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Bovine Gastro Intestinal Parasites Infection in Ethiopia: A Review

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Abstract: Livestock is everything of Ethiopians people especially for the large rural population of the country. Gastrointestinal helminthes are challenging to this core economy of the country since long. The effect of infection is determined by a combination of factors of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasites interaction and the infective dose are the most important.Non combined fragment findings in country wide are there regarding to this issue. Consequently, the aim of this paper is to review gastrointestinal helminthes parasites of cattle in Ethiopia.

Key words: Helminth Parasites · Cattle · Ethiopia

INTRODUCTION

In Ethiopia, livestock play an important role in the livelihood of poor farmers as it provides a vast range of services and products such as meat, milk, skin, hair, horns, bones, manure and urine, security, gifts, religious rituals and medicine [1]. In spite of the large population of cattle, productivity in Ethiopia is low. According to studies in the country, this is due to poor nutrition, reproduction insufficiency, management constraints and prevailing animal disease [2].

Gastrointestinal helminthes are one of the main prob lems to cause economic losses and disease in animals. The effect of infection is determined by a combination of factors of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasites interaction and the infective dose are the most important. The direct losses caused by these parasites are attributed to acute illness and death, premature slaughter and rejection of some parts during meat inspection. Indirect losses include the diminution of productive potential such as reduction of milk production in dairy cow, decrease growth rate, weight loss in young growing calves and late maturity of slaughter stock [3].

The most important helminthes parasites in cattle include nematodes (Round worms), trematodes (Flukes) and cestodes (Tape worms). These parasitic infections are problem for both small- and large-scale farmers worldwide, but their impact 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 [4]. A number of helminthes species are known to infect cattle worldwide. The most important ones include nematodes like Strongyle species (*Haemonchus, Ostartagia, Trichostrongylus, Cooperia*) and trematodes of economic importance Fasciola species (*Fasciola hepatica* and *Fasciola gigantica*) and Paraphistomum species (*Paraphistomum cervei*), while cestodes like Monezia species (*Monezia benideni* and *Monezia expanza*) could also be important constraints in animal production [5].

There are many risk factors influencing the prevalence and severity of gastro intestinal (GI) helminthes. These include age, sex, weather condition and husbandry or management practices of host species [6]. Young animals are most susceptible. The effect of these parasites is strongly dependent on the number of parasites and the nutritional status of the animals they are infecting. The major clinical signs are weight loss, reduced feed intake, diarrhea and mortality reduced carcass quality and reduced wool production or quality [7].Young animals do not have a great deal of immunity to parasites during

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their first year at pasture. The second year, they have partial immunity and, although they may appear healthy, they eliminate many eggs. Adult animals are much less susceptible to most parasites, unless they are in poor living conditions [3].

Animals are sometimes kept in conditions that make them highly susceptible to parasites. In the case of recently dewormed animals, internal parasites do no longer exist. There is thus no equilibrium and such an animal put into a contaminated pasture may be seriously affected. Animals in poor condition (e.g., recent illness, food shortages) are also highly susceptible [8].

Previous reports on prevalence of helminthes parasites of cattle in different areas of Ethiopia showed that 71%, 82.8%, 50.2%, 54.4%, 47.1% and 77.6% which is reported by Manaye [9] from highlands of Asella and its surrounding, Etsehiwot [10] in dairy cows in and around Holeta, Fikru [11] in Western region of Oromia, Berhanu [12] in West Shoa zone, Ephrem [13] in Addis Ababa dairy farms and Cherinet [14] in small holder dairy farms of Jimma town respectively. A study conducted in and around Holeta indicated that the overall prevalence parasitic infections of cattle were 82.8%. The predominant helminthes egg identified were trematodes (*Fasciola* and *Paraphistomum* species) 80.6%, *Strongyle* 66.25%, mixed infection (*Trematodes* and *Strongyle*) 63.12%, while others such as *Trichuris* and *Monezia* 1.5% [10]. Nevertheless of having such fragment findings in country wide there is no any compiled file to use as a quick reference regarding to GIT parasite. Therefore the aim of this paperis to reviewgastro intestinal helminthes parasites of cattle in Ethiopia.

