



Peste des Petits Ruminants (PPR) Virus; an Emerging Threat to Goat Farming in Pakistan

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**Peste des Petits Ruminants (PPR) Virus; an Emerging Threat to Goat Farming
in Pakistan**

By

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Abstract

Pakistan at present is having >60 million head of goats consisting of about 37 well-recognized breeds found in different regions of the country. Goats play a significant role in the country’s economy by producing approximately 366 thousand tons of mutton. The main stock occurs in form of nomadic and transhumant production system but the goat farming at commercial level for meat production is also growing. Although the goat farming on commercial level is escalating in the country yet there are threats which results this initiative into a loss. Among these threats, PPR outbreaks are causing huge damages. During the recent times, three outbreaks of PPR were confirmed at these commercial farms in various regions of Punjab province. The disease started with in one to two months of the establishment of these farms as the animals were purchased from different livestock markets. Disease started with sudden onset of respiratory and enteric clinical signs and spread quickly. Disease caused mortality of 10-15% and morbidity of 20-40% within a time period of 01 to 03 weeks. At three farms, 116 out of 365 animals exhibit the clinical disease, giving morbidity rate of 31.78 %. There were overall 43 animals died, giving mortality rate of 11.78% causing a direct financial loss of \$4300 (Pak Rs. 408500/-). The case fatality rate was about 37 %. The main reason for these outbreaks was the endemicity of PPR so it is recommended that in an endemic country where goat farming is much important for food security issues, there should be proper importance given to PPR and other diseases which are discouraging the investment in goat farming.

Keywords; Goat Farming, PPR viurs, Outbreaks, Pakistan

Introduction

Livestock are natural factories to convert roughage (grasses, shrubs, etc) into quality-food i.e. milk and meat. Goats are well-admired and documented worldwide for providing food in

terms of milk and meat. They are playing a key role in supporting millions of people who are poor, landless and living in the rural areas.

PPR has caused significant economic loss in many parts of Africa and Asia that contain high densities of small ruminant populations. According to a 2009 United Nations Food and Agricultural Organisation (FAO) report, the proportion of the global small ruminant population at risk from PPR is estimated to be 62.5% (OIE, 2009). PPR is considered to be a major limiting factor in the development of the small ruminant industry in disease epidemic areas. It is especially prevalent in developing countries of Africa and Asia, where small ruminants play a vital role in sustainable agriculture employment (Singh et al., 2004).

Pakistan being an agricultural country has a huge livestock population including sheep and goats. The main stock of sheep and goat occurs in form of nomadic and transhumant production system but the goat farming at commercial level for meat production is also emerging as a successful business. Although the goat farming on commercial level is increasing in the country yet there are threats which results this initiative into a loss.

Among these threats, PPR outbreaks are causing huge damages. Every year thousands of goat die through this disease which affect goat production and economy very much. Goat farming is a profitable business so every step should be taken to prevent this disease. One of the major causes of disease spread is unrestricted movements of animals within country and across the broader. This study was designed to highlight the importance and to prevent this threat and point out the possibilities to save goat farming from this risk.

Materials and Methods

Outbreaks Description and Study Plan

Outbreaks were investigated at three commercial farms of goat in various regions of Punjab province (Attock, Taxilla and Rawalpindi) (Figure-1). One farm also had the population of sheep which were also affected (Table 1). The disease started with in one to two months of the establishment of these farms. The animals (6-10 months of age) were purchased from different livestock markets. The average cost of each animal was around \$100 (Pak Rs.9000-10000/ animal).

Collection of Samples and Laboratory Confirmation

Nasal and ocular swabs were taken from the sick animals while the tissue from lungs, liver, spleen, intestines and lymph-nodes were collected from the dead animals. Blood serum was also collected from sick animals.

Twenty swabs and serum samples, collected from clinically suspected animals, were tested for PPRV with Immuno-capture ELISA (IcELISA) and Competitive ELISA (cELISA) respectively. Representative samples of dead animals from each infected herds (05 from each herd) were also taken and tested through Ic ELISA and RT-PCR. The detail of these samples is given in the Table 2.

