

TRENDS OF TICK-BORNE DISEASE CASES IN CATTLE ATTENDED AT THE SOKOINE UNIVERSITY OF AGRICULTURE VETERINARY CLINIC, MOROGORO TANZANIA

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SUMMARY

A retrospective study was conducted on the proportion and seasonal pattern of tick-borne disease cases from Morogoro Municipality reported at Sokoine University of Agriculture Veterinary clinic. The study was carried out through analysis of data collected at the clinic from January 1994 to December 2003. Tick-borne diseases accounted for 15% (241) of the total 1606 clinical cases attended at the clinic. The most frequently seen tick-borne disease was East Coast fever (ECF), which accounted for 76.3% of the cases. Other tick-borne diseases were babesiosis and anaplasmosis, which accounted for 27 (11.2%) and 30 (12.5%) cases, respectively. It is concluded that tick-borne diseases, particularly ECF, are important health constraints in cattle industry in Morogoro district.

INTRODUCTION

Tick-borne diseases are the most important production and health problems of cattle in Tanzania and other East African countries (Irvin and Mwamachi, 1983). The main tick-borne diseases include East Coast fever (ECF), babesiosis and anaplasmosis (Jacobsen *et al.*, 1983; Flach *et al.*, 1990). Flach *et al.*, (1990) demonstrated the presence of heartwater in cattle in Zanzibar Island; however, its importance is unknown because of limited information on its epidemiology. Pyrexia is the main clinical feature for all tick-borne

diseases in cattle but it is not pathognomonic for any of the diseases. In addition to the known specific features of these diseases as described by Irvin and Mwamachi (1983), the identification of parasites in the blood and lymph smear is needed to confirm the diagnosis and differentiate the four diseases.

Despite the efforts to control tick-borne diseases by acaricide dipping, treatment of clinical cases and immunization attempts (Jarret *et al.*, 1969; Maloo *et al.*, 2001), the diseases continue to cause losses to both small-scale and

large-scale farmers. Msami (2001) reported losses of up to 40% in a dairy farm in Morogoro, Tanzania, which was attributed to breakdown in the dipping program on the farm. Although serological surveys indicate presence of anaplasmosis and babesiosis in dairy and indigenous cattle in eastern and southern Africa (Norval *et al.*, 1985; Woodford *et al.*, 1990), no clear relationship has been established between seropositive reactors and incidence of clinical diseases (Ssenyonga *et al.*, 1991). This underlines the importance of updating the clinical trends of these diseases in Africa.

The growing urban population has resulted in an increased demand for milk and other dairy products in major towns of Tanzania. This has in turn, led to expansion of small-scale urban and periurban farming where owners keep small herds of 2 – 20 dairy cattle in the backyard (Mlozi, 2000). Because most veterinarians in the country provide their services to this sector, regular updating of information on clinical epidemiology is needed. Understanding of the problems affecting this sector may help the formulation of disease control programs for development of the cattle industry in Tanzania. Furthermore, knowledge of the epidemiology of tick-borne diseases will assist veterinary clinicians to adjust their index of suspicion, thereby increasing recognition of cattle with tick-borne disease.

The purpose of the present study was to estimate the annual and seasonal occurrence of ECF, babesiosis, anaplasmosis and heartwater in cattle examined at Sokoine University of Agriculture (SUA) Veterinary Clinic from January 1994 to December 2003.

MATERIALS AND METHODS

Case selection

SUA veterinary clinic offers services to farmers in Morogoro Municipality and other areas within Morogoro district. Data recorded for bovine clinical cases (n = 1606) attended at the Veterinary Clinic between 1st January 1994 and 31st December 2003 were analysed. Information obtained included date of examination, patient identification, age, sex, breed, farming system, history and clinical manifestations, diagnosis and treatment of the case. Cases with incomplete information were excluded from the analysis. Diagnoses considered in the records were based on the cases confirmed by demonstration of parasites in clinical specimens by standard parasitological methods (Soulsby, 1985).

