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Prevalence of gastrointestinal parasites in cattle kept under pastoral management system in selected districts of Borana zone, Ethiopia

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The present study was conducted in three districts (Arero, Moyale and Yabello) of Borana zone, from October 2016 to June 2018, with the aim to determine the prevalence, identify the species and detect the risk factors of GIT parasites. For this cross-sectional study, a total of 383 faecal samples were collected directly from the rectum of the animal and examined using flotation and sedimentation techniques according to standard parasitological procedures. The study revealed that the overall prevalence of GIT parasites was 56.92% (*95% CI*= 51.8 to 62%). The prevalence was higher in Moyale (71.65%; 95% CI=62.98 to 79.29%), followed by Yabello (52.76%; 95% CI= 43.70 to 61.67%) and Arero (46.51%; 95% CI= 37.69 to 55.50%). The occurrence of GIT parasites among districts was found significant (P<0.05). Among the identified parasites, the highest prevalence was determined for Strongyles type species (29.6%), followed by *Eimeria* (23.28%), while trematodes and cestodes were found at lower prevalence. The prevalence of GIT parasites was also found to be significantly associated to the age, body condition and history of anthelmintic use of the sampled animals (P<0.05). Sex was insignificantly (P>0.05) associated with the occurrence of GIT parasites. The study revealed that GIT parasites were one of the major problems that could affect health and productivity of cattle in the study area. Therefore, creation of awareness on the effects of GIT parasites for the pastoralists in the study area and designing strategic control approaches have a paramount importance to improve the health and productivity of cattle production in the area.

Key words: Borana, Cattle, Ethiopia, gastrointestinal parasites, prevalence.

INTRODUCTION

Ethiopia has the largest livestock population in Africa and the national herd consists of about 70.29 million cattle, 42.91 million sheep, 52.46 million goats, 8.16 million camels and close to 57 million poultry (CSA, 2021). Despite the large cattle population, productivity in Ethiopia is low due to poor nutrition, reproduction inefficiency, management constraints and animal diseases (Habtemichael et al., 2018).

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Amongst livestock diseases, gastrointestinal (GIT) parasite infestation in ruminant livestock result in adverse effects on feed intake, growth rate, carcass weight and composition, wool growth, fertility and milk yield (Squire et al., 2019).

The GIT tract of animals harbors a variety of parasites, particularly helminthes, which causes clinical and subclinical parasitism. These parasites adversely affect the health status and productivity of animals and cause enormous economic losses to the livestock industry (Rafiullah et al., 2011; Moussouni et al., 2018). These losses are reduced weight gain, digestive disturbance, lowered production, impaired reproductive performance, condemnation of affected organs, mortality in infected animals (Marskole et al., 2016) and reduced working capacity of the animal mainly in developing countries (Telila et al., 2014). Moreover, the costs due to frequent usage of anti-parasitic drugs, the poor feed conversation rates, the reduction of reproductive and/or productive performances, together with the possibility of drug resistance due to indiscriminate treatments with anti-parasitic drugs, represent some of the factors contributing to the reduced efficacy in cattle production (Hamid et al., 2016).

The prevalence of GIT parasites, the genera of helminth parasites involved, species, and the severity of infection also vary considerably depending on local environmental conditions, such as humidity, temperature, rainfall, vegetation and management practices (Regassa et al., 2006). In Ethiopia, several studies have been conducted to determine prevalence of GIT helminthes in different agroecologies of the country (Ahmed et al., 2015) and most of them are tended to central, northern highlands and semi-arid regions of eastern Ethiopia (Awraris et al., 2012). Therefore, taking into account the significance of parasites as one of the most important causes of economic losses and the scarcity of information in the area, the present study was designed to determine the prevalence of GIT parasites and major risk factors associated with GIT parasites in three districts of Borana.

MATERIALS AND METHODS

Study area

The study was conducted from October 2016 to June 2018 in three districts (Arero, Moyale and Yabello) of Borana zone, which is located about 565 km to South East of Addis Ababa (Figure 1). Resource use in the Borana rangeland is largely communal though with crop cultivation and private enclosures that appear to be increasing in recent decades. In these areas, veterinary care was low and cattle had contact with other animal species such as goat and sheep in the communal grazing areas. The area receives bimodal pattern of rainfall, with the long rains falling between March and May and the short rains between September and November. Spatial and temporal variability in both quantity and distribution of rainfall renders the area semi-arid, with an average annual rainfall ranging from 400 mm in the South to 600 mm in the North (Coppock, 1994). The annual mean temperature varies from 19 to over 25° C (Teshome et al., 2019; Teshome et al., 2022).

