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Study on Prevalence of Ovine Fasciolosis at in and Around Jucavm Open Air Veterinary Clinic, Jimma, Southwest Ethiopia

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ABSTRACT

A cross-section study was carried out from April, 2018 to May, 2018to determine prevalence and risk factors associated with Fasciolosis in and around JUCAVM. Fecal sample were collected from a total of 384 sheep of all age and gender. Sedimentation technique was used for the recovery of fasciola egg from fresh fecal. Sample from these animal examination 197 were positive with an overall infection rate of 51.3%.The highest infection rate was found in Ifa bula (60.8%) and the lowest (44.54%) in Bosa addis ketema, through statically non-significant different (P>0.05). There was no statically significant different (P>0.05) in infection rates between male and female animal. Infection rate in age group were no significant difference (P>0.05), but there was a statically significant different (p<0.05) in infection rates between body conditions of animals. In general, the study indicates that ovine fasciolosis is widely distributed disease with high prevalence rate in the study area and strategic use of anthelminthic should be to reduce pasture contamination with fluke's eggs.

Keywords: Fecal, Jimma, Fasciolosis, Prevalence,Sheep

INTRODUCTION

In Ethiopia, agricultural is the ministry of the country and also the major resource of the employment and income. About 85% of the population is live in the rural area and are primarily engaged in agricultural of the level hood of more than sixteen million people in the country.

Ethiopia has an extremely diverse topography a wide range of climatic features and a multitude of agro-ecological zone which make the country, suitable for different agricultural production system. This intern has contributed to the existence of the large diversity of farm animals, genetic resource in the country. The diverse ecology makes Ethiopia the home for large population of different domestic and wide animal with considerable contribution to the national economy. The livelihood of both rural and urban, or sedentary postural communities in the country is to a large extent associated with the previous out put down from this sector. Sheep and Goat provide as much as 30% of meat and milk consumed in sub-Saharan Africa and found on small holding throughout the continents. Sales of sheep and goat and their products are a vital to source of cash, especially for small holders who do not has access to credit or farm income. Their small size, high reproductive capacity and rapid growth rate, makes small ruminated a more flexible, short-term from research and development agencies than have cattle. Benefit from sheep and goat production in Ethiopia remains marginal due to impact of prevalent disease, malnutrition and management constraints, parasitism including fasciolosis represents the major barrier determining the development of the sub sector. Fasciolosis is a disease mainly of domestic ruminants and occasionally other domestic animal and man caused by liver flukes, parasites, Fasciola hepatica and fasciola gigantica. It is particularly important in cattle and sheep. Loss due to fasciolosis is associated with mortality, reduced growth rate, reduction in weight gain and unthriffines , reduction in working power, condemnation of large number of infected liver, increased susceptibility to secondary infection and expense due to control measure. An estimate of economic loss due to ovine fasciolosis in the Ethiopia high land was made based on available data on mortality, weight loss, reduced productivity efficiency and liver condemnation at slaughter. The economic effects of fasciolosis were identified and models for estimating the financial loss presented ovine fasciolosis losses were estimated at 48.4 million in Ethiopian birr per year of which 46.5,48.8 and 4.7% were due to mortality, productivity (weight loss and reproductive wastage) and liver condemnation, respectively). The world-wide losses in animal productivity due to fasciolosis were conservatively estimated at over US $3.2 billion per annual. In addition fasciolosis is now recognized as an emerging human disease, the world health organization (WHO) has estimated that 2.4 million people are infected with fasciola, and a further 180 million are at risk infection. The risk factor of fasciolosis is determined by the number of infected laminated snail in the grazing area .The disease has a predictable seasonal pattern in regions were snails are active for only part of the year .Some laminated snails a more aquatics habit than other but all are restricted to damp or wet environment stricted to damp or wet environments. In general they prefer non acidic low lying swampy area with slowly moving water. But land with small streams, spring blocked drainage or spillage. The influence of watering particles on the transmission of fasciola among sheep in the Ethiopian high lands snails burrow into the soil to survive the dry period and release circadian when free water is presented .the later expands and contract depending on water availability construction works, such as road building may alter drainage patterns and disease risk improvement of peaty pasture by time application may increase risk by reducing soil acidity and allowing snail colonization. The present study was, therefore, undertaken with the aim of generating valuable on ovine fasciolosis coming to Jucavm and its surrounding. Therefore, the objectives of this study were to determine the prevalence of the ovine fasciolosis in and around jucavm open air veterinary clinic, to find out associated risk factor of the ovine fasciolosis in the study area.

MATERIALS AND METHODS

General of the parasites

Fasciolosis is a disease of sheep, goat, and cattle and occasionally affects humans, thus considered as a zoonotic infection. According to Dunn (1978) and Souls by (1982), the taxonomic classification of the organisms that cause fasciolosis is presented.

Morphology

The adult parasite F. hepatica has a flat leaf-like body, typical of flukes, and measures 20 to 30 mm long by 8 to 15 mm wide. It has an anterior elongation (a cephalic cone) on which the oral and ventral suckers, which are approximately of equal size, are located. The intestine of the adult parasite is highly branched, with numerous diverticulae extending from the anterior to the posterior of the body. The pair of testes, also highly branched, is located in the posterior half of the body.

The relative compact ovary is located just above the testes and is linked to a short convoluted uterus opening to a genital pore above the ventral sucker. The vitellaria are highly diffuse and branched in the lateral and posterior region of the body. F. giganticais a parasite very similar to F. hepatica, its length may vary 25 to 75 mm long by 15 mm wide. In addition, the cephalic cone is proportionally shorter than that of F. hepatica, and its body even more leaf like in shape (Figure 1).

