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Research Article

EPIDEMIOLOGICAL OBSERVATIONS ON PESTE DES PETITS RUMINANTS IN SHEEP AND GOATS IN HARYANA

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ABSTRACT

Analysis of 37 outbreaks of peste des petits ruminants involving 96 flocks of sheep and goats in various districts of Haryana during November 2002 to June 2003 revealed higher disease prevalence in goats than sheep. Majority of the outbreaks were recorded from districts of Haryana bordering Rajasthan. The overall morbidity, cumulative mortality and case fatality rates were 37.57, 22.35 and 59.49%, respectively. The morbidity and cumulative mortality in sheep were 36.40 and 21.17%, respectively, while in goats these were 46.65 and 31.49%. Per cent morbidity, mortality and case fatality rate both in sheep and goats was significantly higher in young animals than in adults. The clinical signs included high temperature (up to 106^{0}F), nasal and ocular discharges, erosions in the buccal cavity, respiratory distress and diarrhoea. Abortions were also recorded in some of the affected animals. Gastroenteritis, pneumonia and swollen lymphnodes were the major post-mortem findings. *Escherichia coli* from diarrheic faeces was isolated from many flocks as secondary pathogen. Treatment of the affected animals with enrofloxacin or gentamicin reduced the mortality rate by preventing secondary bacterial infections. The disease was diagnosed on the basis of sandwich ELISA and competitive ELISA. Direct economic losses to farmers due to the death of animals were also estimated to the tune of about Rs. 60 lacs during this period.

Key words: Epidemiology, PPR, sheep and goats, Haryana

Peste des petits ruminants (PPR) is an acute and highly contagious viral disease of sheep and goats, and is frequently associated with high morbidity and mortality. Etiologic agent has been classified as a member of the genus *Morbillivirus* of the family *Paramyxoviridae*. PPR virus is antigenically closely related to rinderpest virus, canine distemper virus and human measles virus. In India, the PPR virus was first isolated from a suspected outbreak of rinderpest among sheep in Tamil Nadu (Shaila *et al.*, 1989). Subsequently, the disease has been reported from many states of the country viz. Himachal Pradesh (Joshi *et al.*, 1996), Orissa (Nayak *et al.*, 1997), Maharashtra (Bhikane *et al.*, 1997), Andhra Pradesh (Anjaneyalu and James, 1999), Uttar Pradesh (Kumar *et al.*, 2001), Punjab (Dhand *et al.*, 2002) and West Bengal (Jana and Ghosh, 2002). The present paper describes some epidemiological observations on PPR outbreaks in sheep and goats in Haryana, a northern state of India.

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MATERIALS AND METHODS

Epidemiological observations: Thirty seven outbreaks of PPR affecting 96 flocks of sheep and / or goats in five districts of Haryana bordering Rajasthan viz. Bhiwani, Hisar, Sirsa, Fatehabad and Jhajjar during November 2002 to June 2003 were investigated. The data relating to morbidity and mortality in young as well as adults were statistically analyzed using the Chi square test (Snedecor and Cochran, 1980). Clinical signs in affected animals were also recorded. At necropsy, gross changes were recorded.

Collection of faecal samples: Diarrheic faecal samples (n=40) collected aseptically from affected animals were inoculated on Mac Conkey's lactose agar and blood agar for isolation of the secondary bacteria, if any. The plates were incubated at 37^{0}C for 24 h. The isolates were

identified by different biochemical tests as per standard protocol.

Detection of PPR virus antigen: Nasal swabs from live affected animals, and pieces of lungs, spleen and liver tissues at necropsy collected from twenty outbreaks were processed for detecting PPR antigen using sandwich ELISA kit obtained from Indian Veterinary Research Institute, Mukteswar. This test utilizes a monoclonal antibody directed against an epitope of nucleoprotein of PPR virus (Singh, 2002).

Serological analysis: Blood samples (n=250) from live affected animals collected from all the outbreaks were processed for antibody detection by competitive ELISA kit obtained from Indian Veterinary Research Institute, Mukteswar. This test utilizes a monoclonal antibody directed against a neutralizing epitope of hemagglutinin protein of PPR virus (Singh *et al.*, 2004).

RESULTS AND DISCUSSION

During the eight months period (November 2002- June 2003), the overall morbidity, cumulative mortality and case fatality rate (CFR) in sheep and goats were 37.57, 22.35 and 59.49 per cent, respectively in the 96 flocks affected due to the disease. In sheep, the morbidity and cumulative mortality were 36.40 and 21.17 % while in goats, these were 46.65 and 31.49 %, respectively (Table 1). The CFR were 58.16% and 67.49% in the sheep and goat population, respectively. Per cent morbidity and mortality in both sheep and goats was significantly higher in young animals than in adults. The CFR in young animals (below 6 months) was higher than adults (sheep 73.53 vs 48.80% and goats 75.49 vs 59.29%) (Table 2). Majority of the outbreaks (23) were from Hisar district followed by Bhiwani (8), Fatehabad (3) and Sirsa (2), while only one outbreak was recorded from Jhajjar district (Fig. 1).