Calculation of proportions of cattle with tick-borne diseases

Monthly, seasonal and annual proportions of cattle in which tick-borne diseases (ECF, babesiosis and anaplasmosis) were diagnosed at the clinic for the 10-year study period were calculated by dividing the number of cattle diagnosed with that disease by the total number of cattle examined during

the same period. The frequency of diseases with specific clinical manifestations was determined for the entire 10-year period. Rainfall data for the entire study period was obtained from the Tanzania Meteorological Agency, Morogoro Branch.

Data analysis

Categorical data analysis was used to evaluate the effects of the independent variables including month, year and their interaction on the proportions of cattle affected with each of the diseases. Chi square analysis of trends in proportions was used to analyze monthly and annual changes in the proportions of cattle diagnosed with tick-borne diseases. Statistical analyses were performed by using GraphPad Prism® software. Values of

$P \leq 0.05$ were considered significant.

RESULTS

Clinical data

Information on 1606 bovine cases was obtained from the database. A diagnosis of tick-borne disease in cattle was recorded in 241 (15%) cases of which 184 (76.4%) were ECF, 30 (12.5%) anaplasmosis and 27 (11.2%) babesiosis (Table 1). Overall proportion of ECF cases was significantly higher ($P < 0.05$) higher than the proportions anaplasmosis and babesiosis (Figure 1). No case of heartwater was diagnosed during the 10-year period. Main clinical findings in the recorded cases of ECF, babesiosis and anaplasmosis were similar to those recorded elsewhere.

Table 1. Combined monthly number of cases of tick-borne disease cases recorded over the 10-year period (January 1994 to December 2003) at SUA veterinary clinic, Morogoro, Tanzania

Month	Disease			Total
	ECF	Babesiosis	Anaplasmosis	
January	11	0	1	12
February	19	3	5	27
March	10	3	6	19
April	23	1	3	27
May	20	4	3	27
June	14	1	4	19
July	22	3	1	26
August	14	3	3	20
September	8	3	0	11

October	13	2	0	15
November	14	1	3	18
December	16	3	1	20
Total	184	27	30	241

Of the 241 affected cases, 117 were adults of more than 2 years of age, 26 were yearlings (1 to 2 years) and 45 were calves (<1 year), and there were no age records for 53 animals. The majority of the cases were females (190) while 29 cases were males and 22 had no sex records. Of all cases diagnosed as tick borne diseases, 209 were from 118 smallholder farms and 32 were from 7 commercial farms, the difference in the occurrence of the cases between the two forms of management was not statistically significant ($P > 0.05$).

Overall annual proportion of tick-borne diseases

Tick-borne diseases other than heartwater were diagnosed every

year during the study period, and the highest number of cases was in 1997, when 37 (27%) cases were recorded (Table 2), the linear trend in proportions of cases of tick-borne diseases was statistically significant different among the years ($P < 0.001$). Combined annual proportions of tick-borne diseases were generally higher from 1994 to 1998 compared to the period from 1999 to 2003, however, the mean proportion of tick-borne diseases for the latter 5-year period (110/956; 12%) was not statistically significant different ($P > 0.05$) from that of the previous 5 year-period (131/650; 20%). The lowest annual proportion (8%) was recorded in 2000 (Table 3).

Table 2. Number of cases with tick-borne diseases as a proportion of all bovine clinical cattle cases recorded during the 10-year period (January 1994-December 2003)

Year	Number of cases	Tick-borne cases (%)
1994	172	35 (20)
1995	148	31 (21)
1996	117	19 (16)
1997	130	37 (28)
1998	83	9 (11)
1999	200	24(12)
2000	255	20 (8)
2001	181	31(17)

2002	225	25 (11)
2003	95	10 (11)
Total	1606	241 (15)