Study animals, design and sampling strategies

In this study, a total of 383 cattle of different age groups and both sexes and those kept under traditional extensive management system, were included. A cross-sectional study design and a multistage random sampling were applied to select the study animals. Pastoral association (PA) and 'Olla' (village) level cattle selection was done and sampled based on simple random selection following farmers' consent to allow their herds to be used for this study. The sampling frame comprised a list of all districts in the zone and three districts (Arero, Moyale and Yabello) were selected for the present study.

The total sample size was determined based on an internationally set standard formula (Thrusfield, 2005). Sample size was calculated using 95% confidence level at 5% absolute precision and expected prevalence of 50%. A minimum sample size of 384 animals was determined. However, due to one sample was not appropriately labeled, it was discarded and only 383 samples were used for lab analysis.

Faecal sample collection and examination

Fresh faecal samples were collected directly from the rectum of selected cattle by using latex examination glove and placed in screw cupped universal bottle. The bottles were labeled with a code containing the district name and animal identity. Samples were kept in an icebox and transported to the parasitology laboratory of Yabello Pastoral and Dryland Agriculture Research Center and properly stored at 4°C for a maximum of one day till parasitological examination. Faecal samples were examined by direct, sedimentation and floatation methods for the presence of eggs. Saturated NaCl solution was used to concentrate nematode eggs, cestode eggs and *Eimeria* oocysts. Sedimentation technique was also conducted to detect trematode eggs in faecal samples. Identification of eggs was done by examining under a compound microscope as described in Soulsby (1982).

Data management and statistical analysis

Data collected from the field and laboratory assays were entered and stored in Excel spreadsheet, screened for proper coding and errors. The obtained data were analyzed by Stata software (StataCorp, 2013). The results were summarized by descriptive statistics, and univariate and bivariate analyses using Chi-square (X^2) test. Variables with p-value less than 0.05 in the univariate analysis were included in multivariable analysis and multivariable model was fitted. Finally, odds ratios and their 95% confidence intervals were calculated. The association in the Chi-square test and logistic regression model were considered significant when the p-value was less than 0.05.

RESULTS

Prevalence of cattle gastrointestinal parasites by risk factors

In the present study, out of 383 cattle sampled, 218 (56.92% with 95% CI: 51.8-62%) harbored one or more GIT parasites; the results are summarized in Table 1.

