Prevalence of Gastrointestinal Nematode of Cattle in Selected Kebeles of Dire Dawa Districts Eastern Ethiopia

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Abstract: A cross sectional study was conducted from November 2011 to April 2012 to determine the prevalence of gastrointestinal nematodes in selected kebeles of Dire Dawa Administrative Council. In this study a total of 384 cattle were included to detect whether they are harboring gastrointestinal nematodes. Fecal samples were collected and coprological examinations were done by using standard flotation technique and the overall prevalence was 41.15%. The major nematodes genera identified in this study were Strongyloides (24.05%), Trichostrongylus (15.19%) and Trichuris (7.59%) and less Cooperia (4.43%), Haemonchus (1.9%) and Ostertagia (1.9%). Moreover co-infection with five or more nematodes was also recorded in the present study. SPSS analysis revealed that the occurrence of gastrointestinal nematode has no statistical difference between sex, age groups and among Peasant associations (p>0.05). In conclusion, nematodes were common in the gastrointestinal tract and were the principal Cause of loss of body condition in cattle. Therefore, prevention of cattle from these nematode infection using strategic deworming and an improved feeding and management of cattle should be attempted. Further detailed epidemiological study should be needed and identification of the parasite species should also be recommended.

Key words: Coprological Examination · Dire Dawa · Ethiopia and Gastrointestinal

INTRODUCTION

Ethiopia possess the largest livestock population in Africa with an estimated population of 47.5 million cattle, 7.8 million equines, 1 million camels, 39.6 million chickens, 26.1 million sheep and 21.7 million goats [1]. With the livestock ownership currently contributing to the livelihoods of an estimated 80% of the rural population. But this extensive livestock resource is not exactly exploited because of many constraints, of which poor animal production and management, improper evaluation of public health importance due to various individual parasitic diseases and inadequate knowledge of epidemiology of parasites which otherwise is of great relevance where the distribution of the disease determine the type and scope of control measures to be applied [2].

The Gastrointestinal tract (GIT) of cattle harbor a variety of parasites particularly helminthes, which causes clinical and subclinical parasitism. These parasites adversely affect the health status of animals and cause enormous economic losses to the livestock industry [3]. Almost mature worms produce toxins that destroy red blood cells, leading to unthrifty anemic condition. Immature worms migrating through the body tissues and open the way for bacteria and fungi complication. Other economic losses are poor work performance, involuntary culling, lower milk production, treatment costs and mortality in heavily parasitized animal [4].

The nematodes, or ‘round worms’, make up a large assemblage of relatively simple structure with a wide spread distribution, their cylindrical non segmented bodies distinguishing them easily from other helminthes. They occur in fresh water, in the sea and in soil and are among the most successful parasites of plants and
animals. Most of the free-living nematodes are microscopic, as are many of the parasitic species invading the body fluids such as the blood or lymph channels of their hosts. These species which live in the intestine are generally larger, while some in tissue habitats (e.g. the kidney) grow to relatively enormous lengths [5].

Adult female nematodes produce eggs that are passed out of the host with the faeces. Under optimal conditions in the external environment, first-stage larvae (L₁) can develop and hatch eggs within 24 hours. L₁ grow and develop in to second-stage larvae (L₂), which in turn grow and develop in to third-stage larvae (L₃). In general, the third-stage larvae are the infective. After ingestion, L₃ develop in to fourth-stage larvae (L₄), which then develop in to immature adults. Sexually mature adult nematodes develop in 2 to 4 weeks after ingestion of the L₁ unless arrested larvae development occurs [6].

Diagnosis of nematodes based on the fecal examination of faeces beyond the clinical sign, the presence of worm eggs or larvae is the most common routine aid to diagnosis. The egg and larvae of nematodes are most often diagnosed done faecal floatation and faecal culture [7]. Flotation technique using floatation fluid in which the specific gravity is higher than that of the eggs. The latter will float up to the surface because nematode and cestode eggs float in a liquid with specific gravity of between 1.10 and 1.20; trematode eggs which are much heavier, require a specific gravity of 1.30-1.35. Mostly the floatation solutions used for nematode and cestode eggs are mainly based on Sodium chloride or sometimes Magnesium sulphate and also fecal culture for identification of larvae to differentiate strongyle type of egg nematode to the genera level [8].

