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Review on Epidemiology, Public Health and Finanicial Loss of Hydatidosis in Ethiopia

Belay Elias Gemesho*

Doyogena Livestock and Fishery Resource Office, Ethiopia

***Corresponding author:** Belay Elias Gemesho, Doyogena Livestock and Fishery Resource Office, Doyogena, Ethiopia

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ABSTRACT

Echinococcosis is a zoonotic parasitic disease caused by larval stages of cestodes belonging to the genus *Echinococcus*. Hydatid cyst, which is the larval stage of *Echinococcus*, is a bladder-like cyst formed in various organs and tissues following the growth of the oncospheres of an *Echinococcus* tape worm in that specific organ or tissue. The epidemiology and control of hydatidosis is often considered to be a veterinary matter since the disease can be regulated by controlling parasites in animals. Therefore, the objective of this paper was to review the Epidemiology, public health and financial importance of hydatidosis in Ethiopia. Human echinococcosis is a zoonotic infection caused by the tape worm of the genus *Echinococcus. Echinococcus granulosus granulosus* cause cystic echinococcosis (CE), *Echinococcus multilocularis* cause *alveolar echinococcosis* (AE), and *Echinococcus vogeli* and *Echinococcus oligarthus* cause *polycystic echinococcosis* (PE). From these *Echinococcus multilocularis* is rare but is the most virulent, *Echinococcus vegeli* and *Echinococcus oligarthus* are the rarest. Hydatidosis is a zoonotic cosmopolitan parasitic disease found in almost all countries of the world. Research findings from abattoir surveys conducted in Ethiopia have been reviewed, which revealed the prevalence of cystic hydatidosis, in bovine ranging from 9.6% (Harar) to 63.7% (Assella), in sheep(14.67%), in goat(7.05%) from Addis Ababa respectively and annual financial loss ranging from 96,315 (Harar) to 4.00 million (Nekemte) Ethiopian Birr. To show real damage incurred due to this zoonotic disease, nationwide studies should be conducted on public health and financial impact, transmission, reservoirs, geographic distribution, control and prevention measures of zoonoses. Strengthening of veterinary facilities and extension systems, expansion of abattoir facilities, creation of community awareness, regular deworming of dogs and appropriate disposal of infected organs are recommendations forwarded in order to help zoonoses control. Collaboration between veterinarians and public health workers in the prevention and control of the disease is mandatory.

Keywords: Ethiopia; Hydatidosis; Prevalence; Zoonosis

Abbreviations: CE: Cystic Echinococcosis; AE: Alveolar Echinococcosis; PE: Polycystic Echinococcosis; GDP: Gross Domestic Product; IH: Intermediate Hosts; CFT: Complement Fixation Test; IFAT: Indirect Fluorescence Antibody Test; LMIT: Leukocyte Migration Inhibition Test; ELISA: Enzyme-Linked Immunosorbent Assay; HBLP: Heparin Binding Lipoprotein; Ab-ELISA: Avidin-Borin-ELISA

Introduction

Ethiopia has the largest livestock population in Africa. An estimate indicates that the country is a home for about 30.70 million sheep, 30.20 million goats and 59.5 million cattle. Livestock plays vital roles contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP (CSA [1]). Hydatidosis is a zoonotic parasitic disease caused by larval stages (hydatid cysts) of cestodes belonging to the genus *Echinococcus* and the family *Taeniidae* (Thompson and J Eckert M A [2]). Hydatid cyst, which is the larval stage of *Echinococcus*, is a bladder-like cyst formed in various organs and tissues following the growth of the oncospheres of an *Echinococcus* tapeworm in that specific organ or tissue (Urquhart

[3]). Four species of the genus *Echinococcus* are recognized and regarded as taxonomically valid: *E. granulosus* (cystic hydatidosis), *E. multilocularis* (multivesicular hydatidosis), *E. vogeli* (polycystic hydatidosis) and *E. oligarthus*. These four species are morphologically distinct in both the adult and the larval stages. In addition, several different strains of *E. granulosus* and *E. multilocularis* are recognized (Soulsby [4]).

