The role of parasitic diseases as causes of mortality in cattle in a high potential area of central Kenya: a quantitative analysis

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ABSTRACT

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Postmortem records of cattle brought to the Veterinary School in Kabete near Nairobi were examined for a period of 15 years (1984–1998, inclusive) in order to establish the role that parasitic diseases played as causes of death. The cattle were mainly of exotic breeds but a few were crosses or of indigenous breeds. There was a total of 1 413 cases of deaths from various diseases of which 177 (13 %) were due to parasites. The tick-borne diseases were in high proportions and accounted for 84,7 % among the parasitic causes, which represented 10,6 % of all the deaths recorded. The main tick-borne disease was East Coast fever (ECF) (65 %) followed by heartwater (10,2 %), babesiosis (5,1 %) and anaplasmosis (4,5 %). Hydatidosis was responsible for 7,3 % of deaths from parasitic causes. Deaths from ECF were recorded in all the 15 years and in high proportions compared to those due to heartwater (8/15), babesiosis (7/15) and anaplasmosis 5/15). Over the period under consideration, no decline was noted among various disease conditions despite advances made in controlling tick vectors and in the treatment of various parasitic conditions. The area covered by this study has the advantage of having several veterinary-related institutions close by. Hence knowledge and awareness about livestock diseases is relatively high compared to other parts of the country. It is therefore challenging to the Veterinary Department to examine the service delivery systems and other factors that may contribute to the persistent presence of these fatal parasitic conditions of cattle.

Keywords: Anaplasmosis, babesiosis, cattle, East Coast fever, heartwater, hydatidosis, Kenya, parasites, tick-borne diseases

INTRODUCTION

Parasitic diseases constitute a major setback to livestock production in most of tropical Africa due to the different forms of losses they cause. The latter can be categorized into direct or indirect. The direct losses are due to peracute and acute illnesses leading to death and mainly affect the susceptible animals in the herd. The indirect losses include such as poor food utilization resulting in reduced production and weight gain. In countries where studies have been carried out on causes of mortalities in cattle, there has been a bias towards calves as seen from the reports of Ibeawuchi, Ndife & Okoro *et al.* (1983) in Nigeria, Shoo, Semvua, Kazwala & Msolla (1992) in Tanzania, Mulei, Gitau & Mbuthia (1995) in Kenya. All these reports point to the important fact that, parasitic diseases contribute to considerable economic loss. Indeed East Coast fever (ECF) alone in Kenya causes an annual loss of between 50,000 and 70,000 head of cattle with an estimated financial value of US$ 1.6–2.2 million (Duffs 1976).

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There is therefore a need to understand the role played by various diseases in causing mortalities in order to reduce these economic losses. A comprehensive knowledge of the prevalence of the specific diseases in a given area is necessary in order to design or re-examine the control strategies that are implemented. In order to gather the relevant information, the current retrospective study was undertaken.

MATERIALS AND METHODS

The retrospective study was undertaken from postmortem reports of cases referred to the Faculty of Veterinary Medicine at Kabete Campus. These cases originated from within an area with a radius of about 50 km of the Campus and included the Kiambu District and Nairobi Province, which are both in Central Kenya. The region covered by this radius is 1 500–3 200 m above sea level and is of high potential with a reliable bimodal rainfall of 750–1 000 mm annually. There are large numbers of small-scale farms with variable numbers of exotic and indigenous cattle breeds. The area has the advantage of being covered by the Veterinary School's ambulatory services and so the farmers are reasonably well versed with methods of disease control, such as the use of acaricides and anthelmintics. When they lose any of their animals through deaths, they refer them to the Veterinary School for diagnosis and advice.

The diagnoses were based on the history and clinical signs presented with each carcass to the postmortem facility as well as on the results of necropsies and when necessary histopathological examination of the tissues. For confirmation of blood-borne infections, Giemsa-stained blood smears were examined microscopically and, in the case of ECF, lymph node smears were prepared and examined. Faecal samples were analyzed for gastrointestinal helminth eggs and coccidial oocyst identification.

Thus, the following report emanates from postmortem findings on cases examined during a 15-year period from 1984–1998 inclusive and focuses on the parasitic diseases diagnosed in all ages and breeds of cattle that were presented for postmortem examination.

DATA ANALYSIS

The number of cases presented during the 15-year period was noted on an annual basis. The number of cattle that had died from parasitic diseases was listed separately as: tick-borne diseases (ECF, babesiosis, anaplasmosis and heartwater), hydatidosis, and others. From this data, the annual and overall prevalence rates were calculated for each category, and the values presented as percentages.