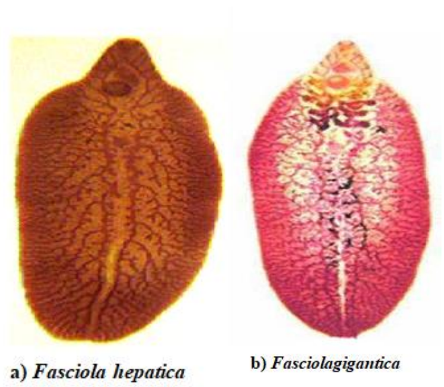
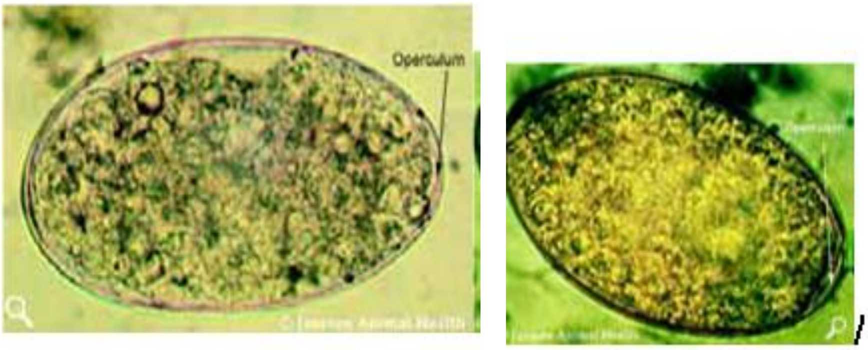


Figure 1: Adult stage of *Fasciolaspp .*

The egg of *F. hepatica* measures 150µm by 90µm in size and also very similar in shape to that of *F.gigantica*(Souls by, 1982). The egg of the latter is larger in size (200µm x 100 µm) (Dunn, 1978).*Fasciola* eggs should be distinguished from the eggs of other flukes, especially from the large eggs of *Paramphistome*. *Fasciola*eggs has a yellowish brown shell with an indistinct operculum and embryonic cells whereas *Paramphistom* egg has transparent shell, distinct operculum with embryonic clear cells, and possess a small knob at their posterior end (Figure 2).



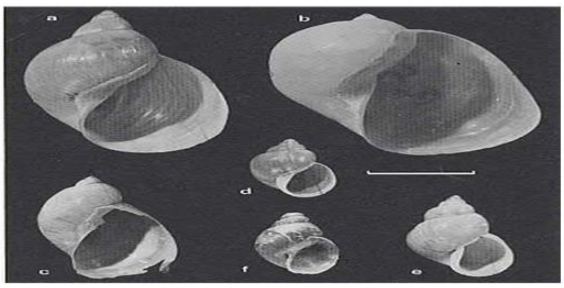
a) Paramphistomum spp. Egg **b) *Fasciola spp.* egg**

Figure 2: Rumen and liver fluke egg.

Intermediate hosts

Snails of the genus *Lymnaea* are the intermediate hosts for genus *Fasciola*. The epidemiology of fasciolosis is dependent on the ecology of the snail intermediate hosts. *Lymnaea* species, most important in the transmission of *F. hepatica,* include: *Lymnaeatruncatula,* widespread in Europe, Asia, Africa and North America; *L. bulimoides*in North America; *L. tomentosa*in Australia. Other species,which have been incriminated in the transmission of *F. hepatica*include *L. viator*and *L. diaphena*(South America), *L. columnella*(USA, Australia, Central America and New Zealand) and *L. humilis*(North America) [1].

L. truncatula(Fig. 3) is the most common intermediate host for *F. hepatica* in different part of the world (Njau*et. al.,* 1989) and in Ethiopia (Graber, 1974). It is an amphibious or mud-dwelling snail which prefers moist temperature conditions (15-22^{o}C) though it appears that variants found in the tropics have adaptation to higher temperature mostly in the lowlands areas and can breed and survive at 26^{0}C with sufficient moister. The most important intermediate hosts of *F. gigantica*are *L. natalensis and L. auricularia*(Urquhart, 1996; Dunn, 1978; Soulsby, 1982). *L. natalensis*(Fig. 3) is the recognized intermediate host for *F.gigantica*(Yilma and Malone, 1998) Other species serving as secondarily hosts to this species are *L.rufescens and L. acuminate* (Indo-Pakistan) and *L. rubiginosa*(Malaysia) (Figure 3).



Figuer 3: *Lymnaea*spp. a) and b) *L. natalensis*; c) *L. columnella*; d), e) and f) *L. truncatula.*

L. natalensis is a strictly aquatic snail often found in Africa. It serves as the intermediate host for *F.gigantica* and requires well-oxygenated non-polluted water bodies and can aestivate during dry periods. Optimal temperature requirement for the completion of parasite developmental stages within the snails is 22-26^{0}C. However, in irrigated areas snail breeding is less circumscribed and will continue all year around, except for periods extreme temperature levels [2].

Life cycle

The life cycle of *Fasciola spp.* is a typical of Digenetic treamatodes. Eggs laid by the adult parasite in the bile ducts of their hosts pass into the duodenum with the bile. The eggs then leave the host through the faces. At this stage, eggs are still not embrocated, further development to maturation taking approximately two weeks. The eggs then hatch to release the motile miracidium, which will then locates and penetrates the intermediate snail host. The need to find a suitable host to penetrate is an urgent one, for those miracidia failing to do so generally die within 24 hours.

