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## **Peste des Petits Ruminants Outbreak in Small Ruminants of Northern Areas of Pakistan\***

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**Abstract:** Following is a detailed description of an outbreak from district Chitral, Northern areas of Pakistan causing heavy mortality in small ruminants but the major affected specie were the goats. Earlier history, major clinical signs and laboratory confirmation proved this to be PPR disease. Total exposure area, history and general management practices of the area are also discussed. A total of five swab samples and twenty two serum samples were collected for the laboratory confirmation. Immuno-capture ELISA for antigen detection and competitive ELISA for antibodies detection were used. Eleven out of twenty serum and three out of five swab samples were found positive for Peste des Petits Ruminants (PPR). Causes related to spread of disease and measures to stop its spread are also discussed to develop a strategy aimed at bringing this important disease under progressive control.

**Key words:** Outbreak, goat, ELISA, control

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### **INTRODUCTION**

Peste des Petits Ruminants (PPR) is a highly contagious disease of domestic and wild small ruminants. It seems to be the major constraint in the development of small ruminant production in areas where it is endemic. Included in the list A of the International Zoosanitary Code, it is also part of the FAO EMPRES programme. Classically, it is characterized by muco-purulent nasal and ocular discharges, necrotising and erosive stomatitis, enteritis and pneumonia and death in 40-80% of acute cases. All these clinical signs, apart from the respiratory symptoms, are very similar to those of rinderpest. The causal agents of both diseases are closely related and belong to the *Morbillivirus genus* (Diallo, 2003).

The disease is endemic in the Arabian Peninsula, the Middle East and in the Indian subcontinent. Typically, lineages 1, 2 and 3 occur in sub-Saharan Africa while lineage 4 is present in Turkey, the Arabian Peninsula, Iraq, Iran, Afghanistan, Pakistan, India, Bhutan and Bangladesh. Taylor and Barrett (2006) suggest that, notwithstanding its discovery in West Africa in 1940, PPR probably originated in Asia and was then carried to Africa.

The existence of PPR has been recognized in Pakistan since 1991 (Amjad *et al.*, 1996) as epidemic in Punjab Province (Athar *et al.*, 1995) but there are few reports regarding its confirmed outbreaks in the northern areas which is a border area so a disease outbreak was observed, recorded and confirmed at district Chitral of Northern Areas of Pakistan.

The following areas were reported to be affected with the disease.

- Golain area with a total goat and sheep population of about 20000 to 22000.
- Sheshi Koh area, with a total goat and sheep population of about 8000 to 10000.
- Rambore area with a total goat and sheep population of 3000-4000.

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## **MATERIALS AND METHODS**

### **History and General Management Practices of the Area**

- Animals were grazing on pasture. There was seasonal shifting of flocks and frequent mixing of flock from various areas in the pastures.
- In winter (September to April) the flocks were on lower pastures or in southern part of Chitral and easily accessible for vaccination and treatment etc.
- In summer (May to September) the flocks were shifted to high mountain pastures of Northern area of the district and not easy to be accessed for vaccination or treatment by the field staff.
- The owners were uneducated, socioeconomic ally poor and unaware of the importance of prophylactic vaccination of animals or control of ecto and endo parasites etc. They were not ready to vaccinate their animals especially on payment.
- In winter due to poor pastures and no feed supplementation the animals especially the young ones were under nourished and more prone to disease.
- Animal population (goats and sheep) in the affected area = 31000-36000.
- Other animals in the area = cattle.
- Other flocks in the above affected areas and other parts of the district were reported to be free of the disease.

### **Total Exposure**

- The goats and sheep are 1680.
- The morbidity reportedly 60% on total basis (variable from flock to flock).
- The mortality reportedly about 32% on total basis in the affected flocks (higher in young 3-4 months age).

### **Clinical Signs**

High fever, Nasal and Ocular discharge, rapid and labored breathing, Mouth lesions and Diarrhoea. High mortality in young and high recovery rate in adult with treatment for secondary bacterial infection.

### **Outbreak Description**

Last year the disease appeared for 1st time in Arandu, which is located South West of Chitral near the Afghanistan border. The disease was introduced into this area by animals from Afghanistan, later on the disease spread to Ashorat area near Darosh. The outbreak was controlled with control of cross border movement of animals from Afghanistan.

The present outbreak of the disease also originated from the South Part of the District. About one and a half month ago the disease 1st appeared in flock migrated from the lower part, due to state of summer season and later on spread to other local flocks in contact to them. The disease appeared in the following villages or pastures of the affected area and the number of flock affected with the disease were.

### **Golain Area**

- Village Izhghoor = 03 no of flocks affected.
- Chakooli pasture = One flock affected.
- At high mountain pastures = Two flocks affected.

### **Sheshi Koh**

- Langer mountain pasture = One flock affected.
- Gorain gole and kuchar pasture = Three flocks affected.

### **Rambore Village**

- One flock at high mountain pasture affected
- The flock had no previous history of illness due to PPR.

### **Clinico-Pathological Examination**

The affected animals were clinically examined and clinical pictures were noted. Postmortem examinations of freshly dead animals were performed. The path-gnomonic lesions of lungs, intestine were noted and the samples were collected for the virus and antibodies confirmation.

### **Sample Collection and Laboratory Confirmation**

A total of 22 serum samples were collected from affected, recovered and apparently healthy goats for laboratory diagnosis and confirmation of PPR antibodies. Five swab samples were collected for the presence of PPR virus/antigen. Competitive ELISA (c ELISA) for the detection of antibodies and Immuno-capture ELISA (Ic ELISA) for the detection of PPR virus were carried out at the National Veterinary Laboratory, Islamabad as described by Anderson *et al.* (1991) and Libeau *et al.* (1994), respectively. The kit used to analyze these samples was imported from World Reference Laboratory for Rinderpest and PPR at PirBright, UK, also the Nunc Maxisorb ELISA plates were used in this analysis. Ortho-phenylenediamine (OPD) was used as chromogen and the absorbance was measured at filter, having wavelength of 492 nm. ELISA Data Interchange (EDI) software was used to analyze the results.

