

The role of parasitic diseases as causes of mortality in small ruminants in a high-potential farming area in central Kenya

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ABSTRACT

A 15-year retrospective study was performed to determine the role of parasitic diseases in causing mortalities in small ruminants. In total, 115 (32 %) sheep were diagnosed as having been killed by parasitic diseases out of 366 that died as a result of disease. The major cause of mortality was helminthosis (63 % of all parasitic cases). Most of the helminthosis cases were attributed to haemonchosis (40 % of parasitic cases). Heartwater was the second most important parasitic disease (27 % of all parasitic cases). Ninety-five (26 %) goats were diagnosed to have been killed by parasitic diseases out of 365 cases presented at the *post mortem* facility. Helminthosis was the most frequent cause of mortality (55 % of the total parasitic diseases). Twenty-six goats were killed by haemonchosis (27 % of all parasitic diseases). Heartwater was the second most important parasitic disease, accounting for about 20 % of all parasitic diseases. These findings indicate that viable helminth and tick control strategies should be devised in order to reduce mortality caused by helminthosis and heartwater and thereby achieve improved productivity.

Key words: goats, heartwater, helminthosis, sheep.

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INTRODUCTION

The livestock industry plays a major role in the economic development of Kenya. It is estimated that the agricultural sector contributes about 25 % to the gross domestic product (GDP), of which livestock accounts for nearly 26 %. Cattle contribute more than 80 % of the total production from livestock. Sheep and goat populations, which number about 19 million, are the second largest contributor to the livestock industry¹.

Among the many constraints that limit productivity in livestock populations, diseases and parasites are of major importance. In contrast to the wealth of information on causes of mortality in developed countries, little is known about the diseases and parasites of small ruminants in Africa. In Kenya, losses due to parasitic diseases are considered to be widespread. Haemonchosis alone causes an annual loss of US\$26 million in sheep and goats, while returns could be increased by as much as 470 % by controlling haemonchosis^{2,10}.

A study in Baringo district, Kenya, attributed 23 % of pre-weaning kid mortality to coccidiosis, 12 % to enterotoxaemia, 17 % to helminthoses and 31 % to pneumonia¹. Another study found that helminthosis was the second most important cause of mortality after pneumonia in exotic (dual purpose) goats in western Kenya¹². In pastoral areas, 8 % of goat deaths were found to be caused by parasitism (haemonchosis and coenurosis)⁵. The last study also found that *Haemonchus contortus* was the major trichostrongyloid found in these areas. This nematode is considered to be the most important helminth in small ruminants in Kenya¹¹.

Parasitic diseases thus play a major role in causing mortality that translates into economic loss. For control of such diseases, there is a need for comprehensive knowledge of the role of specific parasitic diseases in any given area.

To collate current information on the parasitic diseases that cause mortality in domestic animals in areas around Kabete, Kiambu District, and parts of Nairobi Province, this retrospective study was conducted.

MATERIALS AND METHODS

The diagnostic records of the Univer-

sity of Nairobi Veterinary Faculty from 1984–1998 inclusive were examined. The Faculty provides a diagnostic service to the neighbouring Kabete area of Kiambu District and Nairobi Province. It is located about 15 km west of Nairobi city. Most of the small ruminants kept in this area are on small-scale farms, and provide meat, manure, and to a small extent milk. Sheep breeds in order of prevalence were Red Maasai, Dorper, crosses of different breeds and the Persian Blackface. The main breeds of goats were small East African goats and their crosses with the exotic breeds such as Toggenburgs and Galla goats.

The diagnosis of parasitic diseases was based on the history and clinical signs presented with the carcass at the *post mortem* facility. *Post mortem* examination of the carcass was then performed, revealing the macroscopic lesions. For confirmation of heartwater cases, brain cortex smears were made and stained with Giemsa. Faecal samples were analysed for strongyloid eggs, worms and coccidial oocysts. The number of animals killed by the various parasitic diseases was compared to the total number of animals killed by all diseases.

RESULTS

Sheep

The number of sheep diagnosed as having been killed by various parasitic diseases is shown in Table 1.

During the period covered by the study, 115 of 366 sheep were diagnosed as having died due to various parasitic diseases. Parasitic diseases therefore caused about 32 % of all the ovine deaths reported. The percentage was highest during 1994 (52 %), followed by 49 % during 1990, and 42 % during 1985, and was lowest in 1989 (16 %) and 1991 (17 %).

