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Small Ruminant GIT Helminthiasis in Select Pastoral and Agro-pastoral Areas of Afar Region, Ethiopia

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Abstract
A cross-sectional study was conducted to determine the prevalence and identification of GIT parasites of sheep and goats in two selected districts of Afar from December 2014 to February 2016. Totally 590 faecal samples were collected from small ruminants (332 goat and 258 sheep) managed in pastoral and agro-pastoral production. Out of the total examined small ruminant 87.8% (518) were found to harbor one or more genera of helminth parasites. The result of the study revealed that 92.2% (306) of the goats and 82.2% (212) of the sheep were found positive for GIT parasites. Helminth parasites identified in small ruminant of the study area were Strongyles, Fasciola, Strongyloides, Paramphistomum, Trichuris, Ascaris and Monezia. The risk of infection with GIT helminth parasites in goats were 4.009 times higher than sheep (OR=4.009, p=0.011). Age and sex related difference was not observed in the prevalence of helminth parasites in sheep and goats. Significantly (OR=0.119, p=0.000) higher prevalence of overall helminth parasites in poor body condition sheep and goats than good body condition was observed. Likewise significant variation in overall parasite prevalence was observed between the study districts (OR=0.169, p=0.000). In this study, species of the animals, origin, and body condition score are important risk factors associated with gastrointestinal parasites in the study area. In the study area nutrition is generally poor, low productivity in small ruminants is likely to be aggravated by a high prevalence of polyparasitism. Consequently, beneficiary control strategies should be designed and implemented because the primary household food source of the study area pastoralists is milk of small ruminant.
Keywords: Helminths, Small ruminants, Prevalence, Afar Region, Ethiopia

Introduction

Small ruminants have a great potential to affect the socioeconomic development of the majority of African rural communities. Increasing small ruminant production can boost farm income by generating cash income that can be used to purchase inputs for other production activities hence improves the quality of life of the people of the sub-Saharan Africa (UNECA, 2012). Small ruminants represent the most important part of the Ethiopian livestock system, about 24.2 million sheep and 22.6 million of goats reported in the country. In Ethiopia small ruminants are reared in all agro climatic zones. The highland area comprises 75% of the sheep and 27% of the goat population, while the lowland pastoral and agro pastoral area have 25% of the sheep and 73 % of the goats' population (CSA, 2012).

In pastoralist area, goats and sheep are mainly utilized for milk and meat production and generate income to the owner. Nearly 87% of the Afar Regional State population are rural mainly dependent on pastoral and agro-pastoral livelihood systems. In the arid areas of Afar, which are none or limited agricultural potential livestock production is the main and only possible activity of the pastoralists. Among the livestock sectors on which the pastoralists of the region make their livelihood, small ruminant are the main cash income and play an important role. In spite of the large population and potential use of small ruminants in pastoral area, the production system is affected by feed shortage, poor genetic makeup of the animals, and wide spread occurrence of livestock diseases such as endoparasites which have great economic significance to the communities and the country as a whole (FAO, 2005).

Health disorders in all classes of small ruminants represent a factor that greatly affects the economics of sheep and goat production. The most serious problem confronting sheep and goats production worldwide is infection with GIT parasites. Parasitism ranks high among the factors that limit the productivity of small ruminants although its effect is often underestimated. Correspondingly the current levels of contributions of the small ruminants in Ethiopia, either the macro or micro level is below the expected potential. Among major constraints hindering the productivity of sheep and goat in the country diseases are the principal one; of which endoparasites accounts a wide range of health problems that confront the productivity of small ruminants (Chanie M and Begashaw S 2012).

In Ethiopia, parasitological investigations of small ruminants in the highland parts of the country have demonstrated that GIT parasites are the most common problem affecting production and productivity of the area sheep and goats. However, study on the GIT helminth parasites of small ruminants in the Afar Region is not yet conducted. Likewise in the study area different animal species and different age group were kept together on the same pasture and all species of animals share common water point. Hence, such type of husbandry system endorsed transmission and maintenance of parasites. Therefore, the objective of this study was investigating GIT helminth parasites infecting small ruminants of the study area.

Material and methods

Study area and population

The study was conducted in two districts (Asayita and Dubti) of Afar Pastoral and agro-pastoral Region. The Afar National Regional State is located in the Great Rift Valley, comprising rangeland in northeast Ethiopia with an estimated area of 95,958 Km2. The Afar Region is located in Northeast of Ethiopia between 39°34' and 42°28' E longitude and 8°49' and 14°30' N latitude. In the Afar Region, there are about 4,268,000 goats and 2,464,000 sheep, 2,336,488 heads of cattle, 852,016 camels and 187,287 equines which are managed under pastoral and agro-pastoral production system. The annual temperature and rainfall in the region is 30-50^{0}C and 200-600mm, respectively. The altitude of the region ranges from 116 meter below sea level to 1600 meters above sea level (CSA, 2012).

