

Intestinal Parasitic Infections of Camels in the Agro and Pastoral Areas of Northern Tanzania

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Abstract: The prevalence of faecal intestinal parasite eggs and species spectrum was studied in relation to host and management variables in camels in the northern Tanzania. A total of 193 camels of all age and sex were examined between June and August 2010. Collected faecal samples were processed by sedimentation and floatation methods and then examined for helminth eggs. Coprological examination revealed that 62.7% (n = 121) of the camels excreted helminth eggs in their faeces. Eleven types of helminth/protozoan parasites eggs/ocyst encountered in descending order of prevalence were *Strongylus* sp. 89.2%, *Trichostrongylus* sp. 27.3, coccidia 9.9, *Strongyloides* sp. 6.6, *Anaplocephala* sp. 3.3, *Oxyuris* sp. 2.5, *Dictyocaulus* sp. 2.5, *Gastrodiscus* sp. 2.5, *Parascaris* sp. 1.65, *Trichonema* sp. 0.83 and *Triodontophorus* sp. 0.83%. Single (64%) and concurrent infections with two, three and four parasites were recorded in 25.6, 8.26 and 1.65%, respectively of the cases. All the factors except source, body condition score and health status affected significantly (at least $p < 0.05$) the prevalence of gastro intestinal parasite infections. The high prevalence and wide spectrum observed in the present study suggests that helminth infection are widespread at the farms/herds examined and may be a constraint to economic camel production in the country and there is need to institute control measures.

Key words: Camel, endoparasites, prevalence, risk factors, Tanzania

INTRODUCTION

Camels play an important socio-economic role in the arid and semi arid areas where most of the resource poor farmers in Africa live (Guliye *et al.*, 2007). The role of camels in traditional areas has been highlighted (Wilson, 1984, 1998; Mehari *et al.*, 2007). Camels have been reported to form an integral part of the cultural life and system of pastoral communities and they are the major source of food (meat and milk), transport and they provide a genetic resource base which is abundantly available and can be exploited for improvement of the livelihoods of rural people (Schwartz and Walsh, 1992).

The major problems of livestock production, camel inclusive in Tanzania include housing, health and feeding (Max *et al.*, 2006; Parsani *et al.*, 2008). According to EI-Bihari (1986) and Wahba and Refail (2003), high incidence of diseases is one of the major constraints associated with camel production. The detrimental role which parasitic diseases play in livestock production has been emphasized (Hansen and Perry, 1994). Losses are due to mortality, lowering of reproductive and growth rate, reduced hide value, weight loss and increased cost of production due to additional veterinary bills. Animals in discomfort or pain are likely to be less productive than their healthy counterparts.

Globally, a number of studies have been undertaken to determine the relationship between the prevalence of helminth infections and management practises present in camel herds. Such studies have been done in Sudan (Fadl *et al.*, 1992), Mali (Tembely *et al.*, 1992), Kuwait (Abdul-Salam and Farah, 1988), Ethiopia (Bekele, 2002) and Pakistan (Khan *et al.*, 2010) amongst other countries. These studies have shown that poor husbandry, management system, climate and sub-optimal feeding of camels may influence the occurrence and pattern of infection. In contrast, there is no published information on the Gastrointestinal (GIT) helminth status in camels in Tanzania. Therefore, a questionnaire and parasitological survey was carried out in camel herds in different administrative localities of northern Tanzania in order to obtain information on the relationship between various management, environment, host factors and prevalence of different GIT helminths in the camel herds. It's believed that 80% of the camels in Tanzania belong to the resource poor pastoral communities of northern Tanzania.

MATERIALS AND METHODS

Study area: This study was conducted in 8 geographical localities (districts) of northern Tanzania. Geographically, the eight districts are located between Latitude 2°11' and

6°C 14, South of Equator and Longitude 35°11' and 38°26' East of Greenwich. The study sites were purposively selected in collaboration with the government livestock extension and administration officers. The study districts receive an average annual rainfall of 800 mm which is bimodal in distribution. The long rains fall between March-May and the short rains fall between October-December. The amount and duration of rainfall varies from year to year and from season to season. Temperatures vary between 13-31°C through-out the year, the coldest month being July and warmest months being October and March, prior to the rains.