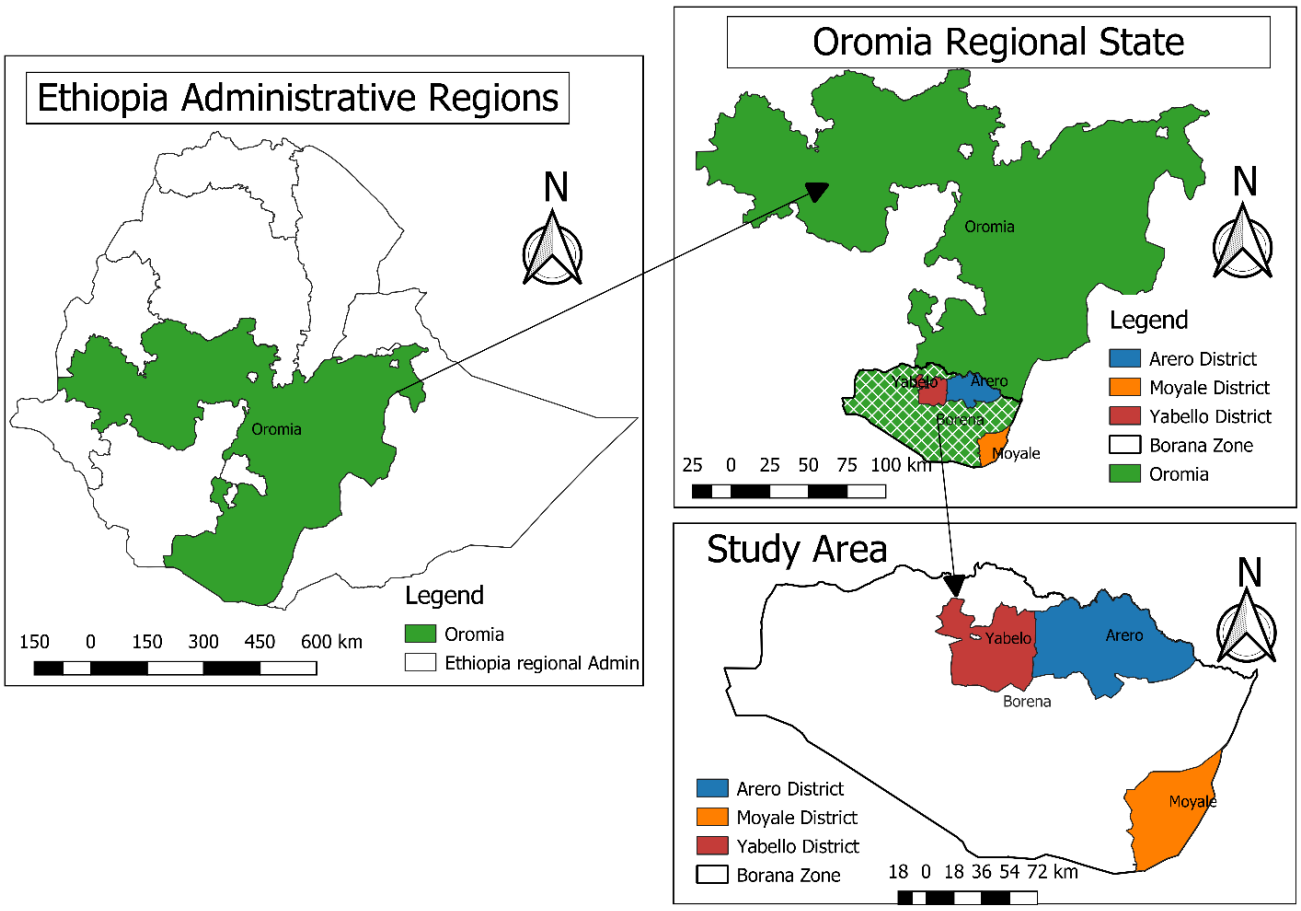

Figure 1. Study area. This map was created using QGIS Software version 3.2.1 and Ethiopian district administrative shape files of 2019.
Source: Authors 2022

Table 1. Prevalence of cattle gastrointestinal parasites by risk factor.

Risk factor		No. examined	No. positive	Prevalence (%)	X^2	P-value
District	Arero	129	60	46.51	17.84	<0.001
	Moyale	127	91	71.65		
	Yabello	127	67	52.76		
Deworming history	Yes	92	38	41.30	12.04	<0.001
	No	291	180	61.86		
Sex	Female	278	152	54.68	2.08	0.149
	Male	105	66	62.86		
Age	Adult	199	95	47.74	14.24	<0.001
	Young	184	123	66.85		
Body condition	Good	168	80	47.62	18.67	<0.001
	Medium	140	80	57.14		
	Poor	75	58	77.33		
	Total	**383**	**218**	**56.92**		