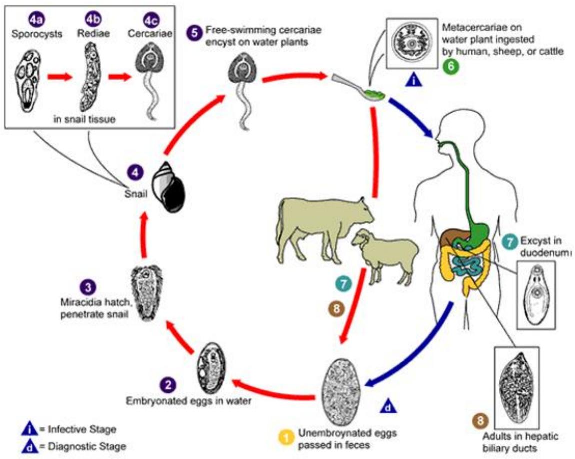
After penetrating the snail, the miracidium loses its cilia and becomes a sporocyest. The sporocyst dividing and forming redia (forum with sucker and primitive gut), and a fully mature redia showing redia and cercaria stages. The cercaria of *Fasciola spp.* have a rounded body measuring between 0.25 and 0.35mm long, with a long thin un branched tail measuring approximately 0.5mm long. The mobile circadian snail generally leaves the snail 4-7 weeks after infection by migrating through the tissues of snails. This is during moist conditions when a critical temperature of 10°C is exceeded.

On emerging from the snail the cercaria attaches to submerged blades of grass or other vegetation like watercress; the tail falls away and the cercarial body secretes a four-layered cyst covering from cystogenous glands located on the lateral regions of the body. The formation of the cyst wall may take up to two days. The metacercaria (encysted, resistant cercariae) is the infective form to the definitive host. Generally, metacercaria are infective to ruminants such as cattle and sheep, but also to other mammals including human beings. One miracidium hatching from a fluke egg can produce up to 4,000 infective cysts (metacercariae) due to the vegetative multiplication at the sporocyst and redail stages.

The metacercarial cyst is only moderately resistant, not being able to survive dry conditions. If however they are maintained in conditions of high humidity and cool temperatures, they may survive for up to a year, infection through hay as a vehicle of infection in non-endemic areas [3].

The metacercarial cysts, when ingested along with the contaminated vegetation by the definitive host enter into the small intestine, releasing the young parasite which penetrates the gut wall, entering the peritoneal cavity. From there, it migrates directly to the liver over a period of approximately seven days, directly to the liver. The juvenile fluke (also referred to as adeloscaria) then penetrates the liver tissues, through which it migrates, feeding mainly on blood, for about six weeks. After this period, the fluke enters the bile ducts, maturing in to a fully adult parasite after about 3 months from initial infection. Egg production then commences and completing the life cycle.

Adult flukes can survive for many years in the livers of infected hosts and lay between 20,000 and 50,000 eggs/day. The rate of egg production is responsible for the degree of pasture contamination and thus greatly influences the epidemiology of the disease. The epidemiology of the disease is also influenced by the grazing habits of the animals. Animals grazing in wet marshy areas, favored by the intermediate host, are more likely to become infected. Typically, long and wet seasons are associated with a higher rate of infection. However, sheep are more likely to ingest large numbers of cysts during dry periods following a wet season. This is due to a reduction in available pasture, forcing the animals to graze in swampy areas or in areas where the water has receded, thus exposing them to vegetation heavily infected with metacercariae (Richter, *et. al.,* 1999). In the past, human fasciolosis was limited to populations within well-defined watershed boundaries; however, recent environmental changes and modifications in human behavior are defining new geographical limits and increasing the populations at risk (WHO, 1999) (Figure 4).



Figuer 4: Life cycle of *Fasciola.*

Epidemiology

Fasciolosis is considered an important limiting factor for ovine and bovine production. In general, infection of domestic ruminants with *F. hepatica* and *F. gigantic* causes significant economic loss estimated at over US$ 200 million per annum to the agricultural sector worldwide, with over 600 million animals infected (Ramajo *et al.,* 2001). In developed countries, the incidence of *F. hepatica* ranges up to 77% (Spithil l*et. al.,* 1998). Evidence suggests that sheep and cattle may be considered the main reservoir host species, pigs and donkeys being secondary. In tropical regions, fasciolosis is considered the single most important helminthec infection of cattle with prevalence rates of 30-90% in Africa, 25-100% in India and 25-90% in Indonesia [4].

Fasciola hepatica is a temperate species and it is found in Southern America, Northern America, Europe and Australia and Africa, but found in the highlands of Ethiopia and Kenya *(*Yilma and Malone, 1998). It is the major cause of liver fluke disease in Ethiopia. Its tropical counterpart, *F. gigantica,* on the other hand is widely distributed in tropical countries, in Africa and Asia, parasitizing domestic ruminants and other herbivores in almost every continent. In Ethiopia, *F. gigantica* is found at altitudes below 1800 m.a.s.l. while *F. hepatica* is found at altitude between 1200-2560 m.a.s.l. (Yilma and Malone, 1998). Mixed infections by the two species can be encountered at 1200-1800 m.a.s.l.

The epidemiology of fasciolosis depends on the grazing habitat preference of the animal. Njau and Scholtens (1991) reported that metacercaria can survive up to 3 months after harvesting in hay from endemic highland areas that are consumed by the ruminants in arid and lowland areas, particularly during the dry season when suitable grazing pastures are scarce; local crowding of animals along the banks of streams and ponds during the dry season. When nutritional conditions are generally compromised also provides an important dynamics for infection transmission. Irrigation would have major effects on transmission [5].

Clinical signs

The clinical features of fasciolosis can have acute, sub-acute and chronic forms. Acute fasciolosis occurs as disease outbreak following a massive, but relatively short-term, intake of metacercariae (Urquhart *et. al.,* 1989). The high fluke intake is often the result of certain seasonal and climatic conditions combined with a lack of appropriate fluke control measures. It typically occurs when stocks are forced to graze in heavily contaminated wet areas as a result of overstocking and/or drought. Animals suffering from acute fasciolosis especially sheep and goat, may display no clinical signs prior to death; while some may display abdominal pain and discomfort and may develop jaundice (Soulsby, 1982*;* Urquhart et. al., 1989). In some cases, the liver capsule may rupture and fluid may lick into the peritoneal cavity causing death due to peritonitis. More commonly, on ingestion of fewer metacercaria, fever and eosinophilia is seen [5]. Death usually results from blood loss due to hemorrhage and tissue destruction caused by the migratory juvenile flukes in the liver resulting in traumatic hepatitis. This is more commonly seen in sheep than in other hosts. Sub-acute fasciolosis is caused by ingestion of a moderate number of metacercaria and is characterized by anemia, jaundice and ill-thrift. The migrating fluke causes extensive tissue damage, hemorrhage and in particular liver damage. The result is severe anemia, liver failure and death in 8-10 weeks.