Epidemiology of gastrointestinal parasites of ruminants in Western Oromia, Ethiopia with overall prevalence of gastrointestinal parasites 69.6, 50.2, 75.3 and 84.1% in cattle, sheep and goats, respectively were reported by [9]. Similar study was done in the eastern part of Ethiopia in small ruminants by [10]. However, very little attention has been given to the role of GIT as the cause of disease and production losses in cattle in Ethiopia, especially in Dire Dawa district of, Eastern Ethiopia. Therefore, taking into account the importance of the parasite as one of the most important causes of economic losses and the scarcity of information in the country, the present study was designed to determine coproscopic prevalence of gastrointestinal nematodes (GIT) in Bovine and analysis of its risk factors in selected Kebeles of Dire Dawa District.

MATERIALS AND METHODS

Study Area: The study was conducted in Dire dawa administrative council, which is located about 518 km East of Addis Ababa. It’s situated between latitude 9°27’ and 9°49’ North and longitude 41°38’ and 42°19’ East. It shares boundary to the South, South east and south west with Eastern Hararge zone of the Oromia regional state and to the North, East and West with Shinile zone of Somali regional state. The total area of the administrative council is about 1977 km². The rain fall pattern is bi-modal with highest rainfall in July and August with average of 800mm. The monthly mean maximum temperature ranges from 28.1°C to 34.6°C recorded May and June respectively. In 2011 the total livestock population is estimated to be 66,346 cattle, 64,370 sheep, 11,206 goats, 19,206 camels, 18,085 equines and 72,000 chickens [11].

Study Design: This investigation involved descriptive cross sectional studies conducted on cattle of the selected district of Dire Dawa. Animal in each selected districts were categorized into sex, two age groups, i.e. young (=12 months) and adult (>12 months), as described by [12]. Out of 38 kebeles found in Dire Dawa administrative 7 Peasant association (PAs) were selected purposively and from each of the selected PAs animals were selected randomly and fecal samples were collected.

Study Animals: A total of 384 faecal samples were taken from cattle from 7 kebele (Goro, Sabiyan, Gendetesfa, Gendedippo, Gendegegerada, Melka and Afesa) of DireDawa to determine the overall prevalence of GIT nematode infection in the study area. All animals that examined were local (indigenous) of mixed age and sex groups

Sample Size Determination and Sampling Method: The sample size required in the study was determined using the formula given by Thrusfield [13] for random sampling.

\[
n = \frac{1.96^2 \cdot P_{exp} \cdot (1-P_{exp})}{d^2}
\]

where,
- \(n\) = required sample size
- \(P_{exp}\) = expected prevalence
- \(d^2\) = desired absolute precision
Expected prevalence of 50% was used since there were no prior works done in the study areas. 0.05 desired absolute precision and 95% level of confidence were used for the study. Therefore, a total of 384 cattle needed for the study.

**Study Methodology:** A cross-sectional study was carried out from November 2011 to April 2012 by collecting data on events associated with gastrointestinal nematode of cattle in Dire dawa administrative council.

**Fecal Material Collection:** During the study period a total of 384 cattle were sampled and fecal material were collected per rectum with gloves. Fecal material collected from each animal were put in to fecal sample bottles and labeled for different age, sex and origin and kept cool prior to transportation to regional veterinary laboratory where the sample were immediately examined or stored at refrigerated temperature (4°C) for a maximum of one day before processing. Larvae identification though culturing fecal sample could be carried but in the laboratory.

**Parasitological Technique:** The faecal samples were collected per rectum and put into faecal pots, labeled and kept cool prior to transportation to the laboratory where they were examined immediately or stored in refrigerator (4°C) or a maximum of 6 hours before processing. The samples were processed by Standard Flotation and Sedimentation techniques to investigate the eggs of helminthes parasites as described by [14].

