Tropical Agricultural Research Vol. 7 1995, 89-95

Some Epidemiological Parameters of Black Quarter among Cattle and Buffaloes in Sri Lanka

L.N.A. Gamage and T.G. Wijewardana

Veterinary Research Institute, PO Box 28
Gannoruwa, Peradeniya.

ABSTRACT. An epidemiological study of Black quarter (BQ) among cattle and buffaloes was carried out in the districts of Anuradapura, Puttalam, Kurunegala, Matale, Badulla and Monaragala. Data were collected from 427 farmers using a questionnaire on outbreaks of BQ that occurred during 1991 to 1993.

The results revealed that cattle and buffaloes were equally susceptible to the disease. Among breeds of cattle, European breeds were found to be more susceptible than the local and Indian breeds, while no significant variation in the susceptibility was noted between the latter two breeds. However, the local and Indian breeds of cattle were found to be more susceptible to the disease when they are between 6 months and 2 years of age. In the European breeds the susceptible age extended from 6 months to 4 years. A seasonality of occurrence of the disease was observed in relation to the rainfall pattern. The peak incidence was found to coincide with the driest month of the year ie., August, while a minor peak was also observed during the South-West pre-monsoonal rainy season (mid March-mid May). This study also revealed that only 64.2% of the farmers interviewed practiced vaccination and that too only after an outbreak of the disease. Approximately one third (35.8%) of the farmers interviewed never vaccinated their animals against the disease.

INTRODUCTION

Black quarter (BQ), an acute infectious disease, caused by the bacterium *Clostridium chauvoei* mainly affects cattle and occasionally sheep. The disease is characterized by gangrenous myositis, severe toxaemia and high mortality (Blood and Raddostits, 1989). In Sri Lanka, outbreaks of BQ reported during the past 10 years reveal that mostly cattle and buffaloes were affected and that the disease occurs in certain regions of the North, East, North Central, North Western, Uva and Central (Epidemiological News, 1994). The occurrence of the disease has also been related with the climate,

season, meteorological factors and environmental changes such as excavation. A study in the Dhankuta district of Nepal revealed that the disease occurs primarily during the dry season (February to April) of the year (Jha *et al.*, 1991). On the contrary Bagadi (1978) in Nigeria reported a positive relationship between the number of outbreaks of BQ and the rainfall. Moreover, a study carried out in the state of Madras in India demonstrated no influence of climatic factors *ie.*, rainfall and air temperature on the incidence of black quarter (Gajapathi *et al.*, 1968). An association of sudden unexpected disease outbreaks in relation to the excavation of soil has been observed in three different disease free areas in Canada (Barnes *et al.*, 1975). The present study was undertaken with the objective of collecting information on susceptibility of animals (species, breed, age) to the disease; disease pattern over a period of 3 years; relationship between deaths due to black quarter and meteorological parameters (rainfall, air temperature, relative humidity), environmental changes (excavation, floods); and vaccination practices followed by the farmers.

MATERIALS AND METHODS

Collection of data

A questionnaire was designed to seek the following information;

Location	-	province, district, veterinary range and village
Species	-	cattle and buffaloes
Breeds	-	cattle breeds namely, local, Indian and European
Herd strength	-	below 6 months, 6 months - 2 years, 2 - 4 years and over 4 years
Mortality	-	number of deaths due to BQ on age basis as under herd strength
Time of death	-	Year and month
Outbreaks associated with sudden environmental changes *ie.*, Floods and Excavation		
Vaccination history	-	prophylactic vaccination, vaccination after outbreak, or never vaccinated

The questionnaire was pretested in a sample of farmers in the Anuradhapura district and appropriate modifications were made. A person who completed the National Diploma in Technology (Agriculture) at the Technical college, Ampara and who was familiar with the disease was

employed to gather information. Only those farmers who had experienced losses due to BQ in their herds were included in the survey. Sixteen veterinary ranges where the disease is more common were selected for the survey in order to include as many farmers as possible in the study. These veterinary ranges were selected on the basis of the number of BQ outbreaks occurred during the 10 year period from 1983 to 1992. The records maintained at each veterinary office on vaccinations carried out in recent BQ outbreaks were used to trace the relevant farmers. The disease had been diagnosed based on the history, clinical signs and postmortem lesions by the range veterinarian prior to vaccination. The survey was conducted during a period of 7 months (June to December 1993) and information gathered was that of outbreaks occurred during 1991, 1992 and 1993. Four hundred and twenty seven farmers were surveyed in the study which involved 373 cattle, 51 buffalo and 3 mixed (cattle and buffalo) herds. Meteorological data on monthly rainfall (RF), air temperature (AT) and relative humidity (RH) for three districts *ie.*, Anuradhapura, Puttalam and Kurunegala which represent most of the area covered by the survey were obtained from the Colombo Observatory for the period from 1991 to 1993..