Echinococcosis has a worldwide distribution; the reason is mainly due to the ability of this tape worm to adapt a wide variety of domestic and wild Intermediate Hosts (IH). Its distribution is usually more prevalent in developing countries especially in the rural communities where the dog lives in close quarters with man and domestic herbivores, feeding on scraps and offal of wild herbivores hunted by his master or domestic herbivores bred for butchering and the highest incidence is reported mainly from sheep and cattle rearing areas (Mebrahtu [5]). The life cycle of *E. granulosus* is complex, involving two hosts and a free-living egg stage. The definitive host of the parasite, *E. granulosus*, is dogs which harbor adult tape worms and excrete the parasite eggs along with their feces, while livestock and human are the main intermediate hosts for whom the outcome of infection is the development of hydatid cysts in lung, liver or other organs (Soulsby [4]). Human cases of hydatidosis are frequently reported from different corner of the country and the disease is much more common in the rural areas of Ethiopia where dogs and domestic animals live in a very close association (Fromsa and Jobre [6]). In Ethiopia, abattoir reports from different regions of the country indicated that hydatidosis is highly prevalent disease including economic loss and affecting public health. Abattoir based studies conducted in various parts of the country showed that prevalence of hydatidosis in cattle ranges from 9.4% to 63.7% at Harar and Assella, respectively and contributing a big role in lowering the amount and quality of exported commodities (Belina and Nuraddis [7,8]). Therefore, the objectives of this paper are to review the Epidemiology, public health and financial loss in Ethiopia based on abattoir survey studies conducted previously at different parts of the country.

Hydatidosis

4.1.1.Etiology: *Echinococcus spp*. is small tapeworms, rarely more than 7 mm in length. The scolex bears four suckers, and there are two rows of hooks, one small and one large on the rostellum, the number and length of which may vary according to species. The eggs are ovoid (diameter about 30-40mm) consisting of a hexacanth embryo (oncospheres) surrounded by several envelopes the most noticeable one being the embryophore, which gives the egg a dark striated appearance. The metacestode basically consists of a bladder with an acellular laminated layer and an inner nucleated terminal layer, which may rise by asexual budding to brood capsules. Protoscolices arise from the inner wall of the brood capsules or from the germinal layer (Mebrahtu and Taylor [5,9]).

Morphology and Host Range: Four species of the genus *Echinococcus* are regarded as valid taxonomically. These are *Echinococcus granulosus, Echinococcus multilocularis, Echinococcus oligarthus* and *Echinococcus vogeli* as cited by Soulsby. These four species are morphologically distinct in both adult and larval stages (Regassa [10]). *Echinococcus granulosus* (*E. granulosus*) (Dwarf dog tape worm) is a tapeworm found in the small intestine of definitive hosts and the cystic stage, i.e., hydatid cyst found in various organs (liver and lung) in the intermediate host and occupies a large portion of functional tissues (Taylor [9]). The adult worm varies between 2-7 mm in length and usually possesses three or four segments (rarely up to six). The gravid uterus is characterized by well-developed lateral sacculations. The larval stage is a fluid-filled bladder usually unilocular but communicating chambers also occur (Mandal [11]). The parasite is perpetuated primarily in a domestic cycle involving the dog (*Canis familaris*) as the definitive host and domestic ungulates (e.g. sheep, cattle, pigs, goats, horses and camels) as intermediate hosts (Urquhart [3]). *Echinococcus multilocularis* (*E. multilocularis*) (Dwarf fox tapeworm) is a tapeworm found in the small intestine of the definitive hosts and the larval stage found mainly in the liver and also in lungs, brain, muscles, lymph nodes, and other organs and tissues (Taylor [9]). The metacestode is a multi-vesicular structure consisting of conglomerates of small vesicles. It is commonly referred to as the alveolar hydatid. Intermediate host specificity is relatively high and infection with the metacestode is confirmed to rodents, particularly members of the family Cricetidae (*Arvicolidae*).

