

A short note on peste des petits ruminants in Karnataka, India

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Summary

Retrospective quantitative analysis of epidemiological data on peste des petits ruminants (PPR) from the Department of Animal Husbandry and Veterinary Sciences in Karnataka, southern India, revealed significant information about the disease in this area. In the nine years between April 1998 and March 2007 a total of 624 outbreaks were reported in the state. With the exception of the 12-month period between April 2001 and March 2002 the disease occurred every year. The study shows clearly that incidences were highest during the rainy season and in the dry agro-climatic zones. The density of the PPR-susceptible population in different districts of the state played a major role in disease incidences. Environmental factors also influenced disease occurrence. Vaccination programmes are slowly being taken up in the state. The disease data documented in this study provide information about the endemicity of the disease that can help to formulate an effective strategy for a PPR-control programme in the state.

Keywords

Agro-climatic zones – Annual trends – Endemicity – Epidemiology – India – Peste des petits ruminants – Spatial distribution – Susceptibility – Vaccination.

Introduction

Peste des petits ruminants (PPR) is an important contagious viral disease of goats and sheep, often associated with high morbidity and mortality. The disease is characterised by necrotic stomatitis, catarrhal inflammation of the ocular and nasal mucosa, and pneumonia, followed by diarrhoea and death. It was first reported in sheep and goats in 1942 in Côte d'Ivoire, West Africa. The disease is caused by PPR virus, which has been classified as the fourth member of the genus *Morbillivirus* of the family *Paramyxoviridae*. Up to 100% of the animals in a flock may be affected in a PPR outbreak, with between 20% and 90% dying. Peste des petits ruminants virus exists in four lineages; three are prevalent in Africa and virus isolates of Asia are grouped under lineage four (2, 6). In India the disease was first reported in 1987 in a small

sheep flock in the village of Arasur in Tamil Nadu state (5), and by 1995 it had spread to cover the whole country. Since the eradication of rinderpest from the country, PPR has been the major health threat in small ruminants. Economic losses in India due to PPR alone have been estimated to be 1,800 million Indian rupees (US\$39.4 million) annually (1).

Karnataka state is situated between latitudes 11° 40' and 18° 27' and longitudes 74° 50' and 78° 33' in the centre of western peninsular India. It covers an area of 19.1 million hectares (Mha) and accounts for 5.8% of the country's total geographic area. According to the 2001 provisional census the population of the state is 52.6 million. The majority of the population (66.02%) live in rural areas and depend on animal husbandry for their livelihood. Sheep and goats are kept largely by low-income, landless villagers for whom such activity provides the main source of income. The

disease was reported in the state for the first time in 1992 (7) and is considered to be the major threat to the small ruminant population and hence to the farmers.

Karnataka is divided into ten agro-climatic zones that have been established by taking into consideration the following geographical features:

- topography
- elevation
- rainfall (pattern, distribution and total quantity)
- the major crops and type of vegetation
- the type, texture, depth and physiochemical properties of the soil.

The ten zones are as follows:

- North-eastern transition zone
- North-eastern dry zone
- Northern dry zone
- Central dry zone
- Eastern dry zone
- Southern dry zone
- Southern transition zone
- Northern transition zone
- Hilly zone
- Coastal zone.

This paper attempts to analyse the occurrence, endemicity and spatial and temporal distribution of outbreaks of PPR in the state of Karnataka since 1998, the year in which the Animal Disease Surveillance Unit of the Animal Husbandry and Veterinary Services Department started keeping records on the disease.

Materials and methods

The data on the sheep and goat population used in the present study were from the 2003 census. The source of the data on the epidemiology of PPR infection in various parts of Karnataka was the Office of the Deputy Director for Disease Surveillance and Monitoring at the Department of Animal Husbandry and Veterinary Services in Bangalore. The data were transmitted from the local field veterinarians to the Office of Disease Surveillance through the deputy directors of the districts concerned. Quantitative data on PPR outbreaks, diseased/sick animals and deaths were collected for the period April 1998 to March 2007 (monthly and district breakdowns were available). The data on PPR vaccination coverage in the state were also collected from the Office of the Deputy Director for Disease Surveillance and Monitoring.