Dubti district contained about 49,234 goats, 24,363 sheep, 39,412 heads of cattle, 7241 camels and 2295 equines which are managed under pastoral and agro-pastoral production system (CSA, 2012). The production system in the area predominantly is pastoralism and agro-pastoralism. The major feed resource in the district is natural grazing and supplements from maize, sorghum, cotton and sesame. Asayita district is located in between 110°34' N and 410°26' E. The annual temperature and rainfall in the district is 28-41.7°C and 144mm annual precipitation, respectively. Asayita district located at an elevation of 340 meter above sea level (ANSR, 2010). In Asayita district there are about 97,013 goats, 17,198 sheep, 81,767 heads of cattle, 6108 camels and 3303 equines which are managed under pastoral and agro-pastoral production system (CSA, 2012). The major feed resource in the district is natural grazing and supplements from maize, sorghum, cotton and sesame.

Study design and sampling methods

A cross-sectional study was employed from December 2014 to February 2016 to address the objective of the study. The sampling method was supposed to be a muti-stage cluster sampling approach. However, due to the absence of between cluster variance and sampling frame in the study districts and pastoral community as a whole and, during sample collection due to migration of animals, unwillingness of pastoralists to include their animals in this study, conflict among pastoralists therefore, the flocks of small ruminants were sampled purposively. However, proportional allocation was used to distribute the individual sampled small ruminants evenly among the flock. Consequently, 5 to 15 individual small ruminants from each small ruminants flock were sampled. Zone one was purposively selected based on the small ruminant population and topography. The primary stage was sampling of districts from the selected zone. Selection of kebeles/PAs, flock and individual small ruminant within the flock were the 2nd, 3rd and 4th stages, respectively. Accordingly, two districts and four kebeles/PAs from each district, proportional flocks from each Kebeles and 5-15 small ruminant population from each flock was sampled. Each kebeles/PAs and individual animals from the flock sampled randomly. Therefore, total of 590 small ruminants was included in this study.

Sample collection

Fresh fecal samples approximately 10 g were collected directly from the rectum of small ruminant and sample placed in sampling bottles (without preservatives) and labeled. Samples were transported to laboratory with ice box contain filled ice bag hence, there were no significant changes in the egg morphology. Following transportation of fecal sample laboratory analysis was carried out at the same day and the remaining samples were kept under 4°C and examined up on the next days. In the laboratory, fecal samples were examined for detection of helminth eggs using standard procedures of flotation and sedimentation methods; eggs will be identified based on their color, shape and contents (Soulsby et al., 1982; Hansen and Perry 1994; Gareth, 2009). The collected fecal samples were processed and examined under the 10x and 40x magnification.

Results

Out of 590 small ruminants (332 goat and 258 sheep) examined 518 (87.8%) were infected with single or multiple parasites. From the totally examined small ruminant 92.2% goat and 82.2% sheep were infected with single or multiple parasites. The major helminth parasites identified from the small ruminants of study area were 49.2% *Strongyles*, 32.5% *Fasciola*, 28.5 *Strongyloides*, 25.4% *Trichuris*, 20.3% *Paramphistomum*, 8.8% *Ascaris* and 8.8% *Monezia* (table 1). From 87.8% of small ruminants infected, 58.3% and 29.5% were infected by multiple parasites and single parasite respectively.

Table 1: GIT parasites identified in the study area

Parasites	Goat (n=332)	Sheep (n=258)	Total (n=590)
Trichuris	23.5%(78)	27.91%(72)	25.4%(150)
Ascaris	11.45%(38)	5.4%(14)	8.8%(52)
Strongyles	56.02%(186)	40.3%(104)	49.2%(290)
Strongyloides	31.33%(104)	24.8%(64)	28.5%(168)
Fasciola	37.95%(126)	25.58%(66)	32.5%(192)
Paramphistomum	24.1%(80)	15.5%(40)	20.3%(120)
Monezia	9.04%(30)	8.53%(22)	8.8%(52)
Overall	**92.2%(306)**	**82.2%(212)**	**87.8%(518)**

Statistically significant difference was recorded in the overall prevalence of parasitism between species (OR=4.009, P=0.011), body condition score (OR=0.119, P=0.000) and origin (OR=0.169, P=0.000) of the study animals (table 2).