The metacestodes causes alveolar hydatid disease in man. *Echinococcus multilocularis* is mainly perpetuated in a sylvatic cycle involving foxes and cricetid (arvicolid) rodents. Domestic dogs and occasionally cats may also enter into this cycle when they eat infected wild rodents or rodents commonly associate with human dwellings such as house mice (Urquhart [3]). *Echinococcus vogeli* (*E. vogeli*) is a tapeworm found in the small intestine of definitive hosts, i.e., bush and domestic dogs. In the intermediate host, the cyst is found in the liver, lungs, and other visceral organs. It is a very small tapeworm (4–6 mm) and usually has 3 segments, the terminal gravid segment being very long in comparison to the rest of the tapeworm. The uterus is saclike, long, and tube shaped (OIE and Taylor [12,9]). *Echinococcus oligarthus* (*E. oligarthus*) is a tapeworm found in the small intestine of definitive hosts and viscera, musculature, and skin of intermediate hosts. The metacestode is polycystic and fluid-filled with a tendency to become septate and multi chambered. The single cyst may reach a diameter of about 5 cm. *Echinococcus oligarthus* characteristically use wild felids including the puma (*Felis concolor*), jaguar (Felis onca), jaguarundi (*Felis yagouaroundi*) and Geoffrey's cat (Felis Geoffrey) as definitive hosts. Other rodents serve as intermediate hosts. So far, no human infections due to *E. oligarthus* have been confirmed (Mandal [11]). *Echinococcus vogeli*: is a tapeworm found in the small intestine of definitive hosts, i.e., bush and domestic dogs. In the intermediate host, the cyst is found in the liver, lungs, and other visceral organs. It is a very small tapeworm (4–6 mm) and usually has 3 segments, the terminal gravid segment being very long in comparison to the rest of the tapeworm. The uterus is saclike, long, and tube shaped. The

metacestode has a polycystic structure (Taylor [9]).

Epidemiology: The distribution of Hydatidosis is considered worldwide, with only a few areas such as Iceland, Ireland, and Greenland believed to be free of the disease. It is highly distributed in under developed countries, especially in rural communities where humans maintain close contact with dogs, the definitive host and other domestic animals, that act as intermediate hosts (OIE [13]). Hydatidosis infections also occur in developed countries, where standards of sanitation are high and meat is carefully inspected and generally thoroughly cooked. The disease spreads in developed countries of the world through tourists enjoying the consumption of lightly grilled meat, mass migration of labor and the export of meat unreliably passed by ''eye or knife'' inspection or from live animals imported from endemic areas (Minozzo [14]). Hydatidosis has been known and documented in Ethiopia as early as 1970. It is still the major cause of organ condemnation in most abattoirs and lead to huge economic losses to the livestock industry. Several reports had indicated that hydatidosis is widely prevalent in livestock population of various regions of Ethiopia (Kebede [15]).

Life Cycle: The life cycle of *E. granulosus* is complex, involving two hosts and a free-living egg stage. The definitive host of the parasite is dogs and livestock and human are the main intermediate hosts (Soulsby [4]). An adult worm resides in the small intestine of a definitive host. Afterwards, gravid proglottids release eggs that are passed in the feces of the definitive host. The egg is then ingested by an intermediate host. The egg then hatches in the small intestine of the intermediate host and releases an oncospheres that penetrates the intestinal wall and moves through the circulatory system into different organs, in particular the liver and lungs. Once it has invaded these organs, the oncospheres develop into a cyst. The cyst then slowly enlarges, creating Protoscolices and daughter cysts within the cyst. The definitive host then becomes infected after ingesting the cyst-containing organs of the infected intermediate host. After ingestion, the Protoscolices attach to the intestine. They then develop into adult worms and the cycle starts all over again (CDC [16]). The survival of the infective egg is influenced by environmental factors, such as humidity and temperature. While eggs may survive for several months under moist conditions and moderate temperatures, desiccation is detrimental and they will only survive a short time when exposed to direct sunlight and dry conditions. The number of infective eggs ingested by the intermediate host is therefore determined by the level of contamination and the infectivity of the eggs (Ataro and Tamirat [17]).