Sampling procedure and data collection: In conducting the study, a cross-sectional design in which data was collected at a single point and time (Thrusfield, 2005) was used. The study population consisted of all age and sex in digenous breeds of camel (one hump camel) reared under extensive husbandry which allows free grazing, usually mixed with livestock from other villages. Semi-Structured Questionnaire (SSQ) comprising herd, camel bio-data was developed during the period of April through May 2010. Administration of the SSQ complemented with herd inspection was used to collect management practices and asses health status of each herd. Data collected were herd size, source of animals classified as homebred or brought-in, sex, age retrieved from owner herd record. Body condition of camels was assessed visually and rated as poor, fair and good. Other information assessed includes health status at a time of visit classified as healthy or unhealthy, history of husbandry practices intervention such as vector and endo-parasite control. Field survey was conducted during the period of June-August 2010.

Sampling and parasitologic techniques: Faecal samples (fresh stool) were collected per-rectum using plastic gloves, put into faecal pots, labelled and kept cool before transportation to the local veterinary Investigation laboratory where they were immediately examined or stored at refrigerated temperature (4°C) for a maximum of one day before processing. The sedimentation and floatation technique as described by Soulsby (1982) and Urquhart *et al.* (1987) was used to detect the presence of stomach and intestinal eggs (trematodes and nematodes) in the samples. The presence of coccidia oocysts was also recorded.

Statistical analysis: Collected data were entered, stored and analyzed using Epi-Info version 6.04b (CDC, USA). Descriptive statistics were generated and presented as tables. For the epidemiological studies, the prevalence (p) of camels harbouring each parasite was calculated as $p = d/n$ where d is the number of camels diagnosed as having a given parasite egg/oocyst at that point in time

and n = number of camels at risk (examined) at that point in time (Thrusfield, 2005). Associations between parasitism and categorical (host, environment and management) factors were compared using χ^2 -tests for independence. The level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Participating herds characteristics: All the selected camel herds were visited, owner or any household member interviewed and animal sampled. The average (mean±SD) herd size of the sampled herds (n = 14) was 24.1±21.9, range, 3-72. The average age of all investigated camels were 6.8 years with range varying from 1 month to 22 years and the majorities (89%) of the animals were below 10 years of age. One humped camel was the predominant specie kept. Of the 193 camels examined, 144 (74.6%) and 49 (35.4%) were females and males, respectively. Regular vector and endo-parasite (worm) control practices were reported to be the common intervention made to 74 and 56% of the study camels, respectively. The proportions of camel in each category of each variable investigated are shown in Table 1, Fig. 1 and 2.

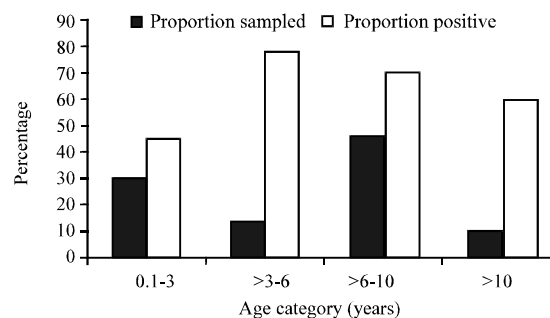


Fig. 1: Proportion sampled and prevalence of GIT parasite eggs/oocysts by age category in camel (n = 193)

Table 1: Proportion of each category investigated and the associated prevalence of parasite (all species) egg/oocyst infection

Variables	Number examined		Prevalence		χ^2	p-value
	Number	Percentage	Number	Percentage (%)		
Body score						
Poor	6	3.1	5	83.3		
Fair	102	52.8	64	62.7		
Good	85	44.0	52	61.2	1.2	0.5550
Sex						
Females	144	74.6	98	68.1		
Males	49	25.4	23	46.9	6.10	0.0136
Source						
Homebred	110	57.0	66	60.0		
Brought-in	93	43.0	55	66.3	0.55	0.4580
Healthy status						
Healthy	180	93.3	111	61.7		
Unhealthy	13	6.7	10	76.9	0.64	0.4220
History of deworming						
Yes	108	56.0	59	54.6		
No	85	44.0	62	72.9	6.06	0.0138