General Description of Gastro Intestinal Helminth Parasites: Gastro intestinal helminthes are among the most important parasitic diseases in veterinary medicine, not only in livestock, but also in all mammals and in other cause of vertebrates. They are caused by varies species of nematodes, cestodes, or trematodes at different stages of development (i.e., larvae and adult) [14]. The amount of parasite burden in connection with environmental conditions, physiological and nutritional status of the host, contributes to development of either subclinical diseases reducing the probability of a host reproducing or surviving or clinical disease defined as signs, including death [15]. Amongst the parasitic diseases, end parasitic roundworms, liver flukes tapeworms and coccidia, are the most pathogenic [16].

Gastrointestinal parasite infections are a world-wide problem for both small- and large-scale farmers, but their impact is greater in sub-Saharan Africa in general and Ethiopia in particular due to the availability of a wide range of agro-ecological factors (Quantity and quality of pasture, temperature, humidity and grazing behaviour of the host) suitable for diversified hosts and parasite species [17, 18]. Gastrointestinal parasites causes economic losses in a variety of ways: through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and lower weight gains, lower milk production, treatment costs and mortality in heavily parasitized animals [17].

Nematode: The phylum Nemathelminthes has six classes, however only one of these, the nematode, contains worms of parasitic significance. Most nematodes have a cylindrical form, tapering at both end and the body is covered by the cuticle, a colorless somewhat translucent layer, which are commonly called roundworms [19]. The nematodes include several super families'of veterinaryimportance. These are Trichostrongyloidea, Strongyloidea, Metastrongyloidea, Ancylostomatoidea, Rhabditoidea, Trichuroidea, Filarioidea, Oxyuroidea, Ascaridoidea and Spiruroidea [20].

Life Cycle: The life cycle is direct with a single host. Females are oviparous. The eggs passed in the external environment, under favorable conditions (Temperature and humidity) hatch to first stage larvae (L1). The L1 develop and moult to second stage larvae (L2)and then the L2 in turn moult to third stage larvae (L3), which is the infective stage. The first three larval stages are free-living constituting the pre-parasitic phases. Within GI tract of the host the L3 moult to fourth stage larvae (L4), which transform to a young adult stage (L5) which eventually becomes mature and start to lay eggs [19].

Pathogenesis: The pathogenic effects of gastrointestinal nematode parasites depend on their localization, feeding habit, the dose of ingested larvae and immune status of the host. *Haemonchus placei* are bloodsuckers in abomasum and cause severe damage of the mucus membrane and anaemia and *Ostertagia ostertagi* reduces feed intake. *Cooperia oncophora* and *Cooperia punctata* in the small intestine of the cattle reduce feed efficiency. The usual manifestation of the disease is a chronic form, characterized by anaemia, digestive disturbances, reduced appetite, weakness and emaciation [21]. The lesions provoked by gastrointestinal nematodes may include haemorrhage, ulcerations, destruction, mucosal damage and nodules formation [22].

Trematode: The class trematoda falls into two main sub classes, the Monogenea, which have a direct life cycle and the Digenea, which require an intermediate host. The former are found mainly as external parasites of fish, while the latter are found exclusively in vertebrates and are of considerable veterinary importance. The adult digenetic trematodes, commonly called 'Flukes', occur primarily in the bile ducts (*Fasciola,* liver fluke), alimentary tract (*Paramphistomum,* rumen fluke) and vascular system (*Schistosoma*, blood fluke). Most flukes are flattened dorsoventrally, have a blind alimentary tract, suckers, for attachment and are hermaphrodite. However, the sexes are separate in *Schistosomes*. The eggs of fluke parasites pass out of the final host, usually in faeces and the larval stage develop in a molluscan intermediate host [19].

Life Cycle: The life cycles of flukes are always indirect, involving one or two intermediate hosts before invasion of definitive hosts. The snails such as *Lymnaea truncatula* for *Fasciola*, *Planorbis* or *Bulinus* for *Paramphistomum* and *Bulinus contortus*, *Physopsis africana*, *Physopsis globsa* and *Physopsis nausta* for Schistosomaacts as intermediate hosts for these flukes [23]. They are narrowly dependent of their close environment (Nature of the soil) and of the climatic conditions for survival and multiplication of the intermediate hosts and also for the survival and evolution of larval stages (Miracidium, sporocyst, redia, cercaria and metacercaria) Shedding of *cercariae* commences at the start of the dry season, when the water level is still high and continues as the water level drops. The animals then ingest the *metacercariae*while grazing on these areas during the dry season and clinical problems, occur at the end of that season or at the beginning of the next wet season, depending on the rate of infection [24].