Pathogenesis and Clinical Sign: Clinical manifestations of cystic hydatid disease may be absent or result from the mass effect and anatomic position of the slowly growing cyst(s). The interval between first infection and clinical manifestations is variable and often prolonged for many years. Most infections are diagnosed in patients between 10 and 50 years of age. The signs and symptoms of hepatic hydatid disease may include hepatic enlargement (with or without a palpable mass in the right upper quadrant), right epigastric pain, nausea and vomiting. Rupture or leakage usually results in acute or intermittent allergic manifestations (WHO [18]). Leakage or rupture of hydatid cysts in the lungs causes chest pain, coughing, dyspnea and hemoptysis. Hydatid membranes may be expectorated, sometimes resulting in spontaneous cure. Emergency complications that may exist at the time of presentation include cyst rupture and secondary bacterial infection. Nearly 40% of patients with pulmonary hydatidosis have liver involvement as well. The first symptom of cerebral cysts may be raised intracranial pressure or focal epilepsy, whereas kidney cysts may be manifested by loin pain or hematuria. Bone cysts are often asymptomatic until pathologic fractures occur (Mebrahtu [5]). The clinical signs of the disease usually do not become evident until middle age. Initial symptoms are generally vague. Mild upper quadrant and epigastric pain with hepatomegaly may progress to obstructive jaundice. Occasionally the initial manifestations are caused by metastases in the lungs or brain. Patients eventually succumb to hepatic failure or invasion of contiguous structures (Mulema, et al. [19]).

Transmission: Animals host of hydatidosis are bovine, ovine, caprine, swine and human. Grazing animals become infected when they swallow eggs from contaminated pasture. When hydatid eggs are swallowed by an intermediate host (sheep, cattle, humans), they migrate through the stomach wall into the bloodstream. They are then carried to various internal organs, usually the liver and lungs, but sometimes the brain. Watery hydatid cyst then forms in these soft tissues. Species vary in their suitability as intermediate host; hydatid cysts found in the sheep are usually fertile, whereas those in cattle are usually sterile (Bowman [20]). Since sheep generally avoid grazing near areas contaminated with dog faeces, this dispersal mechanism enhances the chances of eggs being ingested by the grazing animals. This has important epidemiological implications since a single dog can thus infect many sheep over a wide area (Soulby and Urquhart [4,3]). Man is an accidental intermediate host. Human infection most commonly occurs when infected dogs are handled, because the sticky hydatid eggs are present on the dog's coat. Infection is also possible from eating home-grown raw vegetables, contaminated with the faeces of an infected dog (Shiferaw [21]). The dynamics of the transmission of the parasite are determined by the interaction of factors associated with these two hosts and with the external environment. Transmission of hydatidosis to intermediate hosts takes place through the ingestion of eggs with contaminated food or water (Soulsby [4]). It occurs most frequently when individuals handle or contact infected dogs or other carnivores inadvertently ingest food or drink water contaminated with fecal materials containing tape worm eggs (Ahmed and Furgasa [22]).

Diagnosis: More recent research techniques include the detection of copro DNA by Deoxyribonucleic acid, PCR (Polymerase chain reaction) and the detection of *E. multilocularis* specific copro antigen in an ELISA (Enzyme linked immunosorbent assay) based assay are practiced. Diagnosis is with imaging tests, examination of

the cyst fluid, or serologic tests (immunodiagnostic tests) (Taylor [9]). According to (Mandal [11]), immunodiagnosis of hydatidosis is also possible and the source of antigen is Protoscolices, cyst fluid, and cyst membrane. (e fertile cysts contain much amount of antigen. The immunodiagnostic tests are complement fixation test (CFT), indirect fluorescence antibody test (IFAT), indirect halmagglutination test, leukocyte migration inhibition test (LMIT), latex agglutination test, arc 5 double diffusion test, immunoelectrophoresis and radioimmune assay.