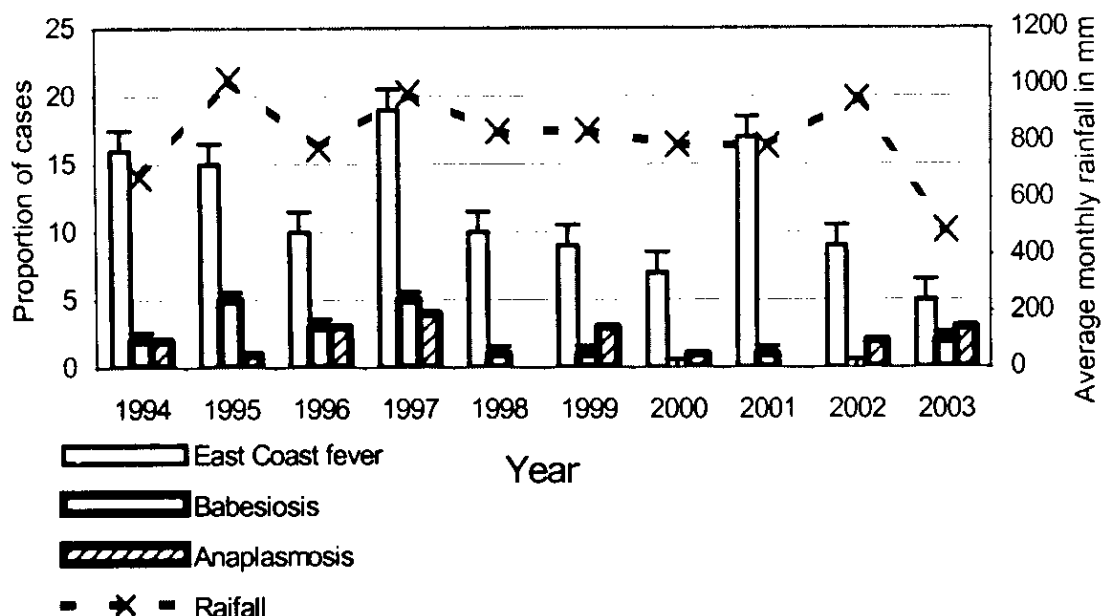
Annual proportions of ECF, babesiosis and anaplasmosis

Cases of ECF were encountered every year from 1994 to 2003 at proportions varying from 5% in 2003 to 19% in 2001 (Figure 1). There was a statistically significant ($P < 0.001$) linear trend in the proportions of ECF in the 10-year study period. Annual proportions of anaplasmosis ranged from 0% to 4%, the highest rate being recorded in 1997. Babesiosis was most prevalent (7%) from 1995 to 1997 with no cases being encountered between 2000 and 2002.

Overall monthly proportions of ECF, babesiosis and anaplasmosis

Tick-borne diseases were diagnosed every month of the year throughout the study period with proportion ranging from 10% in September to 21% in April (Figure 1). On average monthly proportions tended to be higher from February to August and lower from September to January excluding December (Figure 2). More cases were recorded in December, April and July.

Figure 1. Annual proportions of tick-borne diseases during a 10-year period (1994-2003)



Monthly proportions of individual diseases

ECF was diagnosed in every month throughout the 10-year period

with high proportions in April (16%), July (18%) and December (15%), however, there was no statistically significant linear trend