Table I
Number of outbreaks, diseased animals and deaths due to peste des petits ruminants in Karnataka, April 1998 to March 2007

Year*	Outbreaks	Diseased animals	Deaths
1998-1999	5	85	7
1999-2000	6	699	63
2000-2001	15	1,242	248
2001-2002	0	0	0
2002-2003	148	7,293	884
2003-2004	70	1,620	301
2004-2005	184	4,370	716
2005-2006	169	3,448	412
2006-2007	27	683	66

*Each twelve-month period runs from April to March

Results

Between 1998 and 2007, a total of 624 PPR outbreaks were reported from different districts of Karnataka. The number of outbreaks, diseased animals and deaths has been summarised in Table I. The highest number of outbreaks was reported between April 2004 and March 2005 and the second highest number was reported in the twelve months after that (2005 to 2006). Between April 2001 and March 2002 no outbreaks were found. The monthly average outbreak pattern of the disease is shown in Figure 1. The incidence of PPR outbreaks increased gradually during the late-monsoon and pre-winter periods and the greatest number of outbreaks was observed during winter, with a peak in February (18 ± 9.8). The lowest number of outbreaks was seen in the month of April (1.5 ± 0.72).

Details of each agro-climatic zone, including their size and the density of susceptible livestock, are given in Table II. The number of outbreaks in the different zones is shown in Figure 2. The vaccination status of the state has been given in Table III.

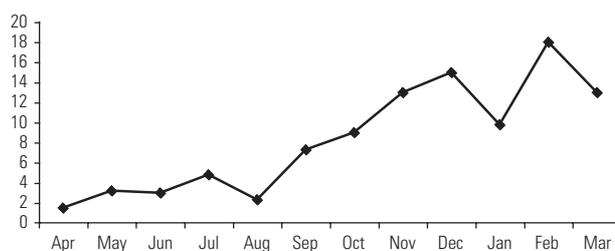


Fig. 1
Average monthly peste des petits ruminants outbreaks in Karnataka, April 1998 to March 2007

Table II
Outbreaks of peste des petits ruminants in Karnataka (April 1998 to March 2007) and the size and density of susceptible populations in the different agro-climatic zones

Zone	Area (km ²)	Susceptible population	Density (No. of animals/km ²)	Outbreaks
North-eastern zone	5,448	197,342	36	1
North-eastern dry zone	23,051	1,679,520	159	27
Northern dry zone	50,779	4,017,799	461	101
Central dry zone	24,961	2,461,175	279	311
Eastern dry zone	16,228	1,344,137	221	118
Southern dry zone	16,916	1,145,687	210	12
Southern transition zone	22,492	440,357	61	23
Northern transition zone	9,083	422,147	90	9
Hilly zone	14,393	35,963	4	0
Coastal zone	8,440	19,587	5	0

Discussion

Peste des petits ruminants may have passed unrecognised for years because it is frequently confused with other diseases that cause respiratory problems and mortality of small ruminants. The true extent of the disease has only become apparent in recent years and is still being clarified. Now it is considered to be the most serious disease threat to the small ruminant industry, causing tremendous economic losses. The study of annual occurrence of PPR in Karnataka showed that the highest number of outbreaks occurred between April 2004 and March 2005, the second highest number occurred in the following year, with a reduction in the number of outbreaks thereafter. From 1998 to 2002 very few outbreaks were reported (there were none at all between April 2001 and March 2002). This may be due to lack of efficient feedback from the field. Variation in the annual occurrence of the disease may be the result of various factors, including host, agent or environmental factors.

Analysis of the monthly occurrence of the disease showed that August had very few outbreaks but that the number

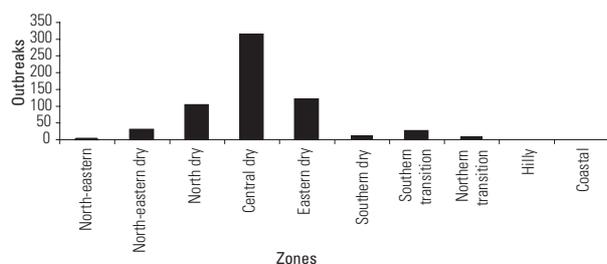


Fig. 2
Distribution of peste des petits ruminants in the agro-climatic regions of Karnataka, April 1998 to March 2007

Table III
Vaccination coverage against peste des petits ruminants in Karnataka, April 2002 to March 2007

Year*	Doses
2002-2003	196,218
2003-2004	859,346
2004-2005	1,612,692
2005-2006	3,480,409
2006-2007	4,621,871

*Each twelve-month period runs from April to March

started to increase slowly from then until December, with a peak in February. The sudden onset of the rainy season in the middle of June may be a factor in this increase. Rainfall causes animals to huddle together, enhancing close contact (a major transmission route for PPR), and high relative humidity values are associated with virus survival in aerosols. Occurrence of the disease in the wet months has also been reported in African countries by earlier workers (4). Movement of animals due to increased sheep trade mainly in the months of November and December might be an additional factor for the occurrence of the disease (other workers have reported similar findings in the state [3, 7]). The peak in the number of outbreaks in February, during the cold dry season, may be because the dusty winds that occur at this time are a risk factor for respiratory tract contamination by air.