## **RESULTS AND DISCUSSION**

The postmortem signs were swollen lymphnodes, congested lungs, hemorrhagic stripping in intestines and secretions from nostrils and eyes (Fig. 1-3). Three out of five swab samples were found positive for antigen/virus and eleven out of twenty two were positive for antibodies of PPR (Table 1 and 2).

If we compare these responses specie wise, then it was found that the disease is more severe in goats than sheep (Goat = 10 as compare to Sheep = 01) also more deaths were found in goat as for sheep. Percent Positivity (PP) and Percent Inhibition (PI) were also higher in the goats as compared to sheep.

The above outbreak was in post summer season and reported to be due to addition of new animals to the herd but if we compare this from reports from other provinces, villagers in northern Punjab ascribes the onset of PPR to the passage of Kashmiri nomads although it would probably be just as correct to say that the virus has been endemic in the Province's northern districts for a number of years.

In both Sindh and Punjab Provinces PPR appears to be a winter disease involving goats more severely than sheep (although not necessarily more frequently). The explanation for this seasonality may lie either in differences in small ruminant husbandry practices between summer and winter, or in other factors bringing about seasonal changes in the virulence of the virus.

If we see the reports from surrounding areas like from India, Singh *et al.* (2004) gave the observations from 58 laboratory confirmed outbreaks of PPR and provided details of the prevalence



Fig. 1: Severe congestion of lungs



Fig. 2: Hemorrhagic enteritis



Fig. 3: Muco-purulent discharge from nostrils

Table 1: Results of antigen detection via monoclonal based immuno-capture ELISA

Name of samples	Species	Age of animal	Locality	Name of the farmer	Result	PP value
Nasal Swab	Goat	Adult	Asghoor	Sher Wali	Positive	76
Ocular Swab	Goat	K(4 months)	Chakooli	Aslat Khan	Positive	59
Oral Swab	Goat	Young (4 months)	Chakooli	Aslat Khan	Positive	35
Nasal and Oral Swab	Goat	Young (4 months)	Chakooli	Aslat Khan	Negative	05
Nasal Swab	Sheep	Young (4 months)	Chakooli	Aslat Khan	Negative	07

Table 2: Result of antibodies detection via monoclonal based competitive ELISA

Name of samples	Species	Age of animal	Locality	Name of the farmer	Result	PI value
Serum	Goat	Adult	Asghoor	Sher Wali	Positive	83
Serum	Goat	Adult	Asghoor	Sher Wali	Positive	77
Serum	Sheep	Adult	Asghoor	Sher Wali	Negative	05
Serum	Goat	Adult	Asghoor	Abdul Ghaffar	Positive	86
Serum	Sheep	Adult	Asghoor	Abdul Ghaffar	Negative	13
Serum	Goat	Adult	Cahkooli	Buzarg Wali	Positive	91
Serum	Goat	Adult	Cahkooli	Buzarg Wali	Positive	73
Serum	Sheep	Adult	Cahkooli	Buzarg Wali	Negative	24
Serum	Sheep	K(4 months)	Cahkooli	Buzarg Wali	Positive	69
Serum	Sheep	K(4 months)	Cahkooli	Buzarg Wali	Positive	85
Serum	Sheep	K(4 months)	Cahkooli	Buzarg Wali	Positive	88
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	21
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	03
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	16
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	07
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	29
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	17
Serum	Goat	Adult	Kuchar Goal	Ziarat Ullah	Negative	22
Serum	Sheep	Adult	Langer	Zadia	Positive	64
Serum	Goat	Adult	Langer	Zadia	Positive	71
Serum	Goat	Adult	Langer	Zadia	Positive	76
Serum	Goat	Adult	Langer	Zadia	Negative	15

of antibodies to PPR virus (PPRV) in 4,407 serum samples of small ruminants. Most of the clinical specimens used for the study originated from the northern and central parts of India. Findings suggested that the disease outbreaks were more severe in goats than sheep and that the frequency of disease outbreaks was greater between the months of March and June (51.7%) as compared to other periods of the year. Based on the screening of the 4,407 sera samples, the antibody prevalence of PPRV in small ruminants in India was 33% (95% confidence interval: 32.3 to 33.7%). The prevalence of antibodies to PPRV was noted to differ between species (i.e. sheep versus goats), age groups and geographical regions. A greater proportion of the sheep (36.3%) versus the goat (32.4%) population was infected with PPRV. The distribution and prevalence of antibodies to PPRV among various age groups of animals indicated that goats were exposed at an earlier age than the sheep, suggesting that goats may be more susceptible to infection with PPRV.

PPRV is transmitted through direct contact between infected and susceptible animals and nomadic animals will often come into contact with local sheep and goat populations from whom they may contract the virus (Ikede, 1983). Likewise, infected migratory animals may transmit the virus to susceptible local sheep and goats. The movement of animals, therefore, plays an important role in the transmission and maintenance of PPRV in nature, as does the purchase of potentially infected animals and their subsequent introduction into naïve flocks/herds.

These findings may be correlated with variations in the sheep and goat husbandry practices within different geographic regions, the topography of different states and the socio-economic status of individual Indian farmers, same is true for northern areas as disease was severe in young animals causing heavy mortality.

All this discussion gave an understanding about the determinants of PPR occurrence in different ecological and farming systems but the assembled evidence suggests that now is the time to develop a strategy aimed at bringing this important disease under progressive control.

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