Chronic fasciolosis is the most common clinical syndrome in sheep and cattle. It occurs when the parasite reaches the hepatic bile duct. The principal effects are bile duct obstruction, destruction of liver tissue, hepatic fibrosis and anemia. The onset of clinical signs is slow. Animals become gradually anemic and anorectic, as the adult fluke becomes active within the bile duct and signs may include dependent oedema or swelling under the jaw ('bottle jaw'). Affected animals are reluctant to travel. Death eventually occurs when anemia becomes severe. Additional stress upon anemic animals, such as droving, may lead to collapse and death. Cattle typically present with signs of weight loss, anemia and chronic diarrhea [2]. In addition to these, a condition known as *'black disease'* is a complication, which usually is fatal. Here, a secondary infection due to the bacterium *Clostridium novyi* Type B, proliferating in necrotic lesions produced by the young larvae migrating in the liver is responsible for the fatal outcome (Radostits*, et. al.,* 1994). Chronic fasciolosis provides the right environment in the liver for the germination of the spores of the bacterium. This form of the disease is much more common particularly in man. In humans the presence of the flukes causes a number of non-specific symptoms including malaise, an intermittent fever, mild jaundice, anemia, eosinophilia and frequently pain under the right costal margin. Furthermore, *Fasciola spp.* do not appear to be fully adapted to using man as a definitive host, as the flukes may often give rise to ectopic infections, particularly in the lungs and subcutaneous tissues, where they may be found encysted [1].

Pathology and pathophysiology

Pathogenesis of fasciolosis varies according to the parasitic development phases: parenchymal and biliary phases. The parenchymal phase occurs during migration of flukes through the liver parenchyma and is associated with liver damage and hemorrhage. The biliary phase coincides with parasite residence in the bile ducts and results from the haematophagic activity of the adult flukes and from the damage to the bile duct mucosa by their cuticular spines. In the bile ducts of some permissive hosts, such as the sheep, rabbit, rat and mouse, the biliary stage of the disease is common. In others, such as cattle and humans, few flukes survive beyond the migratory phase and biliary disease is relatively rare. Light infections due to *Fasciola hepatica* may be asymptomatic. However, they may produce hepatic colic with coughing and vomiting; generalized abdominal rigidity, headache and sweating, irregular fever, diarrhea and anemia (Behm and Sangster, 1999). In domestic ruminants, an adverse effect of acute or chronic fasciolosis includes decreased weigh gain and milk production, decreased female fertility, work power and mortality. Hepatic pathology, even when only limited areas of the liver are damaged, results in significant disturbances in mitochondrial bioenergetic metabolism of carbohydrates, proteins, lipids and steroids, as well as bile flow and bile composition. Sheep and goat are very susceptible to acute fasciolosis and the damage results from the immature flukes tunneling through the liver parenchyma with extensive tissue damage and hemorrhage that culminate in severe clinical disease and high mortality in the grazing sheep in Africa (Okewleo, 2000). During the movement of the immature stages of *Fasciola hepatica,* which may continue for months, symptoms may include abdominal pain, an enlarged live, fever, and diarrhea. Mitchell (2001) indicated that the pathology associated with diseases are caused by the inflammation of the bile ducts which causes thickening of the lining and eventually leads to fibrosis that results in reduced flow of the bile and back pressure builds leading to atrophy of the liver parenchyma and cirrhosis. Occasionally the worms penetrate the bile duct wall into the liver parenchyma causing liver abscesses. The complexity arises from several sources. Maturation of flukes involves development and growth for over 12-16 weeks during which time the fluke travels between and within organs. Because an individual fluke may pass the same part of the liver twice (or more) during these peregrinations, fresh and resolving lesions caused by the sequential insults may be found in the same section of tissue; as the migratory fluke grows the size of its track through the liver increases as does the damage and the inflammatory response.

Calves are susceptible to fasciolosis but in excess of 1000 metacerariae are usually required to cause clinical fasciolosis. The disease is characterized in calves by weight loss, anemia, and hypoprotenimia after infection with 10,000 metacercaria. Resistance develops with age so that adult cattle are quiet resistant to infection. Even though, the rate of development of human fasciolosis is similar to that in sheep, as an unnatural host, only few flukes develop sufficiently to reach the bile duct. Fasciolosis has a major effect on blood components (plasma proteins). Hypo albumin anemia and Hyperglobulinanemia commonly occur in liver fluke infections in all host species. During the parenchymal stage of the infection, liver damage caused by the migrating flukes compromise liver function, which in sheep and calves is reflected in a decline in plasma albumin concentrations, attributed partly to reduced rate of synthesis and partly to an expansion of the plasma volume.

