Prevalence of Haemorrhagic Septicaemia in Cattle and Buffalo in Punjab, Pakistan

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Abstract
The objective of the study was to determine prevalence of haemorrhagic septicaemia in cattle and buffalo in Punjab, Pakistan. Data collected from all districts of Punjab during 2004-2005, 2005-2006 and 2006-2007 was analysed by using Arc GIS ver. 9.1 (ESRI).
An overall prevalence of 5.86% was calculated during the year 2004-05 while in cattle, prevalence of 4.34% and in buffalo, prevalence of 7.92%, was recorded. An overall prevalence of 5.71% was calculated during the year 2005-06 while the value for the year 2006-07 were 9.41%. Statistical analysis was elaborated by applying one way ANOVA. A highly significant difference (P< 0.001) was found between morbidity, mortality and case fatality rates during the study years. By applying multiple comparisons using LSD to know the groupwise comparison, a significant (P< 0.01) difference in cattle affected, buffalo affected and total affected, cattle dead, buffalo dead and total dead was observed between the study years. However no significant difference (P>.22) in these parameters was found in years 2005-06 and 2006-07 respectively. Arc-GIS Geo-statistical analyst was used to interpolate the prevalence of animals affected with HS in Punjab during the years (2004-07). The spatial trend for the respective years was showing increasing trend for total prevalence in north western, western and south western regions of Punjab.

Key words: prevalence, Haemorrhagic septicaemia, cattle and buffalo, Punjab, Pakistan

Introduction
Haemorrhagic septicaemia is a primary pasteurellosis caused by Pasteurella multocida. The disease is more common in tropical climate i.e., in South and South East Asia, the Middle East and in Central Africa. In Pakistan it is known as “galghooto” due to its typical signs. Haemorrhagic septicaemia occurs most commonly in cattle and buffalo. Buffalo is more susceptible than cattle. In Pakistan and India, more susceptibility of buffalo was reported¹-²⁶ and the disease occurred more frequently in poor husbandry conditions. The carrier status is a serious problem and has a major epidemiological impact by providing continuous foci of infection.¹² Clinical symptoms are often not observed but include high temperature, loss of appetite, nasal discharge, increased salivation and laboured breathing with swellings in the sub-mandibular region and mortality is virtually 100% in affected animals. Pakistan has a cattle population of 31.8 million and buffalo population of 29.0 million; the later are being proportionately higher than most other countries in the region.⁵ Nili Ravi buffalo, which is 76.6% of the buffalo population in the country and is the main stay of dairy industry in Pakistan.²¹ More than 29.9 million head population of buffalo
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contribute about 75% of total milk production in the country. Annual economic losses from HS were estimated as 1.89 billion (PKR) or US $ 189 million per annum. Outbreaks of highly contagious diseases are seriously disrupting domestic economies, severely affecting the global economy and international trade of livestock and animal commodities. Pakistan lies in an endemic zone of haemorrhagic septicemia so an immediate and effective regional and international response is needed to curtail the rise as a result of international trade and movement of people and animals.

Current animal health data management system in Pakistan is still conventional and is not able to fully incorporate the spatial components of animal health information. A proper understanding of the geographical distribution of disease is essential for the development of national disease control programme, the establishment of disease free zones and management of veterinary resources. The use of GIS have the ability to manage geographical, spatial and temporal distribution of the disease before the implementation of effective control and surveillance strategy.

Materials and Methods

Prevalence of the haemorrhagic septicaemia was studied in districts of Punjab, Pakistan during three years (2004-2007), for which a data was collected from all districts of Punjab. Morbidity, was calculated for individual species (cattle and buffalo) as well as total morbidity %age, combined for both species.

All the analysis was carried out using SPS statistical package, (SPS version 13). The morbidity, along with bovines (cattle and buffalo) population was mapped by using Arc GIS version 9.1 (Nespak, Islamabad). ANOVA was applied to ascertain the significance in morbidity %age during the study period. Multiple comparisons were performed by applying Least Significant Difference (LSD) test. Arc GIS Geo-Statistical analyst was used to interpolate the morbidity of animals affected with HS in Punjab during the years (2004-07) by using Arc GIS ver. 9.1 (ESRI). By using kriging interpolation the spatial trends in prevalence of animals (cattle and buffal0) for the respective years is documented in maps. The risk factors were taken as variables which have direct correlation with prevalence of HS. [Figure 7,8,9].