χ^2 -Chi-square, p = Level of significance

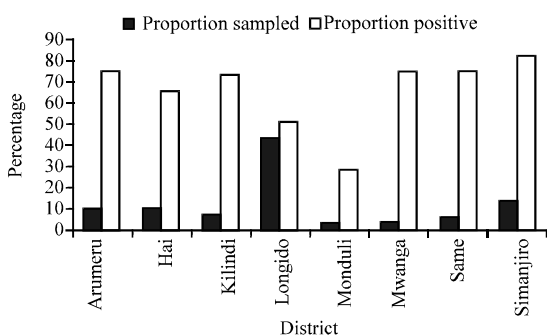


Fig. 2: Proportion and prevalence of GIT parasite eggs/oocysts by district (n = 193)

Table 2: Prevalence of different GIT parasites eggs/oocysts

Parasite class	Number positive	Prevalence (%)
Nematodes (Parasite sp.)		
<i>Strongylus</i>	108	89.20
<i>Trichostrongylus</i>	33	27.30
<i>Tridontophorus</i>	1	0.83
<i>Trichonema</i>	1	0.83
<i>Oxyuris</i>	3	2.47
<i>Dictyocaulus</i>	3	2.47
<i>Parascaris</i>	2	1.65
<i>Strongyloides</i>	8	6.60
<i>Anaplocephala</i>	4	3.30
Trematodes		
<i>Gastrodiscus</i>	3	2.47
Protozoan		
<i>Coccidia oocyst</i>	12	9.90

Prevalence of GIT parasite eggs/oocysts: A total of 193 camels were examined, of which 121 (62.7%) were diagnosed as harbouring nematodes and trematodes eggs at varying levels. The proportion of the camels harbouring nematodes eggs (*Strongylus* sp.) was the highest (89.2%). Other gastro-intestinal parasites eggs encountered included *Trichostrongylus* sp. (27.7%), *Strongyloides* sp. (6.6%) and trematodes (*Gastrodiscus* sp.; 2.47%). Protozoan oocysts (*Eimeria* sp.) were detected in 12 (9.9%) samples. Single parasite infections (n = 77; 63.6%) were more common than two (31; 25.6%) or three (10; 8.26%) or four (2; 1.65%) infections. Prevalence of GIT parasites are shown in Table 2.

Factors influencing the prevalence of GIT parasite eggs/oocysts infection: Significant factors influencing prevalence of GIT parasites infection are shown in Table 1. Host age was found to be a significant factor with respect to the prevalence of GIT parasite infection ($p < 0.05$), with eggs been detected more frequently in age categories (>3-10) than (<3 years) and (>10 years) camels (Fig. 1). The likelihood that camel was positive for GIT parasite eggs varied significantly with geographic location. Camels located in Simanjiro, Arumeru, Same and Mwanga districts had significantly high prevalence of

helminth eggs infection than animals located in Kilindi, Longido and Monduli ($p < 0.05$) (Fig. 2). Female camels were significantly more likely to harbour GIT parasites eggs than males (OR [odds ratio] = 2.41, $p = 0.013$ for female). Health status, source and body score were not significantly associated with prevalence of parasite infection ($p > 0.05$). Camels reported to have been treated against helminths in the last one year prior to the present study survey were significantly associated with lower prevalence of GIT parasite infection (OR = 0.45; $p = 0.013$).

The microscopic fecal examination showed that helminthosis was an important health disease in the study area. This finding is in agreement with the results of other researchers that helminthosis is one of the main problems in camels worldwide (Selim and Rahman, 1972; Fadl *et al.*, 1992; Abdul-Salam and Farah, 1988; Rewatkar *et al.*, 2009; Khan *et al.*, 2010).

The overall prevalence of 62.7% of GIT parasite eggs/oocyst in the camels in this study shows that there were frequent infections of the camels with different species of helminthes and protozoan. Eleven different species of gastrointestinal tract worms and protozoan were identified in camels. They were broadly classified as nematodes (9 species), trematodes (1 specie) and protozoan (1 specie) according to the egg structure (Boid *et al.*, 1986; Max *et al.*, 2006).

The relatively high level of parasitism recorded in this study is probably related to the number of adult parasites established in the GIT, level of host immunity, stage of parasite infection, lack of improvement in the animal health management programmes or non adoption of the modern animal health care programmes by camel owners.