Nevertheless, during biliary stage of the infection loss of blood from haematophagia and into the intestines is so extensive, causing severe anemia, that synthetic capacity of the liver is insufficient to replace the lost albumin (small molecular size) that oozes through the hyperplastic bile ducts (Cholangitis). Thus, a progressive loss of plasma albumin occurs in all infected host species, starting from around the time the fluke commences blood feeding. This results in disturbance in intravascular and extravascular oncotic pressure leading to the development of edema, often markedly visible at submandibular region of ruminants ('bottle jaw'). Liver trauma is the abrasion caused by cuticular spines and the prehensile action of the suckers and appears to account for the majority of the damage caused in the liver. Death of the host is a consequence of the hemorrhage induced by this damage. The oral sucker is the route by which liver flukes obtain most of their nutrition. It appears to cause considerable damage to liver tissue and macerated hepatic cells have been observed inside the sucker and pharynx. The oral sucker extends during migration and feeding from the earliest stages is capable of disrupting cells. The muscular pharynx assists in this process and oral sucker is a major organ involved in tissue disrupting. Although the inflammatory process has an important role in protecting the host against severe consequences of liver damage by the flukes, perhaps by retarding the growth of the parasite and contributing to hepatic healing process, there is accumulated evidence, in rats, that the response also contributes to hepatic dysfunction. There is evidence also that the infected rat liver is under oxidative stress during the parenchymal stage of the infection.The liver plays a central role in the physiology of the body, being responsible for a large proportion of the body's amino acid metabolism, for carbohydrate and lipid balance, urea synthesis, detoxification metabolism, ketogensis, albumin and glutathione synthesis as well as aspects of homeostasis. Therefore, it is to be expecting that many systemic changes will be induced by liver fluke infections that ultimately cause reduced productivity in livestock. Both anorexia (inappetance) and the quality of the diet of infected sheep contribute to hypoalbuminaemia during the infection (Behm and Sangster, 1999*).*

Diagnosis

Diagnosis of fasciolosis may consist of tentative and confirmatory procedures. A tentative diagnosis of fasciolosis may be established based on prior knowledge of the epidemiology of the disease in a given environment; observations of clinical signs, information on grazing history and seasonal occurrence. Confirmatory diagnosis, however, is based on demonstration of *Fasciola* eggs through standard examination of feces in the laboratory; postmortem examination of infected animals and demonstration of immature and mature flukes in the liver. The latter is helpful in deciding the intensity of infection. There are other laboratory tests (enzymatic and/or serological procedures used to qualify

the infection mainly for research purposes. Serological assays are often used to detect infections due to immature forms where fecal egg output is often nil. Such tests allow the detection of substance like cathepsin L proteases, excretory secretory products, detection of Ag in milk, and ELISA detection of antibodies against the flukes plasma concentration of Gamma-glutamyltransferase(GGT), which are increased within the bile duct damage. For example, Oxidative stress would be one of the consequences of the activity of inflammatory cells such as neutrophils, macrophages and eosinophil's in producing oxygen-derived free radicals, nitric oxide and their products.
A useful indicator of oxidative stress is the concentration of reduced glutathione (GSH) in cells. For chronic fasciolosis, confirmatory diagnosis could easily carried out by coproscopic examination employing sedimentation technique. *Fasciola* eggs have high specific gravity and sedimentation is preferred to floatation. When the latter is employed, floating medium such as ZnSo4 should be used. As *Fasciola* eggs may be confused with *Paramphistomum* eggs, addition of methylene blue in the fecal suspension will facilitate ease identification by providing a blue and contrasting microscopic field.

Control and prevention

Several control methods against ruminant fasciolosis are available and can either be used independently and as a combination of two or more of them. These methods involve reduction in the number of intermediate snail hosts by chemical or biological means, strategic application of anthelmintic, reduction in the number of snails by drainage, fencing and other management practices and reduction in the risk of infection by planned grazing management [3].

Snail control

Control of parasitic diseases is crucial to improve the productivity of the animals. In most fasciolosis endemic areas, the control of the intermediate snail host population offers a good opportunity for the reduction of transmission and is generally effective when combined with one or more other methods such as chemotherapy or environmental sanitation. Although eradication of the snail hosts is the most effective method of total fluke controls this, however, is often very difficult in low-lying, wet areas with a mild climate. Snails multiply extremely rapidly and hence eradication is almost impossible in irrigation areas. There are different types of snail poison available that are safe for stock but need care and precision in their application. other useful methods of fluke control include biological control of the intermediate host, fencing the waterlogged area and so on (Hansen and Perry, 1994; Soulsby, 1982; Mitchell, 2001). The use of molluscicides for the control of snail intermediate hosts is a potential tool for the control of fluke infections. Before considering chemical control of snails, it should be noted that many habitats are topographically unsuitable for the use of molluscicides and it is often very difficult to apply them effectively. They are toxic to the environment, cooperation between neighboring properties is required for effective cover and regular (at least yearly) application Is required because rapid repopulation of snails may occur. Whereas, they are not species-specific, may destroy edible snails highly valued as food in some communities and expensive.

A great number of chemicals have been used as molluscicides in the past, but at present Niclosamide (Bayluscide or mollotor) and copper sulfate are used in different part of African Countries (Brown, 1980).Brown (1980) indicated that molluscicidal properties have been demonstrated in extracts from a variety of plants. A substance 'Endod' or Lemma toxins derived from the fruits of shrubs *Phytolaccadode candra*(Lemma, 1970 cited in Brown, 1980). Substance such as 'Endod' might provide means of snail control less costly to developing countries than synthesized by molluscides but the production naturally molluscides on a commercial scale has yet to achieved. Tadesse and Getachew, (2002)from their finding they also indicated that 'Endod' used for the control of fasciola transmitting snails particularly *L. truncatula* and *L. natalensis*.

Chemotherapy

Effective control of most trematode infections is based on strategically applied chemotherapy(Hansen and Perry, 1994). Combination of chemotherapy, intermediate host control, sanitation and environmental manipulation are believed to be more efficient but very expensive. A flukicidal drug of choice must fulfill the following: It must act against both immature and mature flukes, It must not be toxic to the recipient animal, It must be cheep and available. Chemotherapy with drugs remains the most cost-effective way of treating parasitic diseases, and is usually at the heart of any major control campaign. Compared to environmental engineering, drug treatment is very cheap.