**Data Analysis:** The information and data collected on GIT nematodes of cattle during the period were recorded in excel Sheet and analyzed using SPSS version 20. Prevalence was calculated using percentage. The significance of association between and among the considered variables was determined using p-value, chi square $X^2$ test statistics. Association between variables was said to exist if the calculated level of significance is less than 5% (p<0.05) at 95% confidence level.

**RESULT**

During the study period of GIT of cattle at Dire Dawa administrative the overall prevalence was 41.15%. Different genera of nematodes were identified by coprological examinations with different prevalence. Age, sex and origin of animals were considered as potential risk factors: however there was no statistical significance related to these risk factors in the current study (Table.1).

As shown in (Table 3) Strongyloid, Trichostroglus and Trichuris were the dominant genera among the cultivated larvae having 24.5%, 15.19% and 7.59% respectively.

Mixed infection between different nematodes species was also observed and described as high prevalence of the strongyloides together with cooperia (14.56) and less prevalence of the Trichostrongylus together with strongyloides and cooperia as shown (Table 4).

**DISCUSSION**

Epidemiological investigation of nematodes in livestock using suitable and cost effective diagnostic methods is found to be important. Out of 384 cattle examined in Dire Dawa administrative district in cattle during the study period has shown the presence of gastrointestinal nematode parasites (GIN) in the area. The current study discovered an overall prevalence of 41.5% of Gastrointestinal nematode parasites in cattle which is in agreement with 30-60% infection in Kenya [15], over 30% in Sierra Leone [16] and over 70% in Nigeria [17] this might be similarity in study design and ecology of animal. In contrast to the present result, 97.2% in Tanzania [18]. 82.8% in Holleta [19], 71.8% in Arsi [20] and 71% in Asella [21] which were recorded the highest prevalence. The variation was the result of management and husbandry practices. Climate and management of pastures and animals are among the numerous factors that influence the level and extent of parasitism [6]. However, it is not in agreement with 11% reported in Bahirdar [22] and 33.3% reported in Gonder [23] which is lower than the prevalence determined in the present work. The variation might be due to optimum temperature and moisture content which favors the growth and development of larvae on pasture and animals are allowed to graze. The relationship between different risk factors like age, sex and origin has an important value in the study. In relation with sex, the prevalence of GIN has no significant difference [24] but not in agreement with prevalence GIN in male (45.86%) greater than female (41.4%) explained in the previous in finding of [23] and [24] due to males is mostly exposed to graze than female.
Table 1: Prevalence of GIT nematode infection of cattle based on age and sex of animals.

<table>
<thead>
<tr>
<th>Age</th>
<th>No. examined</th>
<th>No. positive (%)</th>
<th>x²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>103</td>
<td>42 (40.78)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td>281</td>
<td>124 (44.1%)</td>
<td>0.35</td>
<td>0.56</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>157</td>
<td>72 (45.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>227</td>
<td>94 (41.4)</td>
<td>0.75</td>
<td>0.39</td>
</tr>
</tbody>
</table>

Table 2: Prevalence of GIT nematode infections based on origin (PA) of animals.

<table>
<thead>
<tr>
<th>Peasant Association</th>
<th>No. Examined</th>
<th>Prevalence (%)</th>
<th>x²</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>GendeTesfa</td>
<td>29</td>
<td>16 (55.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aftesa</td>
<td>35</td>
<td>18 (51.34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sabian</td>
<td>34</td>
<td>11 (32.35)</td>
<td>4.77</td>
<td>0.57</td>
</tr>
<tr>
<td>Goro</td>
<td>74</td>
<td>31 (41.89)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melka</td>
<td>48</td>
<td>21 (43.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GendeGerada</td>
<td>67</td>
<td>30 (44.78)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GendeDipo</td>
<td>97</td>
<td>39 (40.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Prevalence and identification of specific genera using fecal culture