Pathogenesis: Pathogenesis of fasciolosis varies according to the phase of parasitic development in the liver and species of host involved, essentially the pathogenesis is twofold; the first phase occurs during migration in the liver parenchyma and is associated with liver damage and hemorrhage causing anemia and hypoalbuminemia. The hypoalbuminemia is associated with plasma volume expansion caused by liver damage and reduced albumin synthesis. The second phase occurs when the parasite is in the bile ductsand results from the hematophagic activity of the adult flukes and from the damage to the mucosa, by their cuticular spines [19].

The adult *Paramphistomum* in rumen and reticulum is essentially non-pathogenic even though large numbers may present. At most, there may be a localized loss of rumen papillae. However, the immature helminthes attach to the duodenal mucosa by means of a large posterior suckers and causes severe enteritis, possibly necrosis and hemorrhage. In heavy infection a frank hemorrhage, duodenitis, hypoproteinemiaand edema may be produced with immature flukes deeply embedded in the mucosa. Severely affected animals exhibit anorexia, polydipsia, unthriftiness and severe diarrhea. Extensive mortality may occur, especially in young cattle. Older animals can develop resistance to reinfection but may continue to harbor numerous adult flukes [23].

The pathogenesis of Schistosomosis is generally considered to be a much more serious and important infection in sheep than in larger ruminants. Even though high prevalence of the parasite is detected in slaughtered cattle, clinical signs of the disease are showed rarely. Acute disease occurs 7-8 weeks after heavy infection, characterized by diarrhoea and anorexia. It is entirely due to the inflammatory and granulomatous response to the deposition of egg in the mesenteric veins and their subsequent infiltration in the intestinal mucosa. As this occurs, the worms started to a partial shift away from the intestinal mucosa and reactions to these migrating parasites and their eggs can occur in the liver. Following massive infection, death can occur rapidly, but more usually the clinical signs have showed slowly as the infection progresses [19].

Cestodes: This class differs from the trematodes in having a tape- like body with no alimentary canal. The body is segmented, each segment containing one and sometimes two sets of male and female reproductive organs. The seven main families of veterinary interest in the order Cyclophyllidea are the Taeniidae, Anoplocephulidae, Dilrpididae, Davaineidae, Hymenolepididae, Mesocvstoididae and Thysanosomidae. Among this *Taenia* is a most important genus, both the adult and larval stages being of importance in human health and veterinary medicine [19]. The species *Taeniasaginata* is a large tapeworm that causes an infection called taeniasis. It is commonly known as the beef tapeworm or cattle tapeworm because it uses cows as intermediate hosts. Humans are the only definitive hosts. Taeniasis occurs worldwide and is relatively common in Africa, Eastern Europe, Latin America and the Philippines [25].

Life Cycle: An infected host (Human) may pass millions of eggs daily in the faecesand these can survive on pasture for several months. After ingestion by a susceptible bovine the onchosphore travels via the blood to striated muscle. It is first grossly visible about two weeks later as a pale, semi-transparent spot about l0mm in diameter, but is not infective to man until about 12 weeks later when it has reached its full size of l.0 cm. By then it is enclosed by a thin fibrous capsule but still the scolex can be seen. The longevity of the cysts ranges from weeks to years. When they die they are usually replaced by a caseous, crumbly mass which may become calcified. Both living and dead cysts are frequently present in the same carcass. Man becomes infected by ingesting raw or inadequately cooked meat. Development to patency takes 2-3months [19].

Pathogenesis: Under natural conditions the presence of cysticercus in the muscles of cattle is not associated with clinical signs although, experimentally, calves given massive infections of *T. saginata* eggs have developed severe myocarditis and heart failure associated with developing cysticerci in the heart. In man, the adult tapeworm may produce diarrhoea and hunger pains, but the infection is usually asymptomatic and is mainly objectionable on aesthetic grounds [19].