In the present study, comparative analysis of per cent morbidity and mortality revealed that these were higher in goats than in sheep. Likewise, the CFR was also more in goats. Similar observations in respect of morbidity,

Table 1
Epidemiological details of PPR outbreaks in sheep and goats in the state of Haryana during November 2002–June 2003

Month	Place	Type of flock	No. of outbreaks	No. of flocks affected	Sheep			Goat		
					Total No.	Affected	Died	Total No.	Affected	Died
Nov., 02	Hisar	NM	01	01	69	25	13	Nil	Nil	Nil
Dec., 02	Sirsa	M	01	01	250	33	10	Nil	Nil	Nil
Jan., 03	Hisar	M	01	05	630	206	118	40	21	13
		NM	02	04	1560	580	310	620	310	145
	Sirsa	NM	01	06	194	56	21	111	65	46
Feb., 03	Hisar	M	01	01	33	15	10	Nil	Nil	Nil
		NM	01	01	Nil	Nil	Nil	250	55	12
	Jhajjar	NM	01	08	1680	540	202	Nil	Nil	Nil
Mar., 03	Hisar	M	03	04	1935	1014	731	20	05	Nil
		NM	04	07	1185	474	321	243	169	145
	Bhiwani	NM	04	07	460	137	106	430	267	242
Apr., 03	Hisar	M	02	02	2540	580	190	36	Nil	Nil
		NM	02	07	1419	815	340	Nil	Nil	Nil
	Bhiwani	M	01	01	425	120	55	110	18	08
May, 03	Hisar	M	04	26	2671	843	568	228	90	61
	Bhiwani	M	02	04	1716	465	284	105	18	08
		NM	01	01	45	06	03	Nil	Nil	Nil
	Fatehabad	NM	01	01	210	90	65	30	19	14
Jun., 03	Hisar	NM	02	05	860	471	392	70	38	32
	Fatehabad	NM	02	04	216	118	93	41	14	09
	Total		37	96	18098	6588 (36.40)	3832 (21.17)	2334	1089 (46.65)	735 (31.49)

M= Migratory flocks from Rajasthan, NM = Non-migratory flocks belonging to Haryana.
Figures in parenthesis indicate percentage.

Table 2
Morbidity, mortality and CFR indices in young and adult sheep and goats

Age group	Sheep				Goat			
	Total	Morbidity	Mortality	Per cent CFR	Total	Morbidity	Mortality	Per cent CFR
Young (< 6 months)	4353	2494[a] (57.29)	1834[a] (42.13)	73.53	748	551[a] (73.66)	416[a] (55.61)	75.49
Adults (> 6 months)	13745	4094[b] (29.78)	1998[b] (14.53)	48.80	1586	538[b] (33.92)	319[b] (20.11)	59.29
Total	18098	6588 (36.40)	3832 (21.17)	58.16	2334	1089 (46.65)	735 (31.49)	67.49

Figure in parenthesis indicate percentage,
Different superscripts (a, b) within a column indicate significant difference at $P<0.05$, CFR - Case fatality rate

mortality and CFR have been made by Kumar *et al.* (1999) in Uttar Pradesh and Dhand *et al.* (2002) in Punjab. High morbidity rate (90%), mortality and CFR 70%) were also reported in an outbreak of PPR in goats from Saudi Arabia (Abu Elzein *et al.*, 1990). The cumulative mortality and CFR in the present study were significantly higher in young animals than adult animals. This may be attributed to peracute course of the disease in young animals due to poorly developed immune system. The protection in general in this group is passively acquired through maternal antibodies which gives protection for 3-4 months. Further, it is also possible that due to high viral load in the environment, the antibodies thus acquired may fail to protect the young animals.

The affected animals were depressed, anorectic, and unable to walk, and had high body temperature upto 106^{0}F. Later they had nasal and ocular discharges which were watery initially but became purulent subsequently. The crusting of nostrils presented difficulty in respiration. The feed intake was drastically reduced in affected animals. Fetid diarrhoea was observed in most of the affected animals at later phase of the disease. The body temperatures in diarrheic animals were invariably normal to subnormal. Such animals were moderately to severely dehydrated. Some animals had erosive ulceration of the muzzle, dental pad and gums. In some cases, necrotic lesions were seen at the base of the incisors. Mild to severe coughing was noticed in most cases. In severely affected flocks (30), abortions were also recorded. The course of the disease in these outbreaks varied from 2-10 days.