<table>
<thead>
<tr>
<th>Genera</th>
<th>No. of Positive Animals</th>
<th>prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichostrongylus</td>
<td>24</td>
<td>15.19</td>
</tr>
<tr>
<td>Strongyloides</td>
<td>38</td>
<td>24.05</td>
</tr>
<tr>
<td>Haemonchus</td>
<td>3</td>
<td>1.9</td>
</tr>
<tr>
<td>Cooperia</td>
<td>7</td>
<td>4.43</td>
</tr>
<tr>
<td>Trichuris</td>
<td>12</td>
<td>7.59</td>
</tr>
<tr>
<td>Oesphagostomum</td>
<td>8</td>
<td>5.06</td>
</tr>
<tr>
<td>Ostertagia</td>
<td>3</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Table 4: Mixed infection between different nematode identified (%).

<table>
<thead>
<tr>
<th>Nematode</th>
<th>Haemonchus</th>
<th>Strongyloides</th>
<th>Oesphagostomum</th>
<th>Cooperia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichostrongylus</td>
<td>6 (5.69)</td>
<td>3 (1.9)</td>
<td>3 (1.9)</td>
<td></td>
</tr>
<tr>
<td>Haemonchus</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Strongyloides</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23 (14.56)</td>
</tr>
<tr>
<td>Oesphagostomum</td>
<td>0</td>
<td>9 (5.69)</td>
<td>0</td>
<td>9 (5.69)</td>
</tr>
<tr>
<td>Trichuris</td>
<td>6 (5.69)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cooperia</td>
<td>4 (2.53)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

In relation with age, the prevalence of GIT has no significant difference and the prevalence relatively lower in young 40.78% than adult 44.1% that was similar result done by [23]. Such finding may be because of the fact that young animals were not exposed for grazing than adults and may be due to increase awareness of people for their young animal. On the other hand the result of [25] where young animals (66.3%) are affected than adults (50%) in Haramaya beef cattle farm. Such variation of the result can be due to all the animal age group in our study was under outdoor grazing system.

In relation to origin, the prevalence of GIT has also no significant difference (p-value = 0.57). However among seven PAS GendeTesfa (55.17%) and Aftesa (51.43%) was the most common site for GIT and less frequent in Sabiyan (32.35%). The difference may be due to awareness of people for their animal and the site of veterinary clinic was nearest to Sabiyan.

The proportion of the genera nematodes identified in the current study was different. In this Strongyloides (24.05%) was the most prevalent and followed by Trichostrongylus (15.19%) however Haemonchus and Ostertagia accounts (1.9%). Apart from our finding, the
order of prevalence reported by [23] in Gondar, the most frequently encounter nematode were *Trichostrongylus* and *Haemonchus* and less frequently *Strongyloides* and *Cooperia*. Therefore it seems obvious that differences in prevalent worm genera are dependent on geographical and climatic factors. Mixed infection between different nematodes species was also observed and described as high prevalence of *Strongyloides* together with *Cooperia* (14.56%) and the *Trichostongylus* together with *Strongyloides* and *Cooperia* (1.89%). The overall prevalence of mixed infection was 39.87%.

**CONCLUSION AND RECOMMENDATIONS**

The overall prevalence of gastrointestinal helminthes parasite in the study area indicated gastrointestinal helminthosis was found to be important health problem due to its high prevalence and occurrence of polyparasitism. The majority of cattle were infected by more than one parasite type with some animas showing pure infection. There is high prevalence of nematode infection in the study area warns stake holders should control and treat there animals. Therefore, the study area is prone to health problems related to gastrointestinal helminthosis which might subsequently reduce the economic output from cattle production. In view of these conclusions, the following recommendations are forwards:-

- Minimizing pasture contamination through management of grazing pasture.
- The role of Veterinarians in giving professional advices regarding preventive and control measures against gastrointestinal helminthes should be prominent to prevent any abuses.
- Improve the management and feeding condition of those cattle residing in the area.
- Develop awareness on farmers about parasite infection and consequently prevent loss in cattle.
- Further detailed study should be needed using different risk associated factors and identification of the parasite species.

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**REFERENCES**