Diagnosis of GI Parasites: Diagnosis of GI parasites infections skills depends on heavily on parasitological findings such as detecting eggs or parasites in fecal samples [26]. Coproscopy is the basic method for parasitological diagnosis. It is based on observation of the number of eggs laid by adult female parasites present within the gastrointestinal tract and released with faeces. Factors such as species of parasites, animal speciesand reaction of the host determine the number of eggs [3].

The faecal culture enables to easily detect the infective larvae (L3) which is the only free larval stage easily identifiable. It is based on the development of eggs into L3 by keeping the faecal sample at 22-23°C, humidity of 85-90% and optimal oxygen. After 10 to 13 days it is possible to collect the larvae by using a sedimentation apparatus of Baermann. Then the genera of the larvae could be identified [3].

Post-mortem examination is the method that gives the most valuable information about the worm burden. It enables to detect and count the worms, identifies the larval stages and differentiates the two sexes. For parasite counts, the gastrointestinal tract from abomasum to rectum is required. Most of the parasite species are identified immediately on the basis of their shape, colour, size and their localization in the GI tract. Its inconvenience is that expensive to kill animals and is time consuming procedure [26].

Serological Diagnosis: Serological assays are currently the first-choice diagnostic test for screening of patients at risk of some GIT parasitosis, preferably before immunosuppression is initiated. Several in-house and commercial antibody detecting tests have been described with a wide range of sensitivity and specificity. Most of these tests have a high negative predictive value and are therefore extremely useful for excluding chronic infections in immigrants. However, many tests show a low specificity and cross-react with other helminths, or they lack sensitivity and miss the non-chronic infections, which have not yet completed several cycles of autoinfection [31].

Molecular Diagnosis: Enzyme immunoassays are sensitive tests to diagnose GIT parasites eventhogh they are specific for certain parasites only. The emergence of RT-Multiplex PCR has enabled the detection of multiple pathogens and mitigates the subjective nature of identifying parasites by morphology. Nucleic acid testing (NAT) has the potential to improve sensitivity and specificity rates and provide rapid and accurate diagnosis. A study by Pham *et al.* [32] NAT offers rapid accurate screening for common parasites.

Treatment and Control: Anthelmintic groups are greatly effective against the immature and mature stages of virtually all of the important gastrointestinal nematodes as well as many extra intestinal helminthes species [27]. The effect of anthelmintic for treatment of the suffered animal is manifested in many ways, such as enhanced growth rate, reproductive performance and wool production. The effect could occur through an alternation in the onset and magnitude and duration of the availability of infective larvae on pasture, phenomena that determine the worm burden [3].

The most effective control strategy for helminthes, using anthelminthic are usually those based on the epidemiology of the parasites with the treatment being designed to reduce both pasture contamination and host infection [3]. It is found that the use of closantel and albendazole can provide effective control of GI parasites. In which, treatment with albendazole once or twice during the dry season and with closantel and albendazole during the wet season resulted in reduced number of larvae on

the pasture and lower level of infection in lambs, which resulted in higher weight gains and wool production [28]. Improper timing of treatments and incorrect selection of anthelmintics are not only less effective in controlling the parasites but are also costy and potentially harmful by selecting for anthelmintic résistance [3].

Successful control of parasitic diseases is highly dependent on available information on local conditions and the strength of the extension service transferring this knowledge to the farmer. Therefore, we need comprehensive information about the epidemiology of parasites of ruminants, on a regional or national basis and also information about variables such as host resistance, climate and management data which can be used to adequately quantify the occurrence of disease [29, 30].

CONCLUSION

There are reports of indicating the presence of high prevalence of GIT parasites which are important to cause vast economic devastation in the country. Several measures are tried to combat against animal's infection by this agent. However there is a significant problem still regarding to GIT parasite infection in animals in Ethiopia. As a result:

- Concentrated integrated GIT parasite control strategy should be there in the country abroad.
- Effective extension system should be addressed in the country.
- New strategies (for example harboring of disease resistant zebu breed than exotics)of controlling of GIT parasites should be drafted by the required bodies.

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