Table 2: Statistical result of overall helminth parasites infection of the study area

Risk factors	SE	P-value	OR	95%CI for OR	
				Lower	Upper
Species	0.549	0.011	4.009	1.368	11.751
Age	0.457	0.109	2.081	0.850	5.097
Sex	0.519	0.571	0.745	0.270	2.062
BCS	0.486	0.000	0.119	0.046	0.308
Origin	0.495	0.000	0.169	0.064	0.447

Prevalence by the origin of small ruminants

The overall prevalence of small ruminant parasite was significantly higher in Asayita district (93.13%) than in Dubti district (81.5%) (OR= 0.169, P = 0.000) (table 1). However, the result showed high parasitic infection in both districts.

Species based prevalence

The overall prevalence of GIT parasites in goat and sheep of the study area was 92.2% and 82.2% respectively. Statistically significant variation in the overall prevalence of parasites was recoded between goat and sheep of the study area (OR= 4.009, p=0.011) higher in goat than sheep (table 1).

Prevalence of parasite by Sex

Prevalence of GIT parasites in female and male animal of the study area was 88.13% and 87.16% respectively. Statistically significant variation in the prevalence of parasites was not recoded between male and female small ruminants of the study area (p>0.05) (table 1).

Prevalence of Parasites by Age

Statistically significant difference was never recorded (p>0.05) in the overall prevalence of parasite infestation between young and adult small ruminants of the study (table 1). Prevalence of GIT parasites in young and adult small ruminants of the study area was 83.78% and 90.2% respectively (table 1).

Prevalence of Parasites by Body Condition

The overall prevalence of parasites in good and poor body condition small ruminant of the study area were 75.22% and 95.6% respectively. The logistic regression results showed statistically significance difference in overall prevalence of parasite infestations (OR=0.119, p=0.000) between small ruminants with poor and good body condition in study area (table 1).

DISCUSSION

Results presented in this study revealed 87.8% an overall prevalence of small ruminant GIT helminth parasites in the study area. The current finding is inline with previous reports from different parts of Ethiopia and other tropical countries (Gebreyesus, 1986; Bayou, 1992; Dereje, 1992; Genene, 1994; Tefera et al., 2011; Bersisa et al., 2011; Bikila et al., 2013). However this finding is much higher than the studies conducted in different part of the country: (Tesfaheywet, 2012; Welemeehret et al., 2013; Petros and Lakew, 2014; Bashir et al., 2012; Temesgen and Walanso, 2014). The high prevalence observed in this study most probably attributable to several important factors including management problems (keeping different species of animals and different age group together), conducive environment, malnutrition and, negligible knowledge of pastoralists and inadequate veterinary services in the study region. In addition due to no policy which limit free movement of animals from

one place to the other in the country as a whole hence, clinically affected and carrier animals can serve as the source of infection. The effects of climate change and other factor such as changes in animal management and husbandry systems, usage of antiparasitics and increase in animal trafficking may also contribute to the changes in the prevalence, or emergence of parasitic infection in certain localities (Kufman *et al.,* 2012).

The overall prevalence of GIT parasite was significantly higher in goat than sheep of the study area (P=0.011). Goats of the study area were 4.009 times at risk for GIT infestation than sheep. The current finding is in agreement with works of different researchers (Fikru et al., 2006; Keyyu et al., 2006; Raza et al., 2007; Abebe et al., 2010; Dagnachew et al., 2011). However, this finding is in contrary with other findings revealed GIT parasite infection is higher in sheep than goat (Teklye, 1991; Waruiru et al., 2005; 2008; Tesfaheywet, 2012; Teka, 2013). Nevertheless, in the present study even though sheep and goats differ in their feeding habits, small ruminants are kept together on common grazing land which may expose goats to acquire more susceptibility for the same species of parasite infection. In consequence, the condition could be due to less or slow development of immunity in goats to GIT parasites compared with the situation in sheep. Goats do not build up an effective immune response against helminth infections and so remain susceptible to disease throughout their lives. The risk is enhanced if they are forced to graze rather than browse (Urquhart et al., 1996; Radostits et al., 2006). Sheep faced prolonged challenge over generations and had developed good resistance (Urquhart et al., 1996). So that, in the study area recurrent drought occurred repeatedly, so goat of the study area forced to graze as the bush become dry during drought time. In general Afar pastoralists own different species of domestic animals, and these animals share common watering points and grazing pasture. The watering points of small ruminants are commonly shared with cattle and camel creating a close interspecies interaction among these domestic animals, and this might increases the risk of transmission of GIT parasites which infect multiple species.