Tests Used for the Confirmation of Outbreaks

IC-ELISA

The kit used to analyze these samples was imported from World Reference Laboratory for PPR antigen detection (PirBright, UK). Ortho-phenylenediamine (OPD) was used as chromogen and the absorbance was measured at a wavelength of 492 nm. The reader was connected to computer loaded with ELISA Data Interchange (EDI) software (FAO/IAEA, Vienna, Austria), which was used to automate the reading and calculation of percent positivity (PP) values. The OD (optical density) values were converted to percentage positivity and the samples with PP > 18% were considered as positive (Libeau et al., 1994).

cELISA

Competitive enzyme-linked immuno-sorbant assay (cELISA) was carried out to detect the presence of antibodies against PPRV. The PPR competitive ELISA kit (collectively produced by Biological Diagnostic Supplies Ltd, Flow Laboratories and the Institute for Animal Health Pirbright, Surrey, UK) was used in testing and analysis of samples. The test depended on the competition between the anti-N protein of PPRV monoclonal antibodies and the specific anti-N antibodies in the test serum samples binding the PPR antigen (Libeau et al., 1995). The OD values were converted to percentage inhibition and the samples with PI >50% were considered as positive.

RT-PCR

From tissue samples, total cellular RNA was extracted to assess the presence of viral nucleic acid using the Qiagen RNAeasy kit as per the manufacturer’s instructions. Reverse Transcription-Polymerase Chain Reaction (RT-PCR) was performed for the F-gene of PPRV

using one step RT-PCR kit (Invitrogen) as per the manufacturer's instructions. PCR was carried out using PCR primers and conditions as described previously (Forsyth and Barrett, 1995).

Results

Disease started with sudden onset of fever, respiratory and enteric clinical signs and spread quickly. Disease caused mortality of 10-15% and morbidity of 20-40% within a time period of 01 to 03 weeks. At three farms, overall 365 animals were present, among them 116 got disease, giving morbidity rate of 31.78 %. There were 43 animals died, giving an overall mortality rate of 11.78%. The case fatality rate was about 37 % (Table-1).

In terms of economics, overall there was a direct loss of \$4300 (Pak Rs. 408500/-) due to animal death. Also there was loss of animal body condition in diseased animals along with treatment cost.

Among the samples tested, swab and tissue samples were positive with both IcELISA and RT-PCR while all the serum samples were found positive for PPR antibodies (Table-2). All the positive samples on IcELISA gave the high values of PP (Percent positivity) depicting that the samples are from actual outbreak situation.

Discussion

The study presents a very important scenario for the goat farming industry in Pakistan. As the efforts are going on to enhance this industry to meet the food demands, also to improve the quality of meat. The emergence of diseases like PPR has a huge impact on this industry. Due to lack of awareness and unavailability of quality PPR vaccine, the disease has become endemic in Pakistan (Abubakar et al., 2009; Zahur et al., 2011; Abubakar et al., 2011).

One of the interesting finding of the study is different levels of mortality rate at the affective farms. This was the direct loss to the farm but there were also the financial implications like the treatment cost and decline in farm productivity. In a similar study, Thombare and Sinha (2009) presented the data from PPR affected villages pertaining to disease incidence, production losses, costs incurred and impact on farm productivity collected though personal interview method. Reduction in the market value of animals has been recorded as the major loss component as appearance of the animal changes drastically after the illness, costing Rs. 404 (44 %) in sheep and Rs 408 (43%) in goat. It is followed by losses in production yield.

Expenditure on medicine and infertility has been found to cause more than 80 per cent of the total cost, followed by veterinary and labour services. They suggested that timely vaccination could be the best and low-cost preventive measure to control this disease.

Another finding of the study was that the outbreaks occurred after one to two months of farm set-up. The possible explanation for this could be the excretion of PPR viral antigen in some body secretion. Abubakar et al., (2012) gave the idea of PPRV antigen excretion in fecal material in which they described a mechanism of virus transmission following natural infection and that this mechanism may demonstrate a potential method by which PPRV outbreaks occur spontaneously in areas not previously known to have circulating virus. Shedding of PPRV antigen in the fecal matter of the recovered goats following a disease incursion put forward the possibility that goats may be shedding the PPR virus in their fecal matter. These findings are also in agreement with Ezeibe et al. (2008) and may reinforce the idea that virus can sub-clinically infect animals and excrete and/or transmit virus to naïve ‘in contact’ animals.

