Acta Tropica 160 (2016) 68–77

Contents lists available at ScienceDirect

Acta Tropica

journal homepage: www.elsevier.com/locate/actatropica

Gastrointestinal nematode infection in small ruminants in Ethiopia: A systematic review and meta-analysis

Kassahun Asmare[a,*], Desie Sheferaw[a], Kassaye Aragaw[a], Mesele Abera[a], Berhanu Sibhat[b], Aynalem Haile[c], Henry Kiara[d], Barbara Szonyi[e], Eystein Skjerve[f], Barbara Wieland[e]

[a] School of Veterinary Medicine, Hawassa University, P.O. Box 005, Hawassa, Ethiopia
[b] College of Veterinary Medicine, Haramaya University, P.O. Box 138, Dire Dawa, Ethiopia
[c] International Center for Agricultural Research in the Dry Areas (ICARDA), Ethiopia Research Platform, Sub-Saharan Africa Regional Program, P.O. Box 5689, Addis Ababa, Ethiopia
[d] International Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi, Kenya
[e] International Livestock Research Institute (ILRI), P.O. Box 5689, Addis Ababa, Ethiopia
[f] Norwegian University of Life Sciences, P.O. Box 8146 Dep., N- 0033 Oslo, Norway

ARTICLE INFO

Article history:
Received 5 February 2016
Received in revised form 19 April 2016
Accepted 30 April 2016
Available online 3 May 2016

Keywords:
Goat
GI nematodes
Meta-analysis
Sheep
Ethiopia

ABSTRACT

Gastrointestinal (GI) nematode infections are a major health challenge affecting productive and reproductive performance of sheep and goats in Ethiopia. However, there is no comprehensive summary on the occurrence and distribution of the infection at national level. This systematic review provides pooled prevalence estimates and assesses potential predictors of the nematode infections in small ruminants, i.e. helpful in planning interventions or control strategies. The review used 50 animal level datasets retrieved from 24 manuscripts. The studies used data collected from 9407 sheep and 3478 goats. A meta-analytical approach was employed to analyze Effect size (ES). The reported GI nematodes represented eleven genera affecting sheep and goats including: *Haemonchus*, *Trichostrongylus*, *Teladorsagia*/*Ostertagia*, *Strongyloides*, *Bunostomum*, *Nematodirus*, *Chabertia*, *Trichuris*, *Cooperia*, *Skrjabinema* and *Oesophagostomum*. The GI nematodes pooled prevalence estimate in the random effect model was 75.8% (95% CI: 69.6, 80.8). The subgroup analysis revealed significant ($p < 0.05$) differences in the prevalence between different regions and type of diagnostic methods used. 'Postmortem technique' and 'eastern part of the country' were associated with higher GI nematode prevalence and accounted for 68.1% of the between studies heterogeneity. In light of the high parasitic prevalence in all agro-ecologies, the need for strategic intervention is recommended. Meanwhile, data need to be generated for some of the regions where dependable survey reports are lacking.

Contents

* Corresponding author.
E-mail addresses: ka7588@yahoo.com, kassahun7588@gmail.com (K. Asmare).

http://dx.doi.org/10.1016/j.actatropica.2016.04.016
0001-706X/

1. Introduction

Infections with gastrointestinal (GI) nematodes severely affect small ruminant health and compromise their productivity and reproductive performances (Baker, 2001; Suarez et al., 2009) and can be a major cause of economic losses in small ruminant production (Coop and Kyriazakis 2001). The clinical disease development or pathologies causing death or sickness in animals are effected through the parasites' feeding activities or physical presence, migration and associated host immune response. Abomasal hypertrophy, blood and protein loss, damage to the intestinal wall and other related tissues are some of the mechanisms by which the host suffers (Taylor et al., 2007). Consequent to such pathologies, animals manifest anorexia, diarrhea, submandibular edema, emaciation and anemia (Soulsby, 1982; Urquhart et al., 1996).

High burden of infections with nematodes may lead to death; and under field conditions, most infections are usually mixed consisting of different species of nematodes. Indeed, the impact of nematode infections on the animal not only depends on the burden of infection but also the physiological and immunological status of the host. For instance growing lambs and peri-parturient ewes are most susceptible to infection by nematodes (Bishop and Stear, 2001).

In Ethiopia, the reported coproscopical and postmortem prevalence of small ruminant GI nematode infections range from 15.7% to 100% (Sissay et al., 2007a; Aga et al., 2013; Aragaw and Gebreegziabher, 2014). Such infections were due to diverse nematode genera both in sheep and goats. These include *Haemonchus*, *Trichostrongylus*, *Oesophagostomum*, and others (Tembely et al., 1997; Asha and Wossene, 2007; Bitew et al., 2011; Shankute et al., 2013; Mohammed et al., 2014). Owing to its importance a large number of surveys and experimental trials were performed on helminthes, particularly nematode in small ruminants (Abebe and Esayas, 2001; Asha and Wossene, 2007; Sissay et al., 2007a; Sissay et al., 2007b; Abebe et al., 2010; Mohammed et al., 2014). Consequently, researchers have agreed that nematodes infections are among the most devastating diseases of small ruminants with huge economic significance. However, as the reports were based on different set-ups, including various study designs, study areas, sample sizes, diagnostic methods, small stock species, parasites involved, management systems or other factors, high variability is expected. Hence there is a need to capture the overall status of nematodes infection in small ruminants in Ethiopia so that veterinary clinicians, researchers and livestock policy experts of the country can use the finding to set out the way forward. Therefore this study aimed at (i) producing a pooled prevalence estimate of GI nematode infection in small ruminants at country level, and (ii) identifying the relevant predictors that could possibly dictate the observed variation between reports and (iii) highlighting the information gap on nematode infection studies in small ruminants.

2. Methods

2.1. Study protocol

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was followed in the review process (Moher et al., 2009). A protocol that addresses the study outcomes of interest, review questions, inclusion and exclusion criteria, data source, preliminary article assessment criteria, assessment criteria for articles screened eligible, and a data extraction form were developed. The data extraction form was pre-tested and modified to suit the purpose of the study.

2.2. Literature search strategy

The literature search strategy included electronic and manual means. The electronic search used PubMed, Web of Science, Google scholar, Cab Direct and African Journals Online databases. The key electronic search strings were small ruminants, sheep, goats, haemonchosis, nematodes, helminthosis, gastro- intestinal parasites, and Ethiopia. Manual searches of unpublished manuscripts were done at Addis Ababa, Haramaya, Jimma, Gondar and Hawassa universities, the Ministry of Agriculture, and at the repository of the International Livestock Research Institute (ILRI), Addis Ababa. The last search was conducted on 25th of June 2015.

2.3. Inclusion and exclusion criteria

In a preliminary assessment, title and abstract of the study report were screened to ensure they were in line with the review question. Documents that passed the preliminary screening were closely evaluated for quality standard. Among the predefined quality criteria, study design and laboratory procedures were critical, as they ensure internal validity and accuracy of the result for the population under investigation. Moreover, clarity of objectives, data analysis and result presentation were assessed. Original research articles or reports made before 1990 were excluded. The scanning process left out review articles due to lack of primary data. The quality of each manuscript or article was assessed independently by at least two researchers. Finally, each manuscript or article was rated according to three categorical levels of quality, i.e. low, medium and high based on the review guideline. Only those reports rated medium or high were considered for subsequent data extraction.