Results

The data collected on the prevalence of haemorrhagic septicaemia in cattle and buffalo, from all districts of Punjab, Pakistan was analysed by using GIS Arc version 9.1, various thematic maps were integrated to highlight different prevalence parameters like population density and morbidity during 2004-2005, 2005-2006 and 2006-2007. The information merging procedures by map version overlay method was used which showed darker and lighter areas. The darker area on the map indicated more population density [Map 2,4,5].

Prevalence of HS in Both Cattle and Buffalo in 2004-2005.

Morbidity percentage of HS in both cattle and buffalo for each district was 5.865% during 2004-2005. The total population density of both cattle and buffalo as shown on maps [Fig. 1, 2], district Kasur was having the highest density (333 heads/ sq.km) and district Bahawalpur showed the lowest population density (21 heads/sq.km). Total prevalence rate of both cattle and buffalo during the year 2004-05 was the highest in district Jhelum (8.51%) and the lowest in district Rahim Yar Khan (3.69%). In cattle, an overall prevalence of 4.34% was calculated. In buffalo an overall prevalence of 7.92% was calculated.

Prevalence of HS in Both Cattle and Buffalo in 2005-06

When prevalence of HS in both cattle and buffalo was studied from the data collected during 2005-2006 the total average prevalence calculated was 5.71%. GIS maps showed the population density of both

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cattle and buffalo as the highest in district Kasur (370 heads/sq.km) while it was the lowest in district Rajanpur (45 heads/sq.km). Similarly total prevalence was the highest in district Jhelum (8.38) and it was the lowest in district Rahim Yar Khan. [Fig. 3,4]. In cattle, prevalence of 5.83% was recorded in 2005-06. In buffalo, prevalence of 7.44% was recorded in 2005-06.

Prevalence of HS in Both Cattle and Buffalo in 2006-2007
Total prevalence of both cattle and buffalo was 9.41%. It was the highest in district Layyah (15.57%) and the lowest in district. Rawalpindi (2.94%). Total population density of both cattle and buffalo for the year 2006-2007 was the highest in district Sialkot (316 heads/sq.km) and was the lowest in dist. Rajanpur (20 heads/sq.km) [Fig. 5,6]. In cattle, an overall prevalence of 7.36% and in buffalo, an overall prevalence of 11.31%, was recorded during the year 2006-07.

Kriging Interpolation to Assess Disease Trends during 2004-07.
ArcGIS Geo Statistical analyst was used to interpolate the prevalence of HS in Punjab during the years 2004-07 [7,8,9]. It was clear that the total prevalence trend for both cattle and buffalo during 2004-05 was more in north western and western leading to southern Punjab i. e, district Attock. Mianwali, Bhakkar, Layyah, D.G. Khan and Rajanpur (12-18%). In cattle, the prevalence trend was more evenly distributed in 2004-05 (4.3-4.7%) with slightly increasing trend in few areas (4.7-5.1%), while buffalo showed a very high trend of disease (12-18%) in north western, western leading to southern Punjab.

For the year 2005-06, the total prevalence trend for both cattle and buffalo was in increasing phase in northern Punjab i. e, district Jhelum, Chakwal and Sargodha (5.2-8.3%) but in case of cattle it was more in north eastern and eastern Punjab i. e, district Sialkot, Narowal, Gujranwala, Gujrat, Lahore and Sheikhpura (6.3-6.8%). In buffalo, the prevalence trend was greater in north west and west leading to north west Punjab than in other regions (8.2-16%).

When total prevalence trend of HS during 2006-07 was studied it was observed more in western Punjab i.e, district D.G. Khan and adjacent Layyah and Muzaffargarh districts (11-13%) [Fig.9]. In case of cattle it was more in west i.e, district Mianwali leading to west southern and southern Punjab (7.6-9.6%) while buffalo showed increasing trend in west and in east and central east (9.7-17%).

Discussion
Pasturella multocida is associated with a variety of diseases in animals causing haemorrhagic septicaemia in cattle and buffalo, fowl cholera in poultry, atrophic rhinitis in pigs, snuffles in rabbits, pneumonia and septicaemic pasteurellosis in sheep, goat, wild animals and human11. Human infection is generally associated with some form of animal contact 17, 9. Haemorrhagic Septicaemia is an endemic disease in most countries of Asia and Africa. Pakistan falls in category-A 14 where large cattle/buffalo population in respect to the existing infrastructure and the limited operational capabilities of their veterinary services exists 8. A national programme for the control and eradication of prevalent diseases should be launched immediately 2

The actual prevalence of the disease in Pakistan is still unaccomplished and need to be estimated on sound basis. GIS is a powerful tool of managing data related to disease outbreaks and designing surveillance strategies and monitoring spatial-temporal trends of the disease 13. A GIS web based animal health surveillance system was built in Turkey in order to monitor and analyse Avian Influenza outbreaks which proved excellent for the management of the disease outbreaks and enhancement of the response mechanism of the decision makers 6. In the present study the data collected from all districts of Punjab were subjected to GIS software for analysis, a comparison was made between population density and morbidity rate during the year 2004-2007 as 34 gave an overview of application of GIS in epidemiological studies.