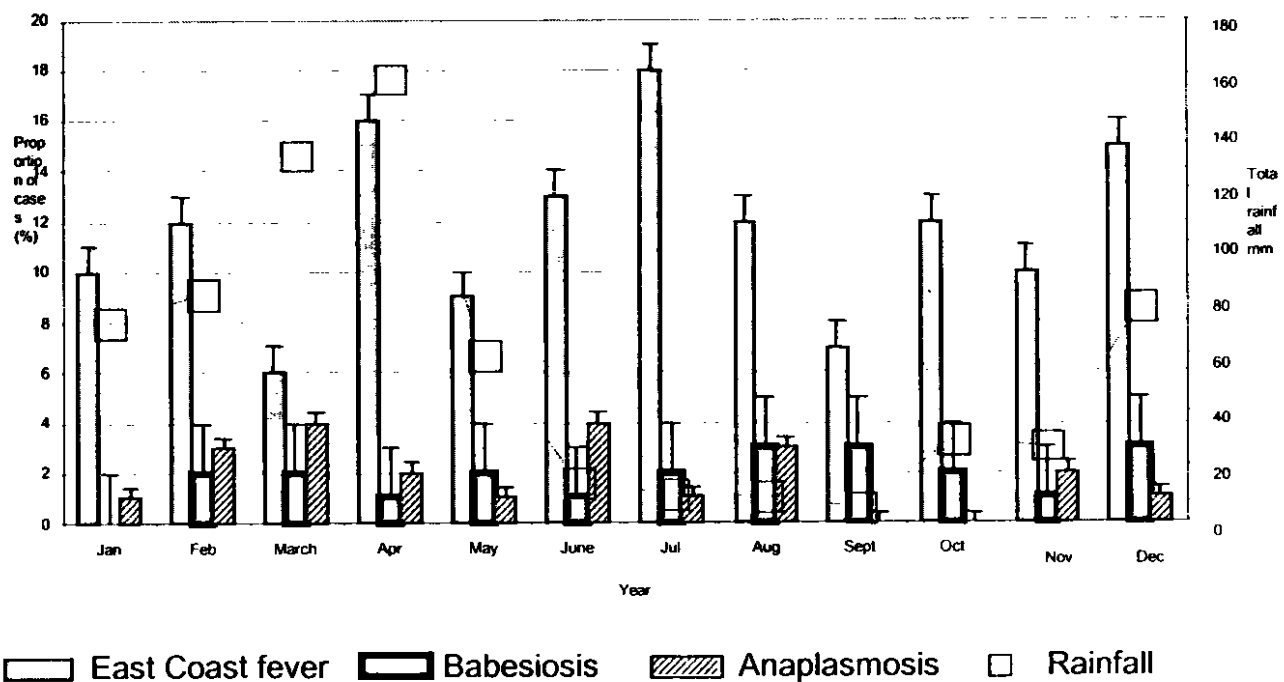
($P > 0.05$) in the monthly proportions of ECF cases. With the exception of January, cases of babesiosis were diagnosed in all months during the whole study period. Anaplasmosis was diagnosed in all months except September and October with the highest average number of cases being recorded in February and March (Figure 2).

DISCUSSION

The results of the present study further confirm that ECF is the most important tick-borne disease of cattle in Morogoro district, Tanzania, as it was diagnosed

more frequently than the other diseases. Increase in cases of ECF seems to correlate with seasonal variation of rainfall than with total annual rainfall, although the lowest annual proportion of the disease among the attended cattle at the clinic was obtained in the year 2003, which had the lowest total annual rainfall in the decade under consideration. More cases were seen during and immediately after the rainy season than during dry season most likely due to increased tick activity. The recorded frequency of babesiosis and anaplasmosis was too low to justify seasonal comparison.

Figure 2. Average monthly proportions of tick-borne diseases during a 10 (January-December)



The proportion of ECF (11%) among cattle attended at the clinic was comparatively higher than that observed 20 years ago (2.3%) at the same clinic (Msolla *et al.*, 1985). Jacobsen (1983)

reported up to 20% mortality in calves due to ECF and prevalence antitheatrical antibodies in 57% in cross-bred calves in Zanzibar. Although this study was conducted in Morogoro district only, the

present findings seem to reflect an increasing trend in the prevalence of ECF in Tanzania in the past twenty years. Although most of the cattle recorded in the present work belonged to smallholder urban and periurban dairy farms, the results provide evidence for the persistence of *Rhipicephalus appendiculatus*, the vector for ECF. Because the animals in the present study either grazed in the periurban areas or were provided with grass cut from nearby areas, the contact with tick-infested pasture is a possible source of infection to these animals. Kambarage (1995) attributed sharing of pasture with pastoral cattle that were rarely subjected to tick control with increase in tick infestation in the dairy cattle herds that had ECF in Morogoro district.

