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Review Article

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Review on Prevalence of Haemonchus Contort us in Ethiopian

Tadesse Tilahun

Ambo University, School of Veterinary Medicine and Department of Veterinery Parasitology, Ethiopia

***Corresponding author**
Tadesse Tilahun, Ambo University, School of Veterinary Medicine and Department of Veterinery Parasitology, Ethiopia. Email: tadesatilahun@gmail.com

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Introduction

In the 17th century, Robert Hooke invented the microscope and our life understanding and disease increased. Further understanding of the invisible, microscopic world has been occurred after the establishment of modern microbiology in the 19th century by Louis Pasteur and Robert Koch. Thanks to modern technology, there have been nearly 300 species of parasitic helminths known to be human parasite. Additionally, livestock, crops and pets are all victims of parasitic helminths, which cause extreme effects on the human population as well [1].

The history of *H. contortus* was first charactereized in 1803 by Rudolphi. Primarily, the parasite was termed *Strongylus contortus* and It was however, not until the 1900s that *H. contortus* became the approved nomenclature [2]. There have been different common names associated with *H. contortus*, including barber‟s pole worm, twisted stomach worm, and wire worm [3].

Livestock currently contribute about 30 percent of agricultural gross domestic product in developing countries and is becoming the fastest growing subsector of agriculture. Livestock systems in developing countries are characterized by rapidly changing, due to many factors such as population growth, increasing demand for livestock products as incomes rise and expansion of urbanization [4].

Ethiopia lies within the tropical latitudes of Africa, and has an extremely diverse topography, a wide range of climatic features and a multitude of agro-ecological zones, which makes the country suitable for different agricultural production systems. This in turn has contributed to the existence of a large diversity of farm animal genetic resources in the country. The country has the largest population of small ruminants in Africa [5].

Gastrointestinal (GI) parasitic infections are a world-wide problem for both small- and large-scale farmers. Infection by GI parasites in ruminants, including sheep and goat can result in harsh economic losses in a variety of ways: reproductive inefficiency, decreased work capacity, involuntary culling, diminished food intake, poor animal growth rates and lower weight gains, treatment and management costs, and mortality in heavily parasitized animals. Among the GI parasites that cause losses to the farming industry, the barber‟s pole worm *Haemonchus contortus* is the predominant, blood- sucking, highly pathogenic, and economically important nematode that infects small ruminants [1].

The impact of gastrointestinal parasitic infection is greater in sub-Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors suitable for diversified hosts and parasite species. Gastrointestinal parasites infections are recognized as a major constraint to ruminant production throughout the tropics and elsewhere [6].

Haemonchus, Trichostrongylus, Teladorsagia/Ostertagia, Strongyloides, Bunostomum, Nematodirus, Chabertia, Trichuris, Cooperia, Skrjabinema and Oesophagostomum are elucidated by parasitological investigations as the most prevalent nematode parasites of small ruminants in Ethiopia. All grazing sheep and goats are infected with most of these nematodes which is clinically known asparasitic gastroenteritis [7].

Haemonchus is regarded as one of the most prevalent and highly pathogenic, possesses the highest biotic potential, and has a prominent ability to develop resistance against most widely used anthelmintics and a unique survival strategy due to great biological and ecological plasticity. Hence compared to other gastrointestinal nematodes haemonchus is the most important parasite of domestic ruminants especially in sheep and goats [8].

The epidemiology of *H. contortus* infections in a flock provides a good indication of the parasite burdens and the magnitude of production losses. Ambient temperature, environmental humidity, grazing behavior of the host, and quantity and quality of pasture are some factors responsible for the prevalence of gastrointestinal helminths. Outbreaks are most common and severe in warm, humid climates. Other risk factors which include host species, sex, age, body condition, breed, and intensity of worm infections affect the development of gastrointestinal parasites [9].

Globally parasitic diseases continue to be a major constraint for poor developing countries. They are rarely associated with high mortality and their effects are usually characterized lower outputs of animal products, by-products, manure and traction all contributing to assure food security. They are responsible for immunosuppression, enhancing the susceptibility of the animals to other diseases. A loss of US $81.8 million is reported annually due to helminth parasites in Ethiopia. Helminthes infections in small ruminants are serious problems in the developing world, particularly where nutrition and sanitation are poor [10].