Among the parasitic diseases, helminthosis was the main cause of mortality, accounting for about 63 % of all the parasitic diseases. Most of these cases were due to haemonchosis, which alone contributed about 40 % of all parasitic cases. In most years, haemonchosis contributed more than 50 % of all parasitic cases

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Table 1: Number of sheep killed by parasitic diseases during the period 1984–1998.

Year	A	%	B	%	C	%	D	%	All*	%	All**
1984	2	33	2	33	–	0	2	33	6	19	31
1985	5	100	–	0	–	0	–	0	5	42	12
1986	4	50	3	38	1	13	–	0	8	23	34
1987	1	16	1	16	3	50	1	17	6	23	26
1988	4	44	4	33	2	22	–	0	9	33	27
1989	3	60	1	20	1	20	–	0	5	16	33
1990	6	38	6	38	1	6	3	19	16	49	32
1991	1	25	3	75	–	0	–	0	4	17	23
1992	3	25	1	8	7	60	1	8	12	40	30
1993	4	50	1	13	1	13	2	25	8	40	20
1994	10	91	–	19	1	9	–	0	11	52	21
1995	1	60	3	19	11	69	1	6	16	42	38
1996	1	25	1	25	1	25	1	25	4	25	16
1997	–	0	2	100	–	0	–	0	2	18	11
1998	1	30	–	0	2	67	–	0	3	25	12
Total	46	40	27	23	31	27	11	10	115	32	366

A = haemonchosis.

B = 'other helminths', includes other helminthoses, e.g. oesophagostomosis.

C = heartwater.

D = 'others', includes fasciolosis, coenurosis, *Oestrus ovis* infestation and hydatidosis.

*Total number of sheep killed by parasitic diseases.

**Total deaths from all diseases.

encountered, e.g. 100 % in 1985. The disease was more prevalent among young animals than adults. The disease most commonly presented as the acute form, while only a few peracute cases were observed.

General helminthosis was also a major cause of mortality. The proportion of animals killed by the condition ranged from 0 % in some years to as high as 100 % in 1997.

Heartwater was the second most important disease. Thirty-one cases were reported during the study period, representing about 27 % of all parasitic diseases. The proportion of heartwater cases

ranged from 0 % of all parasitic diseases in some years to as high as 69 % in 1995.

Parasitic diseases reported less frequently were fasciolosis, coenurosis, hydatidosis and *Oestrus ovis* infestation. Together, they contributed about 10 % of all parasitic cases.

Goats

The parasitic diseases that caused mortality in goats are summarised in Table 2. In total, 95 goats were diagnosed as having been killed by parasitic diseases from 1984–1998. This accounted for 26 % of the total number of caprine mortalities reported. In different years, the number of animals killed by parasites fluctuated,

so that in 1994 and 1997 no case of parasitic disease was reported, while in 1993 and 1996, parasitic diseases accounted for 39 % and 37 % of the total cases, respectively.

Helminthosis caused the highest mortality (55 %) of all the parasitic diseases, with haemonchosis contributing the largest share (27 %). Its prevalence ranged from 0 % in 6 years to as high as 67 % in 1987. Combined infections with various helminths accounted for 27 % of all parasitic diseases.

Heartwater constituted 20 % of the total parasitic diseases, the prevalence ranging from 0 % in 9 years to about 67 % in 1992. It

Table 2: Number of goats killed by various parasitic diseases during the period 1984–1998.

Year	A	%	B	%	C	%	D	%	All*	%	All**
1984	–	0	–	0	–	0	1	100	1	6	18
1985	4	50	2	25	–	0	2	25	8	36	22
1986	3	27	1	9	1	9	6	55	11	18	60
1987	6	67	2	22	–	0	1	11	9	14	63
1988	2	33	4	67	–	0	–	0	6	14	42
1989	2	25	2	25	–	0	4	5	8	25	32
1990	2	29	2	29	–	0	3	43	7	27	26
1991	3	27	4	36	4	36	–	0	11	32	34
1992	–	0	2	33	4	67	–	0	6	26	23
1993	3	21	1	7	8	57	2	14	14	39	37
1994	–	0	–	0	–	0	–	0	–	0	12
1995	–	0	3	50	1	17	2	33	6	24	25
1996	1	14	3	43	1	14	1	14	7	37	19
1997	–	0	–	0	–	0	–	0	–	0	7
1998	–	0	1	100	–	0	–	0	1	13	8
Total	26	27	27	28	19	20	22	23	95	26	365

A = haemonchosis.