Analysis of data

The mortality rate (MR) was calculated using the following equation, and was used to assess the susceptibility of animals under each category and compared by Chi square test.

$$\text{Mortality rate} = \frac{\text{Number of animals dying of the disease (ADD)}}{\text{The number of animals at risk (AR)}} \times 100$$

The pattern of RF (mm) , AT (°C) and RH (%) for 1991, 1992 and 1993 were compiled separately for each of the three districts. Since the patterns of RF, AT and RH were similar for the three districts in each year, a graph common to all three districts for the period of 1991 to 1993 was made for each meteorological factor above. The monthly death percentages of cattle (including buffaloes) for 1991, 1992 and 1993 were calculated for each of the above three districts and death patterns were made separately. Since the death patterns for each district in each year were almost similar, the data were pooled and a death pattern which is common to the three districts for the period of three years was made and compared with the pattern of each of the meteorological factors. The percentages of farmers who followed different vaccination practices were also calculated.

RESULTS AND DISCUSSION

Species susceptibility

The mortality rates of cattle and buffaloes were 13.7% and 13.3%, respectively. These values were not significantly different ($p>0.05$); suggesting that both cattle and buffaloes were equally susceptible to BQ.

Breed susceptibility

The mortality rate for European, Local and Indian breeds were 19.0%, 10.0% and 8.2%, respectively. The European breeds appeared to be more susceptible ($p<0.05$) than the other two types of breeds. Furthermore, the mortality rates of Local and Indian breeds were not significantly different ($p>0.05$). A possible explanation is that the natural immunity developed by the European breeds may not be as high as that in Local and Indian breeds, because the European breeds were mostly reared in Mid and Up country where the chances of exposure to the infection is low.

Age susceptibility

The mortality rate was significantly higher ($p\leq0.05$) in the 6 months to 2 years age group among Local and Indian breeds; but in the European breeds the mortality rate was significantly higher ($p\leq0.05$) in both the 6 months to 2 years and 2 years to 4 years age groups (Table 1). The results indicate that animals of Local and Indian breeds are more susceptible when they are in the age group of 6 months to 2 years; but the European breeds are more susceptible from 6 months up to 4 years of age. Misra (1987) reported that very young and aged cattle have a considerable degree of natural immunity. However, the reasons for this immunity were not well understood. He further stated that in younger animals it is probably opsonic in nature and in older cattle there is always a possibility that they have had an inapparent infection. The findings of the present study were also in agreement with the report of Misra (1987) which stated that the very young (less than 6 months) and older cattle (over 4 years of age) are more resistant to the infection.

Table 1. Mortality rates in various age groups of cattle.

	Indian and Local Breeds		European Breeds	
Age Group	ADD/AR	MR	ADD/AR	MR
0 - 6 months	7/66	10.6	2/24	8.3
6 months - 2 years	46/159	28.9*	39/108	36.0*
2 - 4 years	12/125	9.6	13/27	48.1*
>4 years	4/246	1.6	4/122	3.2

* $P<0.05$

ADD - Number of animals dying of the disease
AR - Number of animals at risk
MR - Mortality rate

Vaccination practices followed by the farmers

Prophylactic vaccination has never been a practice among the farmers. However, the majority of the interviewed farmers (64.2%) resorted to vaccination after an outbreak, while a considerable proportion of farmers (35.8%) continued to abstain from vaccinating their animals. The latter situation may explain the reasons why BQ continues to be a problem for the livestock industry in the country.

The pattern of disease occurrence in relation to rainfall and other meteorological factors

The relationship of deaths due to BQ and rainfall (Figure 1) is such that a slight increase of deaths is accompanied by the south-west pre-monsoonal rainy season (mid March-mid May), and highest death proportion occurred in the driest month, *ie.*, August. Though the death percentages continued to drop with the beginning of the North-East Monsoon (September to December), a considerable proportion of deaths occurred during the rainy season. This pattern was observed consistently throughout 3 consecutive years indicating a seasonality in the occurrence of the disease. A study carried out in Nigeria (Bagadi, 1978) found that the outbreaks of BQ increased with higher rainfall. On the contrary, Jha *et al.*, (1991) reported

that, in the Dhankuta district of Nepal, which is an endemic area for BQ, the disease outbreak occurs during the dry seasons (February to April). In our study, a significant relationship between the pattern of deaths and other meteorological factors such as air temperature and relative humidity were not observed. This observation is in accordance with the findings of Gajapathi *et al.*, (1968) from India.