Ultrasonography: Infections with *E. granulosus* cysts in the intermediate host are typically asymptomatic, except for a small number of cases with chronic and heavy infections. There are no reliable methods for the routine diagnosis of infections in living animals, but some studies suggested the possibility of using ultrasonography to provide data on the number, size, site and condition of CE in sheep and goats and found to be a sensitive method for the diagnosis of liver CE in sheep. Using this technique alone or together with testing of biochemical parameters reflecting the liver functions could be helpful tools for the diagnosis of CE in the sheep liver (Hussein and Elrashidy [23]).

Enzyme-Linked Immunosorbent Assay (Elisa): Enzyme-linked immunosorbent assay (ELISA) is a technique developed for the diagnosis of parasitic diseases (Lahmar, et al. [24]). including CE, although, many conflicting reports have been issued on the suitability of ELISA for the immune diagnosis of hydatid disease (Ibrahem, et al. [25]). In addition, there are also other recent trends of diagnosis which includes peroxidase micro-ELISA (Enzyme Linked Immune Sorbent Assay), Avidin-borin-ELISA (Ab-ELISA) which is used in heparin binding lipoprotein (HBLP) for bovine fertile hydatid cyst (Mandal [11]).

Post Mortem Investigation: During postmortem examination, organs of the abdominal and thoracic cavities namely liver, lung, heart, kidney and spleen were systematically inspected for the presence of hydatid cysts by applying the routine meat inspection procedures. The inspection procedure used consisted primary examination followed by a secondary examination. If evidence of hydatid cyst were found, the primary examination involved are visualization and palpation of organs and muscles, whereas secondary examination involves further incision in to each organ in case where a single or more hydatid cyst where found. The abnormalities on meat inspection for developing countries and the result were recorded (OIE [26]).

Treatment: Domestic dogs and cats with intestinal echinococcosis represent a potential risk to humans; infected animal should be treated immediately. A single dose of Praziquantel virtually eliminates the entire worm burden. In dogs, Praziquantel (5mg/kg Po, 5.7 mg/kg Im) and cats (8 mg/kg topical formulation) is indicated. Confirmed infected cases should receive two doses on consecutive days and 4 to 5 days afterwards (Eckert and Deplaze [27]). Drugs have to penetrate all layers of the cyst in order to kill the living parasite tissues. A unilocular cyst can be removed surgically but major difficulty is to prevent spillages of the contained Protoscolices, each of which can regenerate into a new cyst. In man hydatid cyst may be excised surgically, although more recently Albendazole therapy has been reported to been effective (Urquhart [3]). Benzimidazole-based chemotherapy used frequently for medical treatment of CE in humans involves patients taking the drug on a daily basis over extended periods. Such treatments are not suitable for routine treatment of CE in livestock animals. If a practical and effective drug treatment could be developed for livestock animals that involved a single treatment, or a small number of anthelmintic treatments, which rendered CE cysts either nonviable or at least, non-fertile, this would provide a significant advance for the control of CE transmission (Craig [28]). The most effective treatment identified to date, daily dosing at 30 mg of Oxfendazole per kg, was found to be unacceptably toxic, resulting in a 24% death rate for treated sheep. At this time there is no effective, practical method available for chemotherapy of CE in livestock animals that could be implemented as part of a CE control program (Craig [28]).

Control: Control options describe by (Torgerson and Heath [29]) suggests that a combination of vaccination with EG95 together with 6-monthly treatment of dogs with PZQ would provide an effective strategy for achieving a rapid and high level of control of CE transmission. The control of stray dogs is an essential means of control. In countries where no specific measures for hydatid control exist, it has been found that an incidental benefit from the distribution of stray dogs for rabies control has been a great reduction in the incidence of hydatid infection (Taylor [9]).