Data clearly indicate that the disease is more prevalent in the dry zones. The dry zone covers an area of 12.03 Mha and accounts for approximately 90% of the susceptible population in the state. These areas will receive around 600 mm to 800 mm of rain per year, 50% to 55% of which will fall in the months of September and October, which might help in the onset of the disease. Most of the sheep-

rearing farmers are nomadic and concentrate mainly on these areas, which may explain the large number of outbreaks in this zone. There is no record of the disease having occurred in hilly and coastal zones. Although these areas cover an area of 3.73 Mha the susceptible population is far smaller (only 0.5% of the total population).

Vaccination coverage

The primary PPR control method implemented in Karnataka is vaccination. The Institute of Animal Health and Veterinary Biologicals only began producing live attenuated homologous vaccine on a large scale in 2004. Prior to that, the sheep and goats were protected using an experimental batch of the vaccine. The reduction in the number of outbreaks in 2006 and 2007 suggests that the large-scale preventive vaccination carried out in the state

was effective in helping to control the disease. However, there is a need to increase control and to introduce mass vaccination of all the susceptible population of small ruminants.

Conclusion

Peste des petits ruminants occurs throughout the year but is most prevalent between October and March, reaching a peak in February. The most appropriate time to vaccinate flocks is, therefore, in the months of August and September. It is important to undertake preventive vaccination to eradicate the disease. In addition to virus and host factors, environmental conditions should be considered when attempting to eradicate this disease with appropriate vaccines. ■

Brève note sur la peste des petits ruminants au Karnataka, Inde

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Résumé

Une analyse quantitative rétrospective des données sur l'épidémiologie de la peste des petits ruminants (PPR) disponibles auprès du Département de l'élevage et des sciences vétérinaires de l'État du Karnataka, au sud de l'Inde, a montré que la présence de cette maladie dans la région est bien documentée. Au total, 624 foyers ont été notifiés dans cet État durant les neuf années écoulées entre avril 1998 et mars 2007. Des foyers ont été enregistrés chaque année, à l'exception d'une période de 12 mois entre avril 2001 et mars 2002. L'étude montre clairement que l'incidence est plus élevée pendant la saison des pluies et dans les zones agro-climatiques arides. La densité des populations d'animaux susceptibles à la PPR dans les différents districts de l'État a joué un rôle déterminant sur l'incidence de la maladie. L'apparition de foyers est également influencée par des facteurs environnementaux. Des programmes de vaccination ont été progressivement mis en place dans cet État. Les données réunies dans cette étude fournissent des informations sur le caractère endémique de la PPR, qui seront utiles pour concevoir une stratégie de lutte efficace contre cette maladie au Karnataka.

Mots-clés

Distribution géographique – Endémicité – Épidémiologie – Inde – Peste des petits ruminants – Sensibilité – Tendances annuelles – Vaccination – Zone agro-climatique. ■

Breve nota sobre la peste de pequeños rumiantes en Karnataka (India)

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Resumen

Los autores describen un análisis cuantitativo y retrospectivo de los datos epidemiológicos sobre la peste de pequeños rumiantes (PPR) realizado a partir de los datos del Departamento de Producción Animal y Ciencias Veterinarias de Karnataka, en el sur de la India, estudio que deparó información importante sobre la enfermedad en esa zona. En los nueve años transcurridos entre abril de 1998 y marzo de 2007 se notificaron en el estado un total de 624 brotes. Con la excepción de los 12 meses comprendidos entre abril de 2001 y marzo de 2002, la enfermedad apareció todos los años. El estudio pone claramente de manifiesto que las mayores tasas de incidencia se registraron durante la estación de lluvias y en las zonas agroclimáticas secas. La densidad de la población sensible a la PPR en diferentes distritos resultó un factor determinante en las tasas de incidencia, aunque también influyeron los factores ambientales. Poco a poco se empiezan a instituir programas de vacunación en el estado. Los datos sobre la enfermedad reunidos en el estudio proporcionan información acerca de su endemicidad, que puede resultar útil para definir una estrategia eficaz destinada a poner en marcha en el estado un programa de lucha contra la PPR.

Palabras clave

Distribución espacial – Endemicidad – Epidemiología – India – Peste de pequeños rumiantes – Sensibilidad – Tendencias anuales – Vacunación – Zonas agroclimáticas.



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