Source:Authors 2022

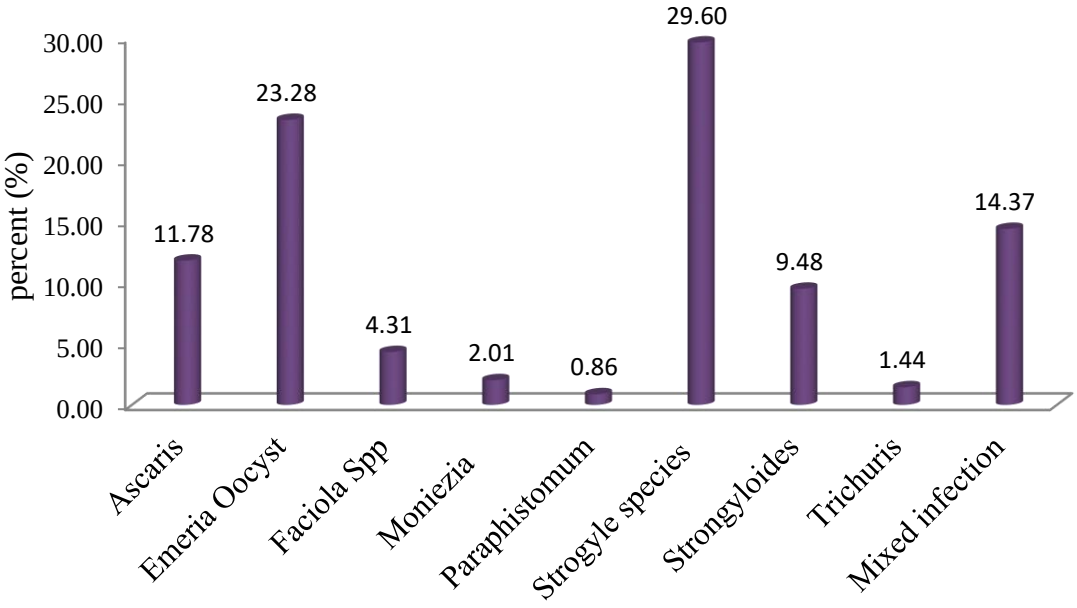

Figure 2. Prevalence of gastrointestinal parasites in cattle.
Source: Authors 2022

The highest prevalence (71.65%) was observed in Moyale, followed by Yabello (52.76%) and Arero (46.51%), and the difference was statistically significant (P < 0.001). Based on history of deworming, 38 (41.3%) cattle were positive from cattle treated with anthelmintic and 180 (61.86%) cattle were positive from non-treated cattle and significant variation (P<0.001) was observed. With respect to the prevalence per sex, 152 (54.68%) female and 66 (62.86%) male cattle were found to be positive. However, the difference was not statistically significant (P>0.05). The relationship between age and cattle GIT parasite prevalence showed that, the prevalence was higher in young-age (66.85%) than adult-age animals (47.74%) and the difference was statistically significant (P<0.001). With regard to body condition of the animal, statistically significant difference was observed between the prevalence of GIT parasites in animals with poor (77.33%), followed by medium (57.14%) and good (47.62%) body conditions. The prevalence of various GIT parasites for *Strongyle genera, Eimeria* spp*., Ascaris, strongyloides, Fasciola* spp*., Moniezia* spp*., Trichuris* spp. *and Paramphistomum* spp. was 29.60, 23.28, 11.78, 9.48, 4.31, 2.01, 1.44 and 0.86%, respectively. The mixed infection rate was 14.37% (Figure 2). These findings are similar to those of Telila et al. (2014).

Results of multivariate logistic regression analysis to fit the model revealed that among the risk factors considered in the analysis district, body condition, history of deworming and age of animals had statistically significant effect on prevalence of GIT parasites (P<0.05). However, sex of the animal did not show statistically significant effect on result outcome. The likelihood of acquiring GIT parasites was 2.683 times higher in Moyale than in Arero district. On the other hand, odds of GIT positive were similar (1.033 times) for Yabello as compared to Arero district. The odd of prevalence was 1.8 times significantly higher in young-age than in adult-age animals. Animals get treatment protected from parasite infestation by 0.5 as compared to dewormed once. The odds of positivity for GIT parasites in poor and medium body condition were about 2.3 and 1.14 times higher than that of good body condition animals (Table 2).

DISCUSSION

Livestock keeping is one of the most important and self-sustaining means of livelihood in the pastoral and agro-pastoral communities of Borana. Thus, cross-sectional study on GIT parasites of cattle was conducted in selected districts of Borana zone, and the finding showed that 56.92% of the sampled animals were positive for GIT parasites. This finding was closely related to the results of Derib (2005), Regassa et al. (2006) and Telila et al. (2014), who reported 50.2, 50.8 and 50.08% of prevalence, respectively, in Ethiopia. A similar prevalence (55.59%) was reported by (Rafiullah et al. (2011). Moreover, this result is in accordance with the finding of Ntonifor et al. (2013), who reported a prevalence of 56.7% GIT parasites of cattle in western Cameroon. In contrast to this finding, a lower prevalence was reported by Bacha and Haftu (2014) and Diriba and Tulu (2018) for West Arsi zone and East Shewa zone, and a higher prevalence of GIT parasites of 82.8% in Holeta was

Table 2. Result of multivariate logistic regression analysis for prevalence of GIT parasites in cattle.