Prevalence of helminth parasite is higher in adult animal than young one. However, age wise observation revealed no statistically significant difference in infestation of helminth parasites. This finding agrees with reports from Gambia and Semi-arid part of Kenya indicated that GIT helminthes affect both ages insignificantly (Waruiru etal., 2005; Fritsch et al., 1993). The present finding disagrees with most literatures (Gamble etal., 1992; Colditz et al., 1996; Fikru et al. 2006;) that young sheep and goats are more susceptible to parasite infection than adult small ruminants. The researchers justified the result that it could be because adult animals may acquire immunity to the parasite through frequent challenge and expel the ingested parasite before they establish infection and young animals are susceptible due to immunological immaturity and immunological unresponsiveness. However, in this study we ascribe the absence of significant difference in parasites infection between young and adult animals might be due to the small number of young animals kept by the pastoralists as they interested to sale young animals since the community used small ruminant milk as a source of food for the household and if they keep young they may not fulfill their necessitate of using milk. Therefore, young small ruminant which are kept as replacement stock may enforced to graze as early age because of limited access to milk.

In the current study significant higher prevalence of gastrointestinal parasites were recorded in poor body condition small ruminant than good body condition animals. This finding agrees with (Keyyu et al., 2006; Negasi et al., 2012; Gonfa et al., 2013; Temesgen and Walanso, 2015). In addition, Radostits et al. (2006) and Odoi et al. (2007) indicated that animals with poor condition are highly susceptible to infection and may be clinically affected by worm burdens too small to harm an otherwise well-fed healthy animal. Moreover, Knox et al. (2006) observed that a well-fed animal was not in trouble with worms, and usually a poor diet resulted in more helminth infections. Furthermore, helminths also led to a loss of appetite and poor utilization of food, which results in a loss of body weight. Hawkins and Morris (1978) demonstrated that weekly growth rates and live weight decreased with increasing helminth burdens in small ruminants.

Coprological examination in both sheep and goats have shown the presence of *Strongyles, Trichuris, Strongyloides, Ascaris, Fasciola, Paramphistomum, Monezia* and mixed infections. The helminth parasites recorded in the study area have also been reported previously in other ares of Ethiopia (Haileleul, 2002; Fikru et al., 2006; Bersissa and Ajebu, 2008; Kumsa and Abebe, 2009; Kumsa et al., 2010; Dagnachew et al., 2011; Ibrahim et al., 2014) and elsewhere in the world (Agyei, 2003; Kumba et al., 2003; Cernanske et al., 2005; Githigia et al., 2005; Opara et al., 2005; Waruru et al., 2005 Odoi et al., 2007; Elele et al., 2013; Ntonifor et al., 2013). The current study showed that nematodes are the most common helminth parasites of both sheep and goats of the study area. The result also revealed that Strongyle nematodes were identified as the most predominant helminths in the small ruminants of the study area. This finding is in agreement with different findings (Raza et al., 2007; Bersissa et al., 2011; Tesfaheywet, 2012; Welemehret et al., 2012; Diriba and Brihanu 2013; Teka, 2013; Petros and Lakew, 2014; Temesgen, 2015). The high prevalence of strongyles may be due to the suitability of the climatic condition of the study area for survival and transmission of the parasites. In addition, the poor management practices including the poor hygienic practices employed by the pastoralists and keeping different age group and different spices of animals together may be the other contributing factor as the epidemiology of nematodosis is determined by environmental factors (Thamsborg et al., 1996; Ng'ang'a et al.,

2004).

Conclusion

The overall prevalence of gastrointestinal helminth parasites in the study area indicates GIT helminthosis to be important health problem due to its high prevalence and occurrence of polyparasitism. The prevalence was significantly influenced by species, origin of the animal and body condition score of the small ruminants. In the study area pastoralists own different species of domestic animals, and these animals share common watering points and grazing sites which creating a close interspecies interaction among these domestic animals, and this might increases the risk of transmission of GIT parasites which infect multiple species. In addition shortage of feed source in the study area magnified the occurrence and prevalence of GIT helminth parasites. Pastoralists of the study area are at risk of economic losses from decreased productivity of their animals as a majority of them harbored polyparasitism. Thus, GIT parasites should considered among those diseases responsible for health and productivity problems in small ruminant. More detailed studies on helminths should be conducted to pinpoint appropriate time for strategic deworming. In addition year rounded investigation is needed to know the species composition, survival strategy and ecology of the economically important GIT helminth parasites of sheep and goat in the study area.

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