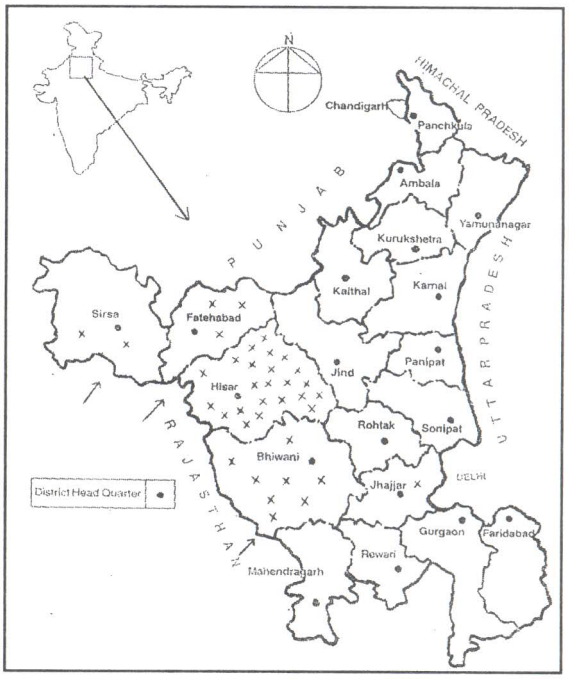

Fig.1. Spatial distribution of PPR outbreaks in sheep and goats in Haryana state during Nov. 2002 to June 2003 (small arrows indicate direction of movement of animals).

Almost similar type of clinical picture has been recorded earlier by other workers (Abu Elzein *et al.*, 1990, Roeder *et al.*, 1994, Kumar *et al.*, 1999, Dhand *et al.*, 2002).

Post-mortem examination conducted on both sheep and goats available from 15 outbreaks revealed ulcerative lesions in the buccal cavity, mild erosions in large intestines and severe gastroenteritis. Large intestines were severely congested and had haemorrhagic streaks. In most cases, pneumonic changes were recorded in the respiratory tract and lymph nodes were also swollen.

All the serum samples from these outbreaks

were found positive for PPR antibodies by competitive ELISA. Besides, three nasal swab samples analyzed by sandwich ELISA showed presence of PPR antigen thus confirming the disease. In convalescent diarrheic animals, *E. coli* was isolated from the faeces. The affected animals were treated with enrofloxacin or gentamicin alongwith supportive therapy. Treatment initiated during an early phase proved successful in reducing the mortality by preventing complications with secondary bacterial invasion. Similar observations have been made by Kumar *et al.* (2001). In the present study, only *E. coli* was isolated from diarrheic faeces. However, isolation of other bacteria like *Corynebacterium* spp., *Staphylococcus* spp., *Streptococcus* spp., *Pasteurella* spp. etc. has also been reported by others (Ugochukwu and Agwu, 1991, Kumar *et al.*, 2001). Considering that an adult sheep/ goat costs on an average Rs. 1,500/- and the young animal (less than six months) Rs. 300/-, the total direct loss has been Rs. 59, 68, 500/- during a period of 8 months. These economic losses to the farmers might be still higher if other parameters viz. production losses, treatment costs etc. were also taken in consideration.

Shaila *et al.* (1989) for the first time recorded PPR in sheep from Tamil Nadu during 1987. Later on, the disease spread to other southern states and thereafter to northern part of India. Nanda *et al.* (1996) isolated PPR virus for the first time from outbreaks in North India in 1994. However, the disease has been recorded from November 2002 onwards in the state of Haryana. Due to draught conditions in Rajasthan state during 2002, lot of sheep and goat flocks owned by migratory nomads shifted to neighboring districts in Haryana for grazing and these flocks moved continuously from one place to another. During this movement, local sheep and goat population came in contact with these animals in common grazing areas at many places. It appears that among the migratory flocks from Rajasthan state, some were affected with PPR which served as source for spread of the virus to other apparently healthy flocks (both migratory and non-migratory) due to regular movement and contact with other flocks. It is for this reason that the outbreaks recorded in the present study involved both migratory from Rajasthan and natives non-migratory flocks of Haryana. Since the disease was not observed previously in the state, vaccination against PPR in Haryana was not practiced. In this study, therefore, the sero-conversion is reflective of exposure of the animals to PPR virus. The detection of PPR antigen further supports this observation.

Sheep and goat rearing in Haryana is mainly done by small and marginal farmers and in majority of the cases, these animals are the only source of their livelihood. Majority of the outbreaks remain unreported due to lack of sound disease reporting system. Due to widespread occurrence of this disease among sheep and goats, the vaccination needs to be carried out on regular basis so that the losses due to PPR can be averted.

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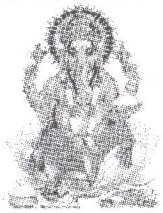

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