The drugs to be used against flukes should ideally destroy the migrating immature flukes as well as adults in the bile ducts. Several drugs are now available for the treatment of fasciolosis, which are against the adult flukes, and the parenchymal stages. These include Rafoxanide, Nitroxynil, Brotanide, Closantel and Albendazole. Diamphentide kills all immature flukes even a day old once and the Triclbendazole (TCBZ) is highly effective against all stages of fluke (Table 1). It is one of the widely used drugs worldwide for the control of fasciolosis (Spithill and Dalton, 1998; Gaasenbeek, *et. al.,* 2001). Chemotherapynormally reduces the prevalence and intensity of infection *as* measured by fecal egg counts [4].

Environmental sanitation and manipulation

Draining swamps, building sewage systems and providing clean water supplies are used to control water-borne /including snail borne/ helminthes but it is very expensive compare to chemotherapy. Strategies for the treatment and prophylaxis of infections with *Fasciola* are developed based on epidemiological data. Effective treatment during the prepatent period for an extended duration could eliminate Fasciola infection or reduce contamination of pasture to a very low level, requiring less frequent treatments for a considerable time. Retardation of immature flukes, which survive treatment, appears to be applicable to all ant helminthic and the degree of retardation depends on the efficacy of the drugs against the immature stages. This phenomenon has a great advantage in strategic control by reducing early pasture contamination with eggs. Less frequent strategic treatments with a possible yearly rotation of ant helmintics or ant helmintic combinations that are effective against both immature and adult flukes has been reported to provide the best method of successful control of fasciolosis (Parr and Gray, 2000). Other control methods includes Rotational grazing (i.e. grazing animals in divided paddocks; grazing equines, then sheep etc)and also avoiding missed grazing of animals of different age groups (NB: Young animals are generally susceptible to helminthes infections).

Importance of ovine fasciolosis

Economic

Food and Agriculture Association (FAO) (2002) estimated that Africa has 241 million Sheep and 209 million goats representing approximately 23% and 29% the world total population, respectively. The latest animal population census (CSA, 2004) shows that Ethiopia has 23.62 million sheep and 23.33 million goats. Despite the huge population size productivity of small ruminants in Ethiopia is very low because of prevalent diseases, sub-optimal nutrition, and poor management (Scott and Goll, 1977). Animal diseases are widely distributed and one of the major causes of livestock mortality, ill thrift and sub-optimal productivity in all agro-ecological zones of the country (EARO, 2000) is diminishing the benefit of their high reproductive performance.

It showed that productivity losses attributed to helminth parasite in Ethiopian highland sheep are considerable, and fasciolosis is a major factor in this respect. Direct losses due to fasciolosis are host mortality and liver condemnations whereas losses indirect losses may occur in a form of losses in body weight and decreased weight of lambs from infected ewes and decrease wool production.

Public health

Fasciolosis has recently been shown to be an important public health problem with human cases reported from countries in five continents, the level of endemics ranging from hypo- to hyper endemic(Dela-Valero *et. al.,* 2001). Human fasciolosis has also been reported in Europe, including Belgium, France, United Kingdom, Ireland, Switzerland and Spain (Ramajo, *et. al.,* 2001).The perception of human fasciolosis, caused by *Fasciola hepatica* or *Fasciola gigantica*, as an sporadic disease of low economic importance, is no longer tenable as the estimate of global prevalence is between 2.4 and 17 million human infections world-wide (Slifko, *et. al.,* 2000) and a further 180 million at risk of infection (Ramajo, *et. al.,* 2001). As a result, WHO (1995) has recognized fasciolosis as an emerging disease of humans. The distribution of the disease is predominantly rural, being associated with cattle and sheep breeding, although high prevalence in humans are not necessarily associated with areas where fasciolosis is a significant veterinary problem. A few studies showed that the incidence appears to be concentrated within families, as they are all likely to consume the same contaminated product.

The most common transmission route is the ingestion of watercress contaminated with encysted Metacercariae, although, depending upon the geographical location, and a variety of edible aquatic plants can be vehicles of transmission. Water containing floating metacercariae has also been implicated in disease transmission, as have salads contaminated with metacercaria-contaminate irrigations water. Among the risk factors are included the use of animal manure as fertilizers and wastewater effluent for irrigating aquatic or semi-aquatic vegetables (Slifko *et. al.,* 2000). High prevalence of human fasciolosis is recorded from Peru and Bolivia. Very few human fasciolosis report in Ethiopia (YilmaJobre (2004), personal communication).

The anticipated common means of transmission is the habitual use of grass as a toothpick in this environment.

The situation in Ethiopia

Fasciolosis is a serious problem in Ethiopia where sheep raising is of major importance to local economy (Njau *et. al.,* 1989). Studies so far conducted on fasciolosis in Ethiopia were mostly based on coprological examinations and abattoir surveys. Brook, 1983 and Brook *et al.,* (1985) carried out an investigation on the epidemiology of ovine helminthosis in four ecological regions and found that fasciolosis was highly prevalent in DebreBerhan area. ILCA (1992) Annual Report showed it to be the main cause of loss of weight and death in small ruminants.