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Total prevalence during the year was the highest in district Jhelum and the lowest in district Rahim Yar Khan. In district Jhelum though total cattle and buffalo population density is less but due to less or no vaccination, late reporting of the disease, lack of early treatment and more average rainfall etc, the prevalence of the disease might be high. Moreover the meteorological data obtained from Pakistan Meteorological Department for the years 2004-07 showed more recorded rain in district Jhelum in comparison with other districts. Hot and humid weather was the major contributing factor in outbreaks of HS. The farmer's education regarding vaccination and early reporting have a significant role in the control.

When comparison was made individually for cattle and buffalo, in district Lahore, the cattle prevalence were towards the highest range while variations occurred in rest of the districts. The explanation for the variation would again be the same as good management at the farm level can minimize the impact of risk factors. Overall it was observed that during the year 2004-05, 2005-06 total prevalence was 5.86% and 5.71% respectively and in the year 2006-07, higher prevalence (9.41%) was observed. Individually if cattle prevalence was studied, it was in the range of 4.34-7.36% while in buffalo, HS prevalence in the three years were higher than cattle, 7.44-7.92% in 2004-06 and 11.31 in 2006-07. The upward trend in prevalence of the disease may reflected limited operational capabilities of veterinary services or more impact of risk factors. There are also other reports for higher incidence in buffalo than in cattle.

Prevalence in the whole Punjab was in the range of (2.2-15.57) in the present study. Results are similar to who reported prevalence (2-12%) in villages of Uttarakhand, western Uttar Pradesh, India. While reported a prevalence of 2.44% in districts of Haryana, India. showed 11% incidence, 9% mortality and 78% case fatality rates of HS in buffalo in only one district (Lahore) of Pakistan. evaluated the prevalence of various livestock diseases particularly Trans-boundary Animal Diseases (TADs) by using different tools of Participatory Disease Surveillance (PDS). Analysis indicated that haemorrhagic septicaemia was the most important disease while foot and mouth disease was the most prevalent disease in the area.

Statistical analysis by ANOVA, showed a highly significant difference (P<0.001) between morbidity, mortality and case fatality rates. A significant difference was found among the cattle and buffalo and total density in the years under study period. Multiple comparisons were performed using LSD to know the group-wise comparison. A significant (P<0) difference in cattle affected, buffaloes affected and total affected, cattle dead, buffaloes dead and total dead was observed between the years 2004-2005, 2005-2006 and 2006-2007. However no significant difference (P>.22) in these parameters was found in years 2005-2006 and 2006-2007 respectively. studied the prevalence and importance percentage of haemorrhagic septicemia in Pakistan but the source of data was Participatory Disease Surveillance (PDS) reports which were mainly the type of questionnaire based upon knowledge of farmers, traditional and oral history. The present study is more meaning full and organized regarding the recorded data in all districts of Punjab, Pakistan by technical staff of livestock department and GIS based analysis and statistical comparison between the species and years. Sero-surveillance of HS in buffalo and cattle was determined in district Dera-Ghazi-Khan (southern Punjab). The average geometric mean titres (GMT) calculated in diseased buffalo and cattle was 5.7 and 6.1 respectively. The study revealed more susceptibility of young animals and buffalo for the disease. During an outbreak of haemorrhagic septicaemia in buffalo calves, a mortality of 31.48% was recorded with peak on 8th day (37%)
Modern Kriging meta model covers the whole experimental area. Therefore, in the present study ArcGIS Geo Statistical analyst was used to interpolate the prevalence of the disease in Punjab during the years (2004-07). The spatial trends in prevalence of animals (cattle and buffalo) for the respective years have been documented. More disease trend was observed in north western and western regions during 2004-05 and 2005-06. The situation was same in buffalo but a variable trend was observed in cattle i.e from central to eastern Punjab during 2004-06 and switched over to west during 2006-07. The variation can be explained in terms of immense transportation of cattle (slaughter) especially on the occasion of Eid-ul-Azha (religious ceremony) The spatial trends of HS is helpful in disease monitoring and designing control and surveillance strategy.

References


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