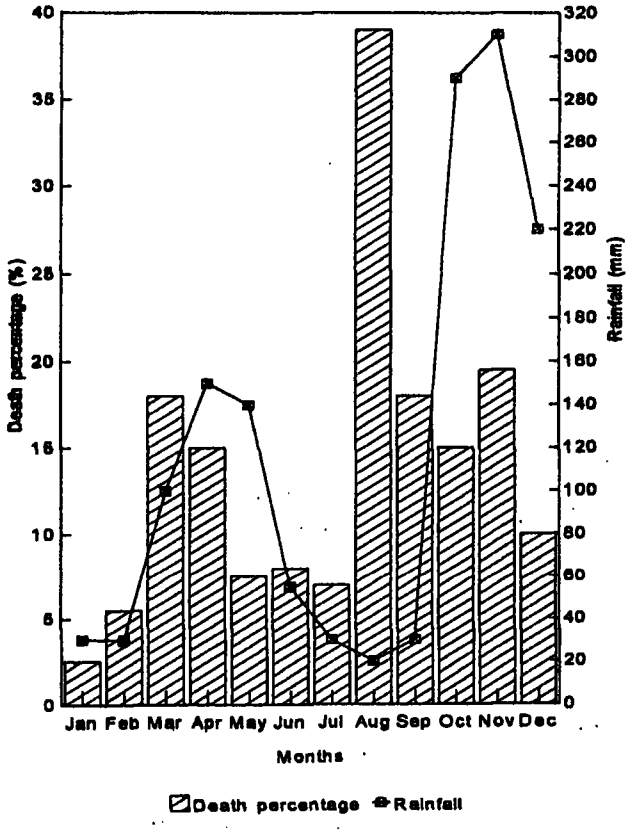

Figure 1. The relationship between average rainfall and overall monthly death percentage in 3 districts (Anuradhapura, Puttalam and Kurunegala) during a 3 year (1991 to 1993) period.

Effect of sudden environmental changes on disease outbreaks

As sudden environmental changes *ie.*, soil excavation and floods were not encountered during the period of study, no attempt was made to establish relationship between BQ outbreaks and their features.

CONCLUSIONS

The present study enabled to identify variations in susceptibility to BQ among cattle with regard to their breed and age. It was also found that both cattle and buffaloes were equally susceptible to BQ. The results of this study revealed that the incidence of deaths reach the peak in the driest month of the year *ie.*, August and continue to drop during August to December which coincide with the North-East monsoon. The findings of this study suggest the need for a vaccination program in endemic regions of the country prior to North-East monsoon.

ACKNOWLEDGEMENTS

We wish to thank Dr. M.G. Jeyaruban for carrying out the statistical analysis.

REFERENCES

Bagadi, H.O. (1978). The relationship between the annual rainfall and outbreaks of black quarter of cattle in Northern Nigeria. Trop. Anim. Hlth. Prod., 10(2): 124-126.

Barnes, D.M., Bergeland, M.E. and Higbee, J.M. (1975). Selected black quarter outbreaks and their relation to soil excavation. Can. Vet. J. 16(9): 257-259.

Blood, D.C. and Raddostits, O.M. (1989). Veterinary Medicine, University printing house, Oxford.

Epidemiological News (1994). Dept. of Animal Production and Health, Sri Lanka. 4(2):1-2.

Gnjapathi, V.S., Bertie, A.D., Souza (1968). Epidemiological studies on haemorrhagic septicaemia, black quarter and foot and mouth disease in Madras state for the period 1957-1964. The Indian Vet. J. 45: 175-186.

Jha, V.C., Thakur, R.P., Yadav, J.N., Thapa, P.B. (1991). Some observations on black quarter in cattle and buffaloes in Dhankuta district. Vet. Rev. 6: 3-7.

Misra, R.P. (1987). Manual for Production of Black Quarter Vaccine, National Institute of Vaccine Production, Nong Teng, Lao P.D.R