Among the diseases that constrain the survival and productivity of sheep, *Haemonchus contortus* infection ranks highest on a global index [11]. *Haemonchus contortus* is primarily occurring in the abomasum of small ruminants, notably in sheep and goats. It has been ranked as the most important parasite of small ruminants in all regions across the tropics or subtropics. Haemonchosis is the disease caused by nematode and is responsible for considerable economic losses [12].

Here, the main objective of this paper is to overreview the epidemiology of haemonchus in small ruminant and collecting recent literature on the H. contortus to bring advance knowledge and the understanding distribution of parasite. In addition to identify possible risk factors and control and management methods.

Literature Review

Etiology

Haemonchosis in small ruminants is caused by Haemochus contortus. H. contortus is a gastro intestinal parasitic nematode, which infects small ruminants such as sheep and goats. Classification of *Haemonchus contortus*: Kingdom: Animalia, Phylum: Nematoda, Class: Secernentea, Order: Strongylida, Family: Trichostrongylidae, Genus: Haemonchus. Species: *Haemonchus contortus* [13].The majority of gastrointestinal strongylida of ruminants belong to thefamily Trichostrongylidae. The genus Haemonchus is in the sub-family of Haemonchinae and consists of four main species in domestic ruminants; H. contortus (in ovine and caprine), H. placei and H. similis (in bovine) and H. longistipes (in camel) [14].

Epidemiology

H. contortus is present globally where small ruminants are grazed, with a particularly high prevalence and concern in tropical and sub-tropical climates. This can be explained by the parasite's requirement and tolerance for warm temperatures and strict need for moisture, but being more sensitive for low temperatures). It is however also present in colder regions on the northern hemisphere. Because of the widespread prevalence of the parasite, the potential for haemonchosis outbreaks, regardless of climate zones is of great concern [15]. In arid and desert regions, H. contortus may be of less importance as lack of moisture is a critical limitation for the survival of the external stages. The parasite may still be present, but usually only in smaller numbers and rarely leading to haemonchosis. Periods of heavy precipitation may however lead to favourable conditions for larval development on the pasture and to heavy worm burdens [15,16].

Among the gastrointestinal nematode infections in sheep and goats *Haemonchus contortus* has been found predominant throughout the world and also found as most pathogenic nematode [17].

Haemonchus contortus occurs in nearly all subtropical and temperate areas of the world in the abomasum of ruminant livestock and also in many wild ruminants. Gastrointestinal nematode infection ranks highest on a global index, with H. contortus being of overwhelming importance [18]. It has been ranked as the most important parasite of small ruminants in all regions across the tropics and subtropics and causes an insidious drain on production, weight losses and even mortality in young animals. The outcome of this parasite depends on various intrinsic and extrinsic factors [19].

In Ethiopia, several studies have been conducted on small ruminant helminthiasis in various regions reporting average prevalence of 67.72% which ranges from 50.4 to 84.1%. Nematode infection is rampant in most developing countries where poor pastures and quantities of nutritious feed consumed do not cover the requirements of animals. Also there is insufficient veterinarian care in the country and the environment is conducive to nematode growth and transmission [14].

Although helminth parasites specifically nematodes of ruminant livestock are ubiquitous in all of the agro-climatic zones of Ethiopia with prevailing weather conditions that provide favorable condition for their survival and development, their presence does not mean that they cause overt diseases [10].

Life Cycle of Haemonchus

Like other trichostrongylids, *Haemonchus* spp. has a direct life cycle which is divided in to a parasitic phase inside the host and a free-living phase in the external environment. Eggs are shed from mature adult female worms to the pasture via the faeces of the host. The eggs then develop into 1st, 2nd and 3rd stage larvae, where the 3rd stage larvae infect animals grazing on pasture. The larvae then move to the predilection site in the abomasum and moult two more times before reaching its adult phase, which feeds on blood from the mucosa). A single female adult worm can shed up to 10 000 eggs per day (The infectious 3rd stage larvae are resilient and can survive on pasture for several months depending on temperature and moisture [8,16].