Mixed parasitism (35.5%) involving two or more helminth genera was common in the present study and is in agreements with the results of other researchers (Selim and Rahman, 1972; Tembely *et al.*, 1992; Fadl *et al.*, 1992; Al-Ani *et al.*, 1998; Bekele, 2002; Rewatkar *et al.*, 2009). *Strongylus* and *Trichostrongylus* sp. were the most incriminated helminths in camels. Other helminth/oocyst genera detected, though at a low frequencies included *Strongyloides* sp., *Gastrodiscus* sp. and *Eimeria* sp. This is the first time that the camel GIT helminths and protozoan has been reported in northern Tanzania. The prevalence of 89.2% of *Strongylus* in this study is comparable to the prevalence of 100% reported in Kenya (Mukani and Kimani, 1999) but higher than the prevalence of 41% obtained in Ethiopia (Bekele, 2002) and 75% obtained in Sudan (Abdul-Salam and Farah, 1988). The higher prevalence obtained in this result than those obtained in Ethiopia and other relevant areas similar to those found in Tanzania could be due to the long

pre-patent period of *Strongylus* eggs, nature of the agro-ecological environment, poor levels of hygiene and the lack of veterinary attention in many marginalized pastoral areas (Allport *et al.*, 2005). The prevalence of *Parascaris* sp. was 1.65%. This finding was low compared to prevalence of 20% reported in Sudan (Fadl *et al.*, 1992). Soulsby (1982) has stated that *Parascaris* sp. eggs are very resistant to adverse conditions, like drying or freezing and the larvae rarely hatch and infection usually takes place through ingestion of the eggs. Heavy infections of *Parascaris* sp. cause impaction and perforation leading to fatal peritonitis (Urquhart *et al.*, 1996).

The prevalence of *Anaplocephala* species was 3.3%. The low prevalence detected in this study could be attributed to the sporadic discharge of gravid segment in the faeces and the difficulty in detecting cestodes eggs by routine faecal examination (Soulsby, 1982).

Eimeria sp. with prevalence of 9.9% was low compared with prevalences of 12.5 and 25%, respectively recorded in Pakistan (Anwar and Khan, 1998; Rewatkar *et al.*, 2009). Heavy protozoan infection may cause significant impact in young camels resulting into high morbidity and mortality (Chineme, 1980; Boid *et al.*, 1986; Kinne and Wernery, 1997).

Most of the camels examined appeared to be in fairly health condition but yielded different types of helminth eggs during examinations despite high level of deworming intervention made by camel owners. Drenched camels prior to the current study were associated with low level of helminth excretion. A good number of camel owners/keepers in the study area perceive helminth infection as a pre determined coincidental manifestation which nobody could do anything to prevent.

The sex of the hosts was an important factor influencing the prevalence of GIT infection in this study. Female camels were more infected with helminth parasites than their male counterparts. This may be due to the physiological peculiarities of the female camels which usually constitute stress factors thus reducing their immunity to infections (Wakelin, 1984).

The study further revealed that body conditions of the animal did not show significant association with the prevalence of the parasites. The absence of association between body condition and prevalence disagrees with previous reports in other livestock species (Keyyu *et al.*, 2003). This could be explained by the fact that loss of body condition in the study animals could be due to other factors, such as seasonal change of forageable feed staff and the presence of other concurrent disease conditions, mainly high prevalence of trypanosomosis in some of the lowland districts.

In this study, detailed investigations such as faecal culture for larvae recovery and species identification to establish the helminth parasites present in the study area was not made. This information would have been valuable for developing helminth control strategies. Resources constraints affecting logistics and laboratory capacity were the main reason.

CONCLUSION

The present study has revealed the presence of a range of helminths species which are representative of the important pathogenic parasites of camels worldwide. The presence of wide spectrum of GIT parasites with high prevalence is an indication that favorable environmental conditions for infection, survival and perpetuation of the parasites exist in Tanzania.

Moreover this study identified the potential risk factors associated with high prevalence rate enabling to design feasible and strategic control of helminth parasites of camels in areas of similar ecological features.

ACKNOWLEDGEMENTS

Researchers acknowledge the kind cooperation of the participating camel owners for accepting the use of their animals for the study. Laboratory technical expertise's provided by VIC colleagues are highly acknowledged. Director, Veterinary services Tanzania is acknowledged for permission to publish this research.

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