RESULTS

The data analysis of the cattle breeds involved in this study showed that 84 % were exotic comprising in the order of magnitude Friesian, Ayrshire, Jersey and Guernsey. Crossbreeds made up 10 % of the total and the indigenous 6 %. Of the deaths from parasitic diseases, 90 % occurred in exotic breeds.

The results of the analyses of the specific cause of mortality are presented in Tables 1 and 2.

The following diseases were diagnosed: ECF, babesiosis, anaplasmosis and heartwater (Table 1). In addition, hydatidosis together with others such as coccidiosis, trypanosomosis and helminthosis also contributed as causes of mortalities (Table 2).

TABLE 1 Annual mortality rates from various tick-borne parasitic diseases among cattle over a 15-year period

Year	East Coast Fever	%	Babesiosis	%	Anaplasmosis	%	Heartwater	%
1984	6	55	1	9,0	–	0,0	–	0
1985	7	78	–	0,0	–	0,0	–	0
1986	7	47	1	7,0	2	14,0	4	27
1987	6	86	–	0,0	–	0,0	–	0
1988	5	83	–	0,0	–	0,0	–	0
1989	15	68	–	0,0	–	0,0	–	0
1990	10	72	–	0,0	2	14,0	1	7
1991	11	79	–	0,0	–	0,0	1	7
1992	8	62	–	0,0	2	15,0	1	8
1993	6	50	1	8,0	1	8,0	4	33
1994	5	42	3	25,0	1	8,0	1	8
1995	8	57	1	7,0	–	0,0	4	29
1996	9	90	–	0,0	–	0,0	–	0
1997	10	83	1	8,0	–	0,0	–	0
1998	2	33	1	17,0	–	0,0	2	33
Total	115	65	9	5,1	8	4,5	18	10

Numbers indicate cause specific deaths and their respective percentages out of all deaths caused by the parasites

TABLE 2 Mortality caused by hydatidosis, other parasitic conditions against overall deaths from parasites and all other causes among cattle

Year	Hydatid (%)	Others[a] (%)	Total parasitic (%)	Total deaths
1984	3 (27,0)	1 (9)	11,0 (12)	90
1985	–	2 (22)	9,0 (14)	66
1986	1 (7,0)	–	15,0 (14)	105
1987	–	1 (7)	7,0 (14)	98
1988	1 (17,0)	–	6,0 (5)	124
1989	3 (14,0)	4 (18)	22,0 (16)	141
1990	–	1 (7)	14,0 (9)	160
1991	1 (7,0)	1 (7)	14,0 (18)	77
1992	2 (15,0)	–	13,0 (14)	94
1993	–	–	12,0 (17)	70
1994	–	2 (17)	12,0 (29)	41
1995	–	1 (7)	14,0 (15)	95
1996	1 (10,0)	–	10,0 (10)	98
1997	–	1 (8)	12,0 (17)	72
1998	1 (17,0)	–	6,0 (7)	82
Totals	13 (7,3)	14 (7,9)	177 (13)	1 413

[a] Others = Coccidiosis, trypanosomiasis and helminthosis

TABLE 3 Tick-borne diseases in relation to parasitic and all other causes of death in cattle

Year	Tick-borne	Total parasitic	% Tick-borne	% of total
1984	7	11	63,6	7,8
1985	7	9	77,7	10,6
1986	14	15	93,3	13,3
1987	6	7	85,7	6,1
1988	5	6	83,3	4,0
1989	15	22	68,2	10,6
1990	13	14	92,9	8,1
1991	12	14	85,7	15,6
1992	11	13	84,6	11,7
1993	12	12	100,0	17,1
1994	10	12	83,3	24,4
1995	13	14	92,9	13,7
1996	9	10	90,0	9,2
1997	11	12	91,7	15,3
1998	5	6	83,3	6,1
Totals	150	177	84,7	10,6

A total of 1 413 cases were recorded during the period under study, and of these, 177 were a result of parasitic causes. Therefore, parasitic diseases were the cause of about 13 % of the total deaths. The proportion of animals that died from parasitic diseases ranged from 4 % in 1988 to as high as 24,4 % in 1994 (Table 2).

Mortalities due to ECF were the highest of all the diseases, being 115 over the study period which represented 64 % of all the deaths due to parasitic causes (Table 1). In most years, cases of ECF were above 60 %, which shows that this disease is the single main contributor to deaths in cattle in this part of the country. There seems to be no particular trend as regards the proportion of deaths due to ECF over the years, though the last year of study (1998) had the lowest rate (33 %). The records indicated that the disease mainly affected younger animals.