Clinical Signs Pathogenesis

The clinical signs of H. contortus infection depend upon the number of haematophagous adult and larvae present in the abomasum, and the variation in susceptibility among individual animals and, to an extent, on their nutritional status [20].

The signs most characteristic of H. contortus infection relate almost entirely to the blood-feeding activities of adult and late larval stages (and include deaths, anaemia, reduced exercise tolerance and subcutaneous oedema. In cases of overwhelming infection ('hyperacute haemonchosis'), animals are found dead, with signs of severe anaemia in many of the survivors [21].

Haemonchosis usually occurs in an acute form with a varying rate of onset and mortality. The major clinical signs are pale mucus membranes, weakness, and oedema because of rapid blood loss and anemia. In a chronic form of haemonchosis, reduced weight gain, lethargy and a mild anemia are due to a sustained small number of worms. Animals in poor body condition may be clinically affected by smaller worm burdens that otherwise wouldn't harm healthy animals [22].

It is also likely that a chronic form of haemonchosis occurs under intensive grazing conditions in less seasonal and higher rainfall zones, where occasional partially effective treatments fail to completely remove Haemonchus burdens, but adequate nutrition ensures sufficient resilience to infection. In such situations, it is likely that Haemonchus is one of the several nematode species contributing to suboptimal animal production [22].

Clinically, haemonchosis can be categorized into three types; hyperacute, acute and chronic. The hyperacute form occurs in young and /or unhealthy lambs exposed over a short period of time to heavy infection (ingested a massive number of L3s > 10,000), and is rare and results in lamb death [23].

The faecal color from these animals usually becomes dark due to digested blood and sudden death may occur owing to tremendous blood loss. Acute cases usually occur in young lambs that get heavily infected with or without diarrhea, but the host mounts an erythropoietic response resulting in the partially compensation for the blood loss. The parasite burden is mild, 1,000-10,000 individuals, and all ages of small ruminant are affected, regardless of present health status. Furthermore, anemia is accompanied by hypoproteinemia and edema, which may contribute to death. A common remark in these cases is sub-mandibular edema designated "bottle-jaw". The L4s and L5s larvae and adult worms are the robust blood-sucking GIN parasite; movement of the worm causes wounds and secretion of anti-coagulants resulting in a continuous haemorrhage from the abomasal wall Tehrani, A. et al ., [24].

Post-mortem examination disclosed serious congestion, pinpoint petechial haemorrhages, and watery bloody contents with diverse minute hair like H. contortus worms in the abomasum. Gross lesions, such as petechial haemorrhages on account of the Haemonchus parasite attachment and feeding behavior, and severe congestion in the abomasal mucosa were corresponded with the earlier observations.

The possible pathogenic mechanism, which is responsible for cause of death in haemonchosis is hemorrhagic anaemia, hypoproteinemia and oedema due to vital blood sucking by both L4s and adults. Moreover, diarrhoea causes fluid loss and dehydration resulting in hypovolaemic shock Chronic haemonchosis is noticed in lambs infected with comparatively few worms (100-1,000 individuals), and distinguished by high morbidity and low mortality [14].

Diagnosis

Haemonchus contortus infection is clinically diagnosed by anemia, dehydration, sub-mandibular internal fluid accumulation that results in the formation of a bottle neck, diarrhoea and low packed cell volume (PCV). Infection also results in retarded growth, reduced reproductive performance, general illness and death. Supplementary diagnosis is achieved through the use of microscopic techniques by the recovery of H. contortus eggs from stool samples. Because the eggs of many important genera are morphologically similar and hard to identify to species level, a better way to delineate species is by larval culture and identification of 3rd stage larvae. Diagnosis is also performing a fecal egg count test, or using the FAMANCHA system to determine the level of infestation. The FAMANCHA system involves comparing the color of the mucous membrane of the eye against a FAMANCHA color chart in order todetermine the extent of anemia and the level of infestation by internal parasites. With the help of a color chart, animals are scored in one of five color categories red, nonanemic, anemic, very pale, and severely anemic) [14].

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