Senior students from the Faculty of Veterinary Medicine, Addis Ababa University, have conducted several studies on prevalence and economic importance of fasciolosis in Ethiopia. These studies indicated that infection prevalence of fasciolosis varied from region to region, and reported prevalence rates of 49 % in Holeta (Yilma, 1985),30.2 % around Ziway (Adem 1994), 70.4 % in Western Shoa and Nekemte (Yadeta, 1994; Mezgebu,1995; Wassie, 1995).Mamo (1980) indicated that fasciolosis is the most prevalent parasitic disease of sheep in the high lands of Ethiopia and reported the existence of the intermediate host, *Lymnaetruncatula*in marshy areas. Graber and Danes (1974) reported the existence of this intermediate host in Illubabor, Shoa, Jima,Sidamo, Harrar, Wello and Bale. In Ethiopia, the highlands contain pockets of waterlogged marshy areas. These provide suitable habitats year round for the snail intermediate hosts (Argaw, 1998). The prevalence of fasciolosis in arid and semi-arid areas is very low. In the presence of irrigation in semiarid and arid areas, the prevalence of fasciolosis is increasing. However, none of the previous works had indicated the importance of irrigation as a risk factor for the high prevalence of an intermediate host snail (*Lymnaeatruncatula* and *L. natalensis*) and hence assessment of the magnitude of the problem will necessary for institution of a rational fasciolosis control strategy suitable to the irrigated areas. therefore, this study focuses on determining the infection prevalence of fasciolosis in sheep owned by the farmers inhabiting around small-scale traditional irrigation schemes in the highlands and, mid-altitude and lowland areas of the upper Awash River basin; and assessing the potential impact of community-based irrigation on the spread of fasciolosis in the study areas; and evaluation of the effect of a strategic anthelmintic treatment on some productivity parameters in as selected upstream areas.

Study area

The study was conducted from April 2018 to May 2018 to determine coprological prevalence and to identifying risk factors associated with ovine fasciolosis in and around jucavm open air veterinary clinic, south western Ethiopia. Jimma town is located in Oromia region, south west of Ethiopia, at a distance of about 352 km from Addis Ababa. Geographically, Jimma is located at 7°13' and 8°56' N latitude and 35°52' and 37°37E longitude. The climatic condition of the area is 'midland with altitude ranging between 1720 to 2110 m above sea level and receives annual rainfall which ranges between 1200 to 2000 mm. There are two rain seasons, short rainy season (November to April) and long rainy *season* (July to October). The annual mean temperature ranges from about 12.1°C to 28°C *(*JZARDO, 2009).

Study ovine population

A total of 384 sheep were randomly selected and subjected to qualitative coprological examination. The study animals were indigenous sheep kept under traditional extensive management system in JUCAVM and its surroundings. In the population there are animals of different age groups and body condition of both gender groups.

Sample size determination

To determinate sample size a fasciola prevalence of 50% was taken into consideration as there is no previous study conducted in the area. The desire sample size for the study was calculating using formula given *by* Thrusfield, (2005) with 95% confidential interval and at 5% absolute precision .There for, a minimum sample size of 384 sheep was considered for this study.

$n = 1.962 Pexp (1-Pexp/d^2$

Where, Pexp = expected prevalence;

d= absolute precision (5%);

n =sample size.

Sample collection

Fecal samples were collected directly from the rectum in to laboratory-sampling bottles and immediately transported by ice box to the parasitology laboratory of the Jimma university laboratory for coprological examinations. Samples that were not processed within 24 hours from collection were stored in a refrigerator at 4°C. During every sampling, information on breed, gender and age of animal were recorded.

Study design

Cross sectional study was conducted to determine the prevalence of ovine fasciolosis in selected study area.

Coprological examination

Coprological examination was performed to detect *Fasciola* eggs in the faces by using standard sedimentation technique. It was used to assess the presence of fluke infections through repeated dilution of the fecal suspension and sedimentation of the eggs (Hansen *et al.,* 1994).

Data analysis

All raw data that were recorded from this study were interred into Microsoft excel data base system and referenced with geographical location of the study area. Using SPSS computer programs data were summarized and analyzed. Chi-square (X^2) test was used to determine the variation infection prevalence between gender and age. A 5% significant level was used to determine whether there is significant difference between the parameter measures between the groups.

RESULT

Carpological examination

Over all prevalence from a total of 384 examined sheep fecal sample of the four kebeles in and around JUCAVM 197 samples were found positive for fasciola eggs with in an overall prevalence of 51.3%. The prevalence of fasciolosis recorded in the four associations (PAs) were 60.8%, 53.5%, 49.1%, 44.5%is Ifa bula, semero, Sadecha and Bosa addisketema respectively. There were no statically significance differences between the prevalence of fasciola eggs in the different study sites (P>0.05) (Table 1).

Site/kebeles	No.of examined animals	No.of positive animals	Prevalence (%)	X^2	P-value
Bosa addisketema	119	53	44.54		
Semero	58	31	53.5		
Ifa bulu	97	59	60.8	6.022	0.111
Sadecha	110	54	49.1		
Total	384	197	51.3		

Table1: Prevalence of ovine fasciolosis based on site.

Prevalence by age groups of animals; the infection rate between young and adult animals was compared. It was observed that the prevalence of fasciolosis was significantly higher in adult (65.35%) than young (47.05) animals (Table 2).

Age	No.of examined animals	No.of positive animals	Prevalence (%)	X^2	P-value
Young	102	48	47.05		
Adult	228	149	65.35		
Total	384	197	51.3	1.001	0.317

Table2: Prevalence of ovine fasciolosis based on age.

Prevalence by gender groups; Over all prevalence fasciolosis in male and female sheep was 50.26% in male and 52.3% in female .Although the prevalence was relatively higher in female sheep than in male sheep. The difference was not statistically significant (P>0.05) (Table 3).

Gender	No.of	No.of	Prevalence	X^2	P-

	examined animals	positive animals	(%)		value
Male	189	95	50.26		
Female	195	102	52.3	0.16	0.689
Total	384	197	51.3		

Table3: Prevalence of Ovine Fasciolosis based on gender.

Prevalence of fasciolosis on poor body condition animals was 98.3%. However, animals with medium and good body condition showed prevalence of 49.05% and 32.2 respectively. Significant difference (P<0.05) in prevalence was observed among body condition of the study animals (Table 4).

Body conditions	No.of examined animals	No.of positive animals	Prevalence (%)	X^2	P-value
Poor	188	116	98.3		
Medium	106	52	49.05	21.468	0
Good	90	29	32.2		
Total	384	197	51.3		

Table 4: Prevalence of Ovine Fasciolosis based on body condition**.**

An attempt was also made to analyze the prevalence with respect to deworming history of the animals. The prevalence of the disease in animals that were not dewormed (55.38%) was highest, followed by dewormed occasionally (48.3%) and dewormed regularly (45.2%). The result of statistical analysis revealed no significant difference (P>0.05) in each group (Table 5).