Prevention: Deworming of dogs is based on the regular treatment of dogs to eliminate the adult tapeworm and on the prevention of infection in dogs by exclusion from their diet of animal material containing hydatids. This is achieved by denying dogs access to abattoirs, and where possible, by proper disposal of carcasses. Proper disposal of the carcass is by deep burial or incineration (Taylor [9]). Removal or reduction in worm biomass in definitive hosts will have the greatest and quickest effect to reduce active transmission because egg production will decrease rapidly and thus infection pressure to livestock. This will also importantly reduce the direct zoonotic risk from dogs within endemic communities. Organs containing hydatid cysts should be removed, condemned and destroyed in a manner that prevents consumption by dogs (Craig [28]).

Community Conversations

Change in behavior requires change in both cognitive and emotional mental models. Bringing community members together for dialogue helps them reflect and develop greater self and social awareness. When community members appreciate the problem and associated consequences, they change their interpretive frame of reference, which triggers shifts in both cognitive and emotional mental models. Community conversations expose people to

alternative experiences and ways of thinking and doing, which cause shifts in mental models, building trust, and encouraging collective action. The community conversation approach empowers community members and helps them discover their ability to facilitate change disease control (Mulema, et al. [19]).

Status of Hydatidosis in Ethiopia

In Ethiopia studies conducted in different abattoirs indicated that cystic hydatidosis is prevalent and considerable financial loss is associated with it and there is few study report of human cases. The presences of large stray dog population are thought to contribute significantly to the prevalence of the disease in Ethiopia (Atsede and Abeba [30]). Abattoir based studies conducted in various parts of the country showed that prevalence of hydatidosis in cattle (Kebede [31]) ranges from 9.4% to 63.7% at Harar and Assella, respectively, and contributing a big role in lowering the amount and quality of exported commodities (Belina and Nuraddis [7,8]). The variation in prevalence in different regions or localities might be due to the difference in agro ecologic situations, public awareness about transmission of the disease, strain difference in *E. granulosus* in the different geographical situations and also other factor such as difference in culture, social activity, animal husbandry systems, lack of proper removal of infectious carcass, and attitude to dogs in different regions might have contributed to the variation in prevalence in different areas of a country (Bizuwork [31]).

Certain deep-rooted traditional activities have been described as factors associated with the spread and high prevalence of the disease in some areas of the country. These can include the wide spread backyard slaughter of animals, the corresponding absence of rigorous meat inspection procedures, the long standing habit of feeding domesticated dogs with condemned offal and the subsequent contamination of pasture and grazing fields. This can facilitate the maintenance of the life cycle of *E. granulosus* which is the causative agent of cystic hydatidosis. Several researchers from different parts of the country have reported that the liver and lung were the most commonly infected organs by hydatid cysts (Nuraddis [8]).

Public Health Importance: Human Echinococcosis is a zoonotic infection caused by the tapeworm of the genus *Echinococcus* (Aschalew [32]). *Echinococcus granulosus* causes cystic echinococcosis, *Echinococcus multilocularis* causes alveolar echinococcosis and *Echinococcus vogeli* and *Echinococcus oligarthus* cause polycystic echinococcosis (Yimer [33]). From these, *Echinococcus multilocularis* is rare but is the most virulent; (Wubshet and Mahendra [34]) *Echinococcus* vegeli and *Echinococcus oligarthus* are the rarest (Al-khayat [35]). Hydatid cysts can cause serious problems for humans. The adult tape warm occurs in domestic dogs and cats, are potential carriers of the infection for man, which brings it into the veterinary sphere of interest (Urquhart [3]). Human infection follows ingestion of the eggs passed by infected dogs. This is may occur by eating raw vegetables or other food items contaminated with dog feces (Urquhart [3]). Fingers contaminated with the eggs and touching dogs may cause the eggs to be transferred directly to the mouth. On the other hand, the sylvatic cycle of Echinococcus, which occurs in wild canids and ruminants, is based on predation or carrion feeding. However, it is less important as a source of human infection but in hunting communities (Paniker [36]).