The second most important tick-borne disease was heartwater, which accounted for 18 % of the deaths due to parasitic causes. During the period under review, there were variations in the numbers and frequency with which deaths due to this condition were encountered. In 7 years no deaths were recorded while in others, e.g. 1993, up to 33 % cows died from the disease. Other tick-borne diseases that were responsible for deaths were babesiosis and anaplasmosis whose overall proportions were 5,1 % and 4,5 % respectively. As with heartwater, no deaths were recorded from babesiosis or anaplasmosis in

eight and ten of the years respectively. During the period 1987 and 1989, no deaths were reported from any of the three tick-borne diseases if ECF is excluded. A similar situation was observed in the years 1985 and 1996.

During all the years covered in this study, over 60 % of deaths from parasitic diseases resulted from tick-borne infections (Table 2). Indeed, in 1993, these accounted for 100 % of the deaths from parasitic diseases. Between 1984 and 1998, parasitic infections exerted their fatal effects in varying proportions. It was lowest in 1987 and 1998 (6,1 %) and highest in 1994 (24,4 %).

Hydatidosis was responsible for 7 % of all the deaths from parasitic causes. It was recorded with varying frequency—the year 1984 having the highest (27 %). In seven of the 15 years, no cases of hydatidosis were diagnosed. This condition in some cases occurred concurrently with ECF.

Other parasitic causes of death among the cattle included coccidiosis, trypanosomiasis and helminthiasis, which together accounted for 8 % of the deaths. Parasitic diseases were responsible for 13 % of all the deaths of the cattle that were necropsed at the Veterinary School.

DISCUSSION

In this study, parasitic infections accounted for 13 % of all the cattle deaths. ECF has been shown to be the most common cause of calf morbidity and mortality in Murang'a District where the condition is endemic (Gitau, Perry & McDermott 1999). This finding is supported by an earlier report by Mulei, Rege & Kiptoon (1989) who found that in Kiambu District ECF is an important disease among cattle. Further Mulei & Rege (1989) reported from the same region that, among tick-borne diseases, the clinical prevalence of ECF was 69,6 % and was the highest when compared to that of babesiosis and anaplasmosis whose prevalence was 8,7 % and 21,8 %, respectively. They further reported that all three diseases accounted for 8,9 % of all clinical cases. The data analyzed in our study shows that a greater proportion of cattle died from babesiosis than anaplasmosis, a situation that would appear to contradict the results of the other authors quoted here. The possible explanation for this is that they were dealing with clinical cases, thus though anaplasmosis may be a cause of more clinical cases; the fatality rates from this condition are not higher than those of babesiosis. This observation is in accord with the one from South Africa by Du Plessis, De Waal & Stoltsz (1994) who stated that mortalities in cattle due to babesiosis were 0,3 % and those due to anaplasmosis were 0,2 %. These figures are relatively low when compared to the Kenyan ones and are discussed below.

In this study, an important tick-borne disease of cattle that caused 10 % of the mortality due to parasitic diseases was heartwater, a condition caused by *Cowdria ruminantium*. In the current study, this disease was rated higher than babesiosis or anaplasmosis as a killer of cattle being second only to ECF. This fact has not been shown in earlier studies; indeed the study by Mulei & Rege (1989) lists the most important tick-borne diseases in Kenya as ECF, anaplasmosis and babesiosis. A later study by Mulei *et al.* (1995) to determine the cause of calf mortalities from the age of 1 day to 10 months showed the main causes of deaths to be colibacillosis, salmonellosis, coccidiosis and helminthosis. Tick-borne diseases accounted for 13,3 % of the deaths with ECF being by far the main cause. Others, in the order of magnitude, were babesiosis, anaplasmosis and heartwater. This difference in the order of magnitude may be explained by the fact that only calves were considered by the former workers. Reports from South African provinces where the three tick-borne diseases are endemic confirm that the mortality rates due to heartwater are higher (1,3 %), being up to three times those of babesiosis and anaplasmosis combined (Du Plessis *et al.* 1994). Thus, this rickettsial disease of cattle is an important one to consider where the vector ticks *Amblyomma* spp. are endemic.

The high incidence of tick-borne diseases in this region of Kenya and indeed all those regions where the vector ticks are found, has been attributed to such factors as: improper spraying for tick control, use of understrength acaricides, irregular application of acaricides and development of acaricide resistance by ticks (Ongare, Munyua, Wilson & Rinkanya 1985). Any of these factors may play a role and it is surprising that, over the years, the prevalence of none of the parasitic conditions has shown any tendency to decline. Indeed Mulei *et al.* (1989) found that despite the fact that 98 % of the farmers in Kiambu District used acaricides routinely, ECF was still an important disease. This poses a challenge to the Veterinary Department to allocate more resources for the purpose of controlling these parasitic conditions that negatively impact on the livestock industry of Kenya.

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