence interval, odd ratio was higher in migratory (1.610) than non-migratory (0.612) flocks, in sheep (1.023) than goats (0.978), the value of odd ratio was higher in >12 months age group (2.490 and 1.828) as compared to 4–8 months and 8–12 months, respectively. The overall sex wise seroprevalence in males (33.33%) was significantly ($p < 0.05$) higher than in females (24.53%) and also risk factor analysis revealed a higher odd ratio in males (1.538, overall; 1.581, migratory and 1.503, non-migratory) than in females (0.650, overall; 0.633, migratory and 0.655 non-migratory). The present study relates the variation of PPR risk in association with species, age, sex, sheep and goat husbandry practices.

1. Introduction

Peste des petits ruminants (PPR), which literally means "Plague of small ruminants", is an acute viral disease of small ruminants caused by a Morbillivirus belonging to the family Paramyxoviridae (Gibbs et al., 1979) and is related to Canine distemper, Rinderpest and Measles virus (Van mol et al., 1995), The natural disease affects mainly goats and sheep, but it is usually more severe in goats where, it causes severe morbidity and mortality and is only occasionally severe in sheep (Raghavendra et al., 2000). The course of disease is about 2 weeks and generally death occurs within 10–12 days after infection (Lefevre and Diallo, 1990). Disease is characterized by high rise of temperature, oral and oculo-nasal discharges, necrotic stomatitis, severe pneumonia, dyspnoea, coughing, enteritis and severe diarrhoea followed by death (Roeder and Obi, 1999; Pawaiya et al., 2004). The disease is endemic in India and is a major threat to about 200 million small ruminant population of the country (Dhar et al., 2002), causing an economic loss of about 1800 million Indian rupees annually (Bhadyopadhyay, 2002). Close contact is the most important way of transmitting the disease. It is suspected that the infectious materials can also contaminate water, feed troughs and bedding, turning them into additional sources of the infection. These are however short term sources,

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since the PPRV, like its close relative the Rinderpest virus, would not be expected to survive for a long time outside the host (Diallo, 2003). In addition to these sources of infection movement of animals across the boundaries of states commonly acts as source of PPR epidemics. There is no known carrier state in PPR and the infected animal may transmit the disease itself during the stage of incubation period. However, the PPR infected animal's sero-convert and become immune to PPR and RP viruses (Sudarshan et al., 1995). Singh et al. (2004a) discussed the relation of migration of animals with that of maintenance and transmission of PPRV in nature. The close relations between PPR outbreaks and transportation of sheep and goats flocks have been reported (Boniwell, 1980; Dhand et al., 2002; Kataria et al., 2007; Shankar et al., 1998). Migration may also spread infection to cattle (Shaila et al., 1989). In India, animal rearing is practiced in two major ways: one is unorganized back yard rearing (where 5–10 sheep or goats are reared in backyards and fed up on the agriculture byproduct) and the other is the traditional rearing of sheep and goats by nomadic communities (where the animals are fed on pasture lands and uncultivated or barren fields during the course of migration). Most of the earlier studies from India were conducted on sheep and goats of non-migratory flock (Singh et al., 1996, 2004a; Kataria et al., 2007; Bhanuprakash et al., 2008) but the present study covered animals of both migratory and non-migratory flocks. The study was conducted with the prime aim to assess the risk of PPR in unvaccinated animals in relation to the various host factors and migration. This may prove to be helpful in rational decision making for formulating preventive and control strategies against PPR.

2. Materials and methods

2.1. Study area

The present study was conducted during the year 2009–2010 in state of Jammu and Kashmir (J&K) India. A total of 6 major migratory routes used by nomadic community were selected for migratory flocks of sheep and goats. For studying non-migratory flocks, villages from 6 districts of J&K were selected randomly. A pre-designed questionnaire was used to interview the owners of the flocks. Data related to species, age, sex and route of migration was gathered to ascertain the difference in seroprevalence and risk in migratory versus non-migratory flocks along with species, age and sex predisposition to PPR in sheep and goats.

2.2. Sample collection

A total of 432 serum samples comprising of 216 samples (108 sheep and 108 goats) of migratory and 216 samples (108 sheep and 108 goats) of non-migratory flocks were collected from animals unvaccinated against PPR. Of the 108 samples 56 each from males and females of sheep and goats of migratory and non-migratory flocks. The animals of three age groups viz., 4–8 months, 8–12 months and >12 months were included in the study. Blood was collected from animals by jugular-vein puncture using vacuette tubes (Greiner Laboratortechnik, Germany) and left to clot at 4 °C until transported to laboratory. The serum was collected after centrifugation, transferred to 2 ml centrifuge tube and stored at −20 °C until used for detection of PPR antibodies.

2.3. Determination of antibodies

The PPR specific antibodies were detected using competitive ELISA (cELISA) kit for PPR, developed by National Rinderpest Laboratory, Division of Virology, IVRI, Mukteswar, India. As per the protocol the ELISA plates showing proper colour development in control wells were read at 492 nm in ELISA plate reader (Multiskan plus, LabSystem). To interpret the results of the c-ELISA, EDI (ELISA Data Interchange) software developed by the FAO/IAEA (Jeggo and Anderson, 1992) was used.

2.4. Interpretation of test results

The test sera samples showing per cent inhibition (PI) value of 50% or above of mean OD values of Cm (monoclonal antibody control) were taken as positive and less than 50% were considered as negative for PPR antibodies. The results were expressed in terms of PI by converting the optical density (OD) to PI according to the following formula:

$$\mathrm{PI} = 100 - \left[\left(\frac{\text{OD of the test wells}}{\text{OD of the Cm wells}}\right) \times 100\right]$$

2.5. Statistical analysis of risk factor

The statistical association of PPR disease with regard to species (sheep and goats), age, sex, migration and non-migration was analyzed through independent Chi-square test and the odd ratio was determined at 95% CI using online program (http://statpages.org/ctab2x2.html).

3. Results

3.1. Flock wise seroprevalence and risk of PPR

The seroprevalence of PPR in migratory flocks were significantly ($p < 0.05$) higher (33.79%) than in non-migratory (24.07%) flocks of different districts (Table 1).

3.2. Species wise seroprevalence and risk of PPR

The seroprevalence of PPR in sheep (29.16%) was higher than that of goat (28.70%) but the differences were non-significant in both migratory and non-migratory flocks. Similarly the odd ratio was higher in sheep (1.023) as compared to goats (0.978). Further detailed statistical analysis has been shown in Table 2.

3.3. Age wise seroprevalence and risk of PPR

Age wise analysis of data revealed significantly ($p < 0.05$) higher seroprevalence of PPR in >12 months age group (39.58%) followed by 8–12 months (26.38%) and 4–8 months (20.83%) age group. On risk factor analysis, it was observed that at 95% confidence interval, the value of odd ratio was higher in >12 months age group (2.490 and 1.828) as compared to 4–8 months and 8–12 months, respectively.

In migratory animals of >12 months age group, the odd ratio was 3.500 and 2.429 when compared with 4–8 months and 8–12 months, respectively. A similar trend but with lower odd ratio values was recorded in the non-migratory flock. The detailed age wise analysis of risk factor between different age groups of migratory and non-migratory flocks of sheep and goats has been shown in Tables 3–5.

3.4. Sex wise seroprevalence and risk of PPR

The overall seroprevalence in males (33.33%) was non-significantly ($p < 0.05$) higher than in females (24.53%). In sheep, the overall seroprevalence was significantly ($p < 0.05$) higher in males (38.88%) than in females (19.44%) (Table 6).