Although there was no linear correlation between the seasons and the incidence of ECF, it was apparent that the cases increased during the rainy season and reached peak during post-rainy season. These findings concur with observations of Lawrence (1991) that transmission of ECF in Zimbabwean cattle by the tick *R. appendiculatus* occurs throughout the year with peaks in January to March and May to July, which are rainy season and post-rainy season, respectively. With the exception of the year 1995, the highest rainfall records were obtained in year 1997, which was one of the years in which peak ECF cases were recorded. Recording the highest proportion (19%) in 1997, when the country

experienced the *El-nino* weather phenomenon with very heavy rains, and the lowest proportion (5%) in 2003 when the total annual rainfall was less than 500mm, suggests that ECF occurrence can be predicted by analysis of the rainfall data and that lower incidence of disease may occur in months with least rainfall as seen September.

Occurrence of clinical cases of babesiosis in cattle seems to have remained subtle over the past two decades. The proportion of 2% compares favourably with 1.5% recorded by Msolla *et al.*, (1985). Woodford *et al.*, (1990) demonstrated about 96% of cattle in Pemba Island, Zanzibar were seropositive to *Babesia bovis*. However, recently Swai *et al.*, (2004) showed lower seroprevalence to *B. bovis* in 6% and 12% dairy cattle in Tanga and Iringa regions, respectively. The wide variation in the seroprevalence of *B. bovis* could be due to variation in the density of *Boophilus* ticks in different areas of Tanzania.

Seropositivity to anaplasmosis has been varying from 38% to 99% of cattle (Norval *et al.*, 1985; Jogenjan *et al.*, 1988) indicating high rates of exposure to the causative agent. At the SUA veterinary clinic, cases of anaplasmosis in cattle decreased from 4.7% (Msolla *et al.*, 1985) to 2% in the present study. This discrepancy can partly be explained by the fact that most of the cattle examined 20 years ago

belonged to the state or institutional farms where mechanical transmission of anaplasmosis during mass operations such as vaccination and treatment was possible. Mass operations are very limited in smallholder farmers, probably explaining the low proportion of anaplasmosis. Reduction in the number of cases reported at SUA clinic, caused by expanding private veterinary services can also have influence on the trend of the diseases, however their exact effects remains to be investigated by surveying the disease trends attended by private practitioners.

Over the past 20 years, there has been no national policy for acaricides use in the country. Coupled with trade liberalization and privatization of animal health services delivery, wide varieties of acaricides are available in the market. This can contribute to the resistance of ticks to the acaricides and probably explain the increased incidence of ECF. Further studies to investigate the resistance of ticks to available acaricides and tick control practises of smallholder cattle are needed to understand the magnitude of the problem in relation to the increased occurrence of ECF. Indiscriminate use of acaricides because of breakdown in state regulations governing the provision of veterinary services and the low level of knowledge of the smallholder farmers, probably explain the increased incidence of ECF.

In this study, heartwater, which is a highly fatal tick-borne disease, was not recorded at the clinic throughout the 10-year period. However, *Amblyomma variegatum*, the vector for the disease has been reported in Morogoro district (Kusiluka *et al.*, 1995). The lack of records for heartwater might probably indicate that there is low proportion of *Cowdria ruminantium* infected ticks or the causative agent is not present at all. On the other hand, this may be a reflection of difficulties in the diagnosis of the disease in live animals when compared to ECF, babesiosis and anaplasmosis, in which parasites can be demonstrated in lymph node smears or blood smears. Samples of endothelial cells or brain for demonstration of *C. ruminantium* might be difficult in the field and may only be obtained in dead animals. Application of other diagnostic methods such as serology would have probably assisted in diagnosis of heartwater. Lack of appropriate diagnostic systems in developing countries explain the problems encountered in mapping the disease patterns in such countries.

One of the limitations of the present study is that it was based on clinical and parasitological records available at the SUA Veterinary Clinic. For proper assessment of patterns of diseases in an area, other screening methods such as serology are recommended to elucidate the exposure rate to various infectious agents.

However, this work provides an update on the status of tick-borne diseases in seen at SUA in the past decade. The data obtained suggest that ECF occur at a higher frequency than anaplasmosis, and babesiosis, whereas heartwater is not a clinical problem in the study area.

ACKNOWLEDGMENTS

The authors acknowledge the assistance of technical and field staff of SUA veterinary clinic.

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