Deworming history	No.of examined animals	No.of positive animals	Prevalence (%)	X^2	P-value
No deworming	195	108	55.38		
Occasionally deworming	116	56	48.3		
Regularly deworming	73	33	45.2	2.812	0.245
Total	384	197	51.3		

Table 5: Prevalence of Ovine Fasciolosis based on deworming history.

DISCUSSION

The present study was designed to determine prevalence and assess risk factors associated with *Ovine fasciolosis*. It revealed that an overall prevalence of Fasciolosis based on coprological investigation of *Ovine fasciolosis* was 51.3%. The present study was in close agreement with the report of Michael (2003) with prevalence of 51% of Debrezeit (mid altitude), with prevalence of 50.8% in chole woreda and (Yilma (1985) with a prevalence of 49% in Holeta. The result of the present study was higher than the reports 13.2% in the middle Awash river basin. The result of the present coprological examination was very low from the finding of with the overall prevalence of 54.2% and 56.2% respectively. The difference in the prevalence might be related to the variation in the agro-climate condition management system in the different study areas, including altitude, rainfall, temperature, humidity and management system of the sheep.

This prevalence in the study area may be attributed to the presence of conductive ecological factors for the snail intermediate host and the parasite (fasciola) in the study area, feature of the land escape being plain with „poor drainage, heavy dark brown clay soil (With slight acidic PH) which has high capacity of water retention with annual over flooding during the rainy season leaving pockets of water bodies and is mostly marsh area for long period during the dry season. Barcha River, slowly flowing rivers and swampy parts of the river border the area such ecological conditions are considerable for breeding and survival of the intermediate host snails and the parasite. In the present study area, prevalence of bovine fasciolosis was compared based on the origin of animals. The study revealed prevalence of 59(60.8%) in Ifabulu, 31(53.5%) in semero, 54(49.09%) in Sadecha and 53(44.54%) in Bosa addis katema with non-statistical difference (P>0.05). This non significant difference indicates that there is no difference in the prevalence of the disease. This variation mainly attributed to the variation in climatic and ecological conditions such as altitude, rain fall, presence of marshy areas and temperature and management system of livestock. The prevalence of the disease in female and male animals was recorded as 52.3% and 50.26% respectively. There was non-significant difference (P > 0.05) between the two indicating that gender seems no effect on the prevalence of the disease. This may be due to the fact that grazing of both gender groups in similar pasture land. Moreover, it might also be that fasciolosis is not a disease directly related to animal reproductive system. Similar results have been reported. The study related that prevalence of ovine fasciolosis become high following the increase of age in sheep .In other word, the younger the age the lower the prevalence and the older the age the higher it will be so that significant variation in prevalence of ovine fasciolosis of different age group were observed (P<0.05).This is certainly because of that adult animal have repeatedly exposed to flukes infection than young, similar results has been reported. Study was carried out on prevalence of Fasciolosis on the basis of body condition. The results of this study indicated that infection rates in poor body condition (98.3%) animals were significantly higher (P < 0.05) than that of medium (49.05%) and good body conditions animals (32.2%). This signifies that the importance of Fasciolosis in causing weight loss and is a characteristic sign of the disease. Sheep of poor body condition are vulnerable to parasitic diseases. The present result indicated that significant difference exists in deworming history (P >0.05). There was 55.38% of prevalence in those which do not dewormed and 48.3% of prevalence rate in those occasionally dewormed sheep. For sheep those regularly dewormed the prevalence was 45.2%. In the study area almost more sheep are not dewormed and especially strategic treatments not implemented at appropriate timing and with the aim of reducing worm burden from infected animals and preclude pasture contamination. Periodic anthelmintic treatment is the most commonly used means to control the diverse effects of Fasciolosis in ruminants. It is recommended that twice yearly treatment under smallholder farmer's situation is an effective and affordable regime under tropical conditions. The first treatment is recommended to be given during the dry season to eliminate the adult parasite. Such a treatment enables the animals to survive the effects of the dry season, when nutritional condition are generally compressed. It also avoids contamination with fluke eggs of water holes and irrigation channels. On the other hand that late December might be a more appropriate month to administer the treatment to sheep in the study area concerned, where the rainy season sometimes extends into October, since animals treated before mid December are liable to significant re-infection. The second treatment has been given early wet season when the immature flukes migrate through the hepatic parenchyma. Strategic anthelmintic treatment helps to reduce grazing land contamination with fluke eggs and increases productivity (Hansen and Perry, 1994; Yilma and Malone, 1998). But in the study area sheep will not be dewormed according to the aforementioned deworming calendar.

CONCLUSION AND RECOMMENDATION

In general, it can be concluded that fasciolosis is one of the major obstacle for livestock development in Ethiopia by inflecting remarkable and indirect losses at different part of the country. The present study indicates that ovine fasciolosis is widely distributed disease with high prevalence rate in the study area. The levels of infection in this study suggested that there is an existence of favorable climatic conditions throughout the year for the development and survival of the parasites and their intermediate hosts in the area of origin of study animals. Based on the above conclusion the following recommendations are forwarded:

- Integrated approach, which is combination of selective chemotherapy and selective vector control, should be considered more practically and economically feasible.
- Education of farness with economical significance and control methods of this distance was forwarded.
- Strategic use of helminthic should be performed to reduce pasture contamination with fluke‟s eggs.
- Further study on the control aspect of the disease should be done to reduce the economic impact of fasciolosis in the study area.
- It is impossible to treat all water bodies due to huge cost implication and environmental hazards. Hence, control of snail population should be selective directed toward the main watering point (transmission site or contact points) at specific time.

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