The main reason for these outbreaks could be the endemic nature of PPR disease in Pakistan and there is no availability of PPR vaccine in routine for goats. So it is recommended that there should be proper importance given to PPR and other diseases which are discouraging the investment in goat farming.

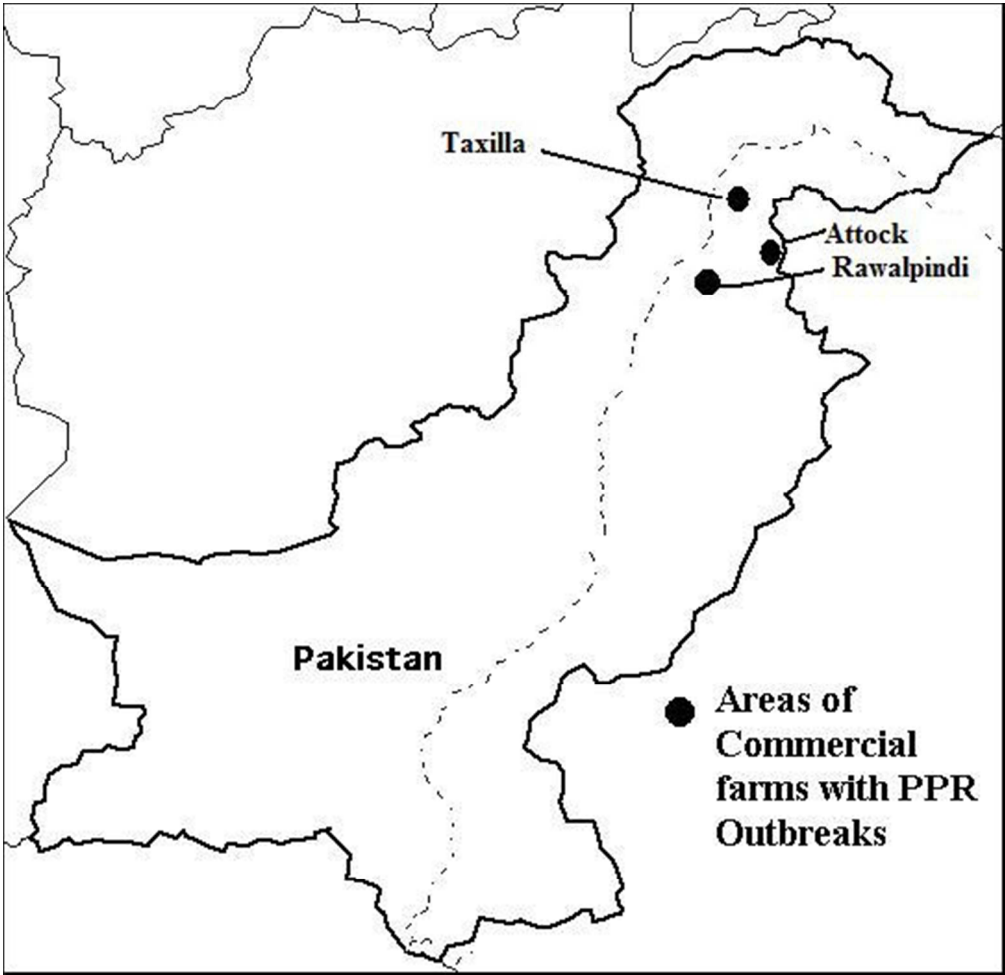
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Table-1: Area-wise distribution of PPR with specie and mortality rate

<i>Area</i>	<i>Animal Species</i>	<i>Total animal kept</i>	<i>Diseased</i>	<i>Mortality</i>	<i>Morbidity rate %</i>	<i>Mortality rate %</i>
Taxilla	Goat	110	35	15	31.82	13.64
	Sheep	35	13	3	37.14	8.57
FatehJung (Attock)	Goat	150	45	18	30	12
Rawalpindi	Goat	70	23	07	32.86	10
Total		365	116	43	31.78	11.78

Table-2: Summary of samples tested with different tests

<i>Type of Samples</i>	<i>No. of Samples</i>	<i>Test Applied</i>			<i>Results</i>
		<i>cELISA</i>	<i>IcELISA</i>	<i>RT-PCR</i>	
Swab	20	--	15	17	Positive for PPR antigen
Serum	20	20	--	--	Positive for PPR antibodies
Tissue	15	--	13	16	Positive for PPR antigen