Risk factor	Odds ratio	Std. err.	z	P>|z|	(95% Confidence Interval)
District					
Arero	Ref.				
Moyale	2.683	0.754	3.514	<0.001	(1.547 - 4.654)
Yabello	1.033	0.276	0.123	0.902	(0.612 - 1.746)
History of deworming					
Animals not dewormed	Ref				
Animals dewormed	0.491	0.132	-2.641	0.008	(0.290 - 0.832)
Age of the animal					
Adult	Ref.				
Young	1.796	0.43	2.447	0.014	(1.124 - 2.872)
Body condition					
Good	Ref.				
Medium	1.137	0.288	0.509	0.611	(0.693 - 1.867)
Poor	2.293	0.78	2.439	0.015	(1.177 - 4.468)
Constant	0.718	0.176	-1.349	0.177	(0.444 - 1.162)

Source: Authors 2022

reported by Etsehiwot (2004). The difference observed might be due to variation in the type of management, geographical location and the number of samples, as well as sampling design used in the study.

The highest prevalence (71.65%) was observed in Moyale, followed by Yabello (52.76%) and Arero (46.51%) and the difference was statistically significant ($P < 0.05$). The current result is consistent with the previous report of Regea (2019). The variation observed among the districts could be attributed to difference in environmental condition and rainfall, which favors the survival and development of infective larvae. Furthermore, the distance they have from capital town of the zone could bring variation among the pastoralists in awareness as well as animal health services they get.

Based on history of deworming 38 (41.3%) cattle were positive from cattle treated with anthelmintic and 180 (61.86%) were positive from cattle not treated and significant variation ($P<0.05$) was observed. A similar finding was reported by Telila et al. (2014). On the contrary to our findings, Chikweto et al. (2018) reported there is no relationship between deworming history and GIT parasite load. The possible explanation for the difference between the aforementioned and our finding could be the presence of anthelminthic resistance in their study.

In the current study, there was no significance difference in prevalence of GIT parasites between female (54.68%) and male (62.86%) animals ($P>0.05$) and the result was in agreement with that of (Maharana et al. (2016), who reported absence of difference in prevalence between female and male animals. The possible explanation for non-significance difference in our study might be due to the similarity in management given for both sexes.

There was a significant difference in the occurrence of GIT parasites between different age groups ($P< 0.05$), where young (66.85%) were more likely to test positive than adult cattle (47.74%). This finding is consistent with those of Pfukenyi et al. (2007) in communal grazing areas of Zimbabwe, Kemal and Terefe (2013) in Gedebario Gutazer Wolane district, and Tulu and Lelisa (2016) in Tulo district. However, the present finding contradicts with the report of Regassa et al. (2006), who reported absence of difference in parasite load between age groups. The difference observed in age groups in the present study is most probably due to susceptibility and resistance of different age groups.

Out of 218 cattle found positive for fecal egg examination, 80 (47.62%) had good body condition score, 80 (57.14%) medium and 58 (77.33%) poor body condition and significant variation was observed. This finding is in line with those reported by Awraris et al. (2012), Telila et al. (2014) and Regea (2019), who reported significant association between prevalence of GIT parasites and body condition. However, this result differs from that of Regassa et al. (2006), who reported absence of significant association between the prevalence of helminths and body condition scores of animals. The reason for the difference found in the current study is that animals with poor body condition are affected by parasites due to the fact that they have

suppressed immune system; in contrast, animals with moderate and good body condition had good immunity that helps in reduction of parasite transmission in the cattle herd (Gasbarre et al., 2001).

In conclusion, the findings of the current study suggest that the occurrence of high prevalence of GIT parasites in the study area could have a great economic impact and hamper the cattle industry in achieving better and sustainable livestock production. Therefore, a well-coordinated implementation of strategic control measures that integrate better nutrition with anthelmintic treatment in order to increase the productivity of cattle in the area is needed. Furthermore, strengthening animal health extension programs in order to educate pastoralists on general management practices is required. Future studies on seasonal transmission pattern of the parasites in order to design sustainable control program and studies to evaluate the economic impact of GIT parasites in the study area are required.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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