Prevalence rates are determined by epizootiological factors related to the size of the stray dog population and its worm burden and to the infection rates in the intermediate host reservoir livestock population. Socioeconomic development and sociocultural practices are considered important determinants in the continued transmission of the disease (Gessese [37]). Infection of human echinococcosis is often acquired during childhood when intimate contact with a pet dog is more likely. But the clinical disease develops only several years later when the hydatid cyst has grown big enough to cause obstructive symptoms. The disease results mainly from pressure effects caused by the enlarging cysts (Paniker [36]). The rupture of the hydatid cyst causes an allergic reaction. Slow leakage of worm antigens ensures that the patient's most cells are sensitized with specific immunoglobulin E (IgE), and the massive flood of antigens on rupture may cause acute fatal anaphylaxis, with vascular collapse and pulmonary edema (Gessese [37]). The presence of a large number of stray dogs was an important factor in the spread of CE. They were rarely vaccinated, had easy access to infected offal at slaughtering sites and had insufficient or inappropriate anthelmintic treatment (Lucas, et al. [38]).

The expansion of the synanthropic cycle, involving domestic dogs that prey on metacestode infected rodents, may lead to an increase in the prevalence of human alveolar echinococcosis. *E. multilocularis* egg contamination has been predicted to be maximal where the urban and rural habitats overlap. These facts should be reasons for health authorities to establish internationally coordinated systems of surveillance and risk assessment to improve and support measures for control and prevention (Eckert and Deplaze [27]). Cyst growth averages 7–29mm per year in human liver and lungs, but symptoms take many years to develop. The need for imaging diagnostics, such as ultrasonography and radiography, as well as complicated treatments like surgery and repeat dosing of ant parasitic drugs, present major treatment obstacles for resource-limited communities (McManus [39]). Cystic echinococcosis causes abdominal distention due to liver as shown by ultrasound imaging (Jafer [40]). The occurrence of the disease in humans in Ethiopia was described earlier by Graber. However, the situation of the disease in humans is not well documented and explored so far in the country. In the northern part of the country of the regional state of Tigray all the six hospitals pretending to this area had disclosed diagnosing one active clinical case in Mekelle hospital during the study period of 2008 (Kebede [41]).

In Ethiopia human hydatidosis infection was also reported from different part of the country such as Nekemte and Bahir Dar hospitals (Tadesse [42]). Other study at Jimma indicated that only

20.65% of interviewed members of community are aware of about hydatidosis and 18.5% of the respondents knew as the disease was zoonotic disease and the rest 81.5% of the participants do not know whether the disease is zoonotic or not Zoonotic disease control and prevention strategies necessitate integration and collaboration of both veterinary and human health professionals, in Ethiopia there is no satisfactory progress in this aspect. There is no participation of veterinarians in public health departments to create awareness and to train community in zoonotic diseases (Kebede [41]). No collaboration between veterinarians, medical professionals and other concerned bodies (Sisay [43]). According to different study conducted on Prevalence of Hydatidosis/CE in cattle, Small Ruminants and Camels in different parts of Ethiopia described (Atsede and Belay [30]) (Table 1).

Table1: Prevalence of Hydatidosis based on abattoir finding in Ethiopia.