B = 'other helminths', includes other helminthoses, e.g. oesophagostomosis.

C = heartwater.

D = 'others', includes besnoitiosis, hydatidosis, coenurosis, cysticercosis and trypanosomiasis.

*Total number of goats killed by parasitic diseases.

**Total goats killed by all diseases.

was more prevalent between 1991 and 1993.

Other parasitic diseases reported included cysticercosis (*Cysticercus tenuicollis*), hydatidosis, besnoitiosis and trypanosomosis. Together, they comprised about 23% of all parasitic diseases.

DISCUSSION

This study demonstrates that parasitic diseases are important causes of mortality in small ruminants. Amongst the helminthoses, haemonchosis was the major cause of mortality.

Other workers have obtained similar results. In a study carried out in central Tanzania, parasitic infections accounted for 53.1% of the total number of diseases affecting small ruminants⁷. Other studies in Kenya have also shown that helminthosis is the leading cause of mortality in sheep and goats^{3,11,12}. The pathogenesis of haemonchosis involves anaemia and hypoproteinemia caused by the blood-sucking activity of *Haemonchus contortus*. In the peracute form of the disease, which was observed in a few cases in this study, the animal is attacked by thousands of parasites and bleeds to death within a week. In most cases death was sudden, with no preliminary signs. Most of the cases in the study were acute, and the most consistent sign was severe anaemia. Hypoalbuminaemia was also common and resulted in animals becoming weak, lethargic and developing anasarca, mostly manifesting as 'bottle jaw' oedema.

The economic impact of helminthosis is enormous. A study has estimated that the total animal loss due to helminthosis world wide is equivalent to 30 million goats and sheep⁶. In Australia mortality due to sheep helminths accounts for about 41 million Australian dollars annually⁸. In Kenya, haemonchosis causes an annual loss of about US\$26 million². Another study has shown that returns could be increased by as much as 470% by simply controlling haemonchosis in goats¹⁰. Constraints to animal production attributable to helminthosis include inefficient food conversion, poor growth, reduced fertility and death of some animals.

The high prevalence of helminthosis as a cause of death in this area is attributable to management factors, where animals are kept semi-intensively and are rarely treated for worms. Most of the helminth

infections are subclinical, and therefore farmers do not easily recognise them. Weak, immunologically incompetent animals such as old and broken-mouthed does and ewes or the young kids and lambs develop the clinical form of the disease. Most farmers do not easily recognise the early clinical signs, and consequently seek veterinary advice too late, and the animals die because they are not treated in time. The use of anthelmintics at lower than recommended therapeutic levels and the possible occurrence of anthelmintic resistance may also contribute to the high prevalence of the disease.

Heartwater was the second most common cause of mortality in small ruminants. The disease accounted for 31% and 19% of all the parasitic mortalities of sheep and goats respectively. According to the mortality rate, the disease was more prevalent among sheep, in which the most severe pathological signs were also observed. The disease is debilitating to ruminants and is prevalent in much of Africa and the Caribbean region. It is caused by the rickettsial organism *Cowdria ruminantium*, and is transmitted by ticks of the genus *Amblyomma*⁴. The disease poses a severe threat to cattle- and sheep-farming. In Zimbabwe alone the disease causes annual national direct losses amounting to US\$5.6 million in discounted value⁹. Most of these losses are due to the cost of control. Unlike in South Africa, where substantial work has been undertaken on the disease⁴, there is very little information on the prevalence of the disease in Kenya or even its economic importance. The high mortality rate observed in this study could be due to minimal or no tick control on sheep and goats. Most farmers of small ruminants rarely practise tick control, presumably owing to ignorance of ticks as the cause of the disease. The high cost of the drug used for treatment⁹ could also be an inhibiting factor in the control of the disease.

This study has demonstrated that helminthosis and heartwater are the major parasitic causes of mortality in small ruminants in the area around the Veterinary Faculty at Kabete. Based on this information on the role of different parasitic diseases as causes of mortality in small ruminants, control strategies can be devised to reduce mortality and thereby achieve improved productivity. There is

clearly a need for the relevant departments to educate farmers and re-examine the current methods of veterinary service delivery.

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