Area	Animal species	Number examined	Prevalence	References
Bishofitu	Sheep and Goat	400 sheep and 450 goats	14.3%(sheep) 3.6%(goat)	Teshome [62]
Jijiga	Camel	400	23%	Etana, et al. [51]
Jimma	Cattle	400	54.5%	Temam [61]
Debre Berhan	Cattle	415	35.7%	Tibebu [63]
Mekelle	Cattle	310	25.16%	Tkubet [64]
Soddo	Cattle	446	11.21%	Abera & Teklaberhan [47]
Arsi Dodola	Cattle	384	50.78%	Hailu [54]
Kombolcha	Cattle	400	33.5%	Nasr & Pal [58]
Yabello	Cattle	384	33.3%	Beyene & Hiko [49]
Jimma	Cattle	384	30.70%	Atsede & Belay [30]
Nekemte	Cattle	531	17.10%	Tadesse [42]
Bako	Cattle	246	11.88%	Haftu & Kebede [53]
Adama	Cattle	400	52.5%	Mandefro [56]
Gondar	Cattle	620	21.61%	Belisty [48]
Addis Ababa	Ruminants	1027 (cattle) 825 (sheep) 170(goats)	(21.13%)cattle, (14.67%) sheep (7.05%)goats	Gemeda [52]
Harar	Cattle	384	9.4%	Belina [7]
Hawassa	Cattle	395	40.2%	Yohannes & Masresha [65]

Table 2: Estimated losses due to organ/carcass condemnation at different abattoirs in Ethiopia.

Place	Type of animals	Loss due to condemnation (birr)	Reference
Dire Dawa	Cattle	165,876	Mihret [57]
Harar	Cattle	96,315	Lema [45]
Nekota	Cattle	4.00 million	Tadesse [42]
Addis Ababa	Cattle	345,334.84	Yimer [33]
Debre Berhan	Cattle	136,555.13	Tibebu [63]
Adama	Cattle	896,378.4	Serda & Jago [60]
Jimma	Cattle	362,212.9	Temam [61]
Mizan Teferi and Teppi	Cattle	127,456.3	Jemere [55]
Jijiga	camel	12,147.75	Etana, et al. [51]

Financial Importance: Echinococcus is seen as a human health hazard and is recognized to cause serious financial losses to the cattle industry around the world. The economic losses due to bovine Hydatidosis are mainly due to condemnation and down grading of infected carcasses. Financial losses from Hydatidosis are determined by disease prevalence, grade of animals infested, potential markets, prices of cattle and treatment costs for detained carcasses (Melaku [44]). In Ethiopia studies conducted in different abattoirs indicated that cystic hydatidosis is prevalent and considerable economic loss is associated with it. Different financial losses were reported from different part of the country. The difference in the amount of financial loss in different regions or localities could be due to the variation in the prevalence of the disease, retail market price of organs and mean annual slaughter rate in different abattoirs (Lema [45]). Annual financial losses in the abattoirs due to carcass/ organ condemnation, ranges from minimum of 96,315 birr at Harar abattoir to maximum

of 4.00 million birr in Nekemte (Bizuwork [31]). This is summation of the carcass weight loss and loss due to organ condemnation. But these losses and infection prevalence do not show the real estimates because these estimates are made by meat inspection in abattoirs only and many animals slaughtered at backyard are not been included (Tadesse [42]) [46-65].

Conclusion and Recommendation

Hydatidosis is a zoonotic cosmopolitan parasitic disease found in almost all countries of the world, including Ethiopia. Human infection with hydatidosis is reported from various part of the country. This disease is imposing huge financial loss to the country through affecting production efficiency of livestock and resulting condemnation of organs and carcasses in abattoirs. Based on abattoir survey hydatidosis is reported with prevalence ranging from 9.6% to 63.7% in bovine, 14.67%, 7.05% in sheep and goat, 23% in Camel, respectively. Since zoonotic diseases are circulating among humans, domestic animals, wild animals and environment; it needs collaboration of veterinarians, public health professionals and other concerned bodies to eliminate the diseases. But there is no participation of veterinarians in public health departments to create awareness and to train community in zoonotic diseases in general and in hydatidosis in particular. In addition, awareness level of community about zoonotic impact, way of transmission, methods of control and prevention is poor. Based on the above conclusion, the following points are recommended: Effective control and prevention mechanisms in animal population should be done.

1) There must be legislation that will strictly prevent backyard slaughtering practice.

2) Veterinary facilities and extension system should be strengthened

3) Appropriate disposal of infected organs

4) Creation of community awareness about hydatidosis as zoonosis is important.

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