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Review Article

Review on Socio-Economic Significance of Hydatidosis in Humans and Animals in Ethiopia Review on Socio-Economic Significance of Hydatidosis in Humans and Animals in Ethiopia

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ABSTRACT

Hydatidosis/Cystic Echinococcosis (CE) is one of the most important neglected tropical parasitic diseases of livestock that has both financial and public health significance caused by larval (metacestode) stage of Cestodes belonging to the genus Echinococcus, family Taenidae. CE caused by the larval stage of *E. granulosus* is recognized as being one of the major zoonosis and associated with severe economic losses and great public health significance worldwide. The distribution of hydatidosis is normally associated with underdeveloped countries, especially in rural communities where humans maintain close contact with dogs and various domestic animals. Carnivores are definite hosts for the parasite with livestock acting as intermediate hosts and human as accidental intermediate or aberrant host. Globally, economic losses estimated to cause human and livestock associated annual economic losses of at least US$ 193,529,740 and US$ 141,605,195, respectively and estimated to causes 2-3 million human cases are thought to occur worldwide. Abattoir based studies conducted in various parts of Ethiopia, showed that prevalence of CE ranges from 6.51% to 54.5%, 0% to 24.8%, 11.69% to 65.47% and 7.03% to 60.2% in cattle, goats, camel and sheep respectively and 8561.61 ETB to 19,847,704.5 ETB annual economic losses in animals. In human prevalence of 1.6% and 0.5% have been reported from southern part of Ethiopia. On the human side economic losses arise through diagnostic cost, treatment cost and cost of hospitalization. In animals' economic losses are observed in decreased carcass weight, milk production and fertility rates, and from increased rate of condemnation of affected organs. Breaking the life cycle is one of the main control measures. Strengthening of veterinary facilities and extension systems, expansion of abattoir facilities to avoid backyard slaughter practices, creation of community awareness, regular deworming of dogs and appropriate disposal of infected organs are recommendations forwarded in order to help zoonosis control.

Key words: *Echinococcus granulosus*; Economic Significance; Hydatidosis; Public health

INTRODUCTION

Ethiopia is particularly vulnerable to the effect of zoonotic diseases with both public health and economic problems that arise due to zoonotic diseases, because the economy of the country is largely dependent on agriculture and a vast majority of households have direct contact with domestic animals, which creates an opportunity for infection and spreading of zoonotic diseases. Ethiopia ranks very high in the health burden of zoonotic diseases and in having a large population of low-income livestock farmers [1-3].

Ethiopia has the largest animal population in Africa, but its livestock production has lower average than most of African countries. However, the contribution from these huge livestock resources to the national income is disproportionately small, owing to several factors such as draught or mal-nutrition, management problems, poor genetic performance and prevalent livestock diseases [4,5]. Parasitic infections are major causes of death for animals, sub optimal production, reduced quality of animal products, decreased draft power output, and risk of zoonotic diseases to man because of domestic animals live in close contact with humans [6-8].

Among the major parasitic diseases, Hydatidosis or CE is one of the most important neglected tropical parasitic diseases of livestock that has both financial and public health significance [9-11]. The disease is caused by larval stage of dog tapeworms of *Echinococcus granulosus* [12-14]. Two hosts are involved in the completion of the life cycle of *E. granulosus*. The definitive hosts are carnivores which harbor mature tape worms in the intestine and excrete the parasite eggs along with their faeces, while livestock are the main

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intermediate hosts and humans act as accidental intermediate hosts. There are four recognized species of *Echinococcus*; namely, *E. granulosus, E. multilocularis, E. oligarthus* and *E. vogeli*. Among these species, *E. granulosus* and *E. multilocularis* are the most important zoonotic and pathogenic species to humans and other domesticated animals [15-17].

The disease has a worldwide distribution and is endemic in many countries of the Mediterranean basin, North and East Africa, Western and Central Asia, China, South America and Australia [18-20]. However, even if the distribution of *E. granulosus* worldwide, it is higher in developing countries, especially in rural communities where there is close contact between the dog, the definitive host, and various domestic animals, which may act as intermediate hosts [21-23].

In Ethiopia, hydatidosis is one of the major endemic diseases, especially where sheep, goats, cattle, camel, and pigs are still slaughtered traditionally, and offals are easily accessible to scavenging dogs and other wild carnivores. Accordingly, factors like absence of proper meat inspection procedures, poor management of food animals, lack of awareness about food borne diseases, and lack of adequate number of abattoirs compared to the fast growth rate of human population are all thought to contribute significantly to the high prevalence, persistence and emergency of *E. granulosus* in the area [24-25].

Hydatidosis/Cystic echinococcosis is a disease of major economic importance in both humans and animals. Globally, economic losses estimated to cause human and livestock associated annual economic losses of at least US$ 193,529,740 and US$ 141,605,195, respectively [26-28]. In Ethiopia, livestock associated annual economic losses due to CE ranges from 8,561.61 Ethiopian Birr (ETB) [29,30] to 19,847,704.5 ETB from organ condemnation [31,32].

CE is one of the most common zoonotic diseases associated with severe economic losses and great public health significance worldwide [28,33]. It represents a significant global human disease burden in poor pastoral communities. It is associated with severe morbidity and disability and is one of the world's most geographically widespread zoonotic diseases [34,35]. Globally, cystic echinococcosis is in humans are estimated to affect approximately 2 to 3 million people worldwide, with Africa amongst the primarily endemic regions [36-38]. The occasional rupture of the hydatid cyst often leads to sudden death due to anaphylaxis, haemorrhage and metastasis [39-42].

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. However, collaboration between veterinarians and public health workers is essential for the successful control through health education and appropriate legislation; and only when people understand the life cycle of the parasites [43,44].

Therefore, the objectives of this review are:

- To provide economic and public health significance of the disease with a particular emphasis to Ethiopia health and livestock sub-sector.
- To give high light on the effective control and preventive strategies against the disease in order to protect public health and economic losses.

LITERATURE REVIEW

Etiology and Taxonomy

Echinococcus granulosus is a small tapeworm of carnivorous and the etiological agent of the disease known as Hydatidosis/CE. It is a parasitic zoonotic disease which is caused by the larval stage (metacestode) belonging the Phylum: Platyhelminthes; Class: Cestoda; Order: Cyclophyllidea; Family: Taeniidae and Genus: Echinococcus [34]. There are four morphologically distinct species of Echinococcus namely, E. granulosus, E. multilocularis, E. oligarthrus, and E. vogeli. Among these E. granulosus and E. multilocularis are the most pathogenic to humans and other domestic animals [15,17].

Recently two new species of *Echinococcus* have been identified; *E. shiquicus* and *E. felids*, in small mammals from the Tibetan plateau and in African lion respectively, but their zoonotic potential is unknown. Clinically, there are three broad morphological forms of echinococcosis that are recognized cystic echinococcosis caused by *E. granulosus*, alveolar echinococcosis caused by *E. multilocularis* and polycystic echinococcosis caused by *E. vogeli* and *E. oligarthrus* [45,46].

To distinguish the diseases caused by the two most pathogenic species, the World Health Organization (WHO) proposed the designation of CE for the disease caused by *E. granulosus* and Alveolar Echinococcosis (AE) for the disease caused by *E. multilocularis*. In addition, a third form of echinococcosis caused by *E. oligarthrus* and *E. vogeli* called Polycystic Echinococcosis (PE) is also recognized [23,47]. Currently, ten (G1-G10) and lion strain (*E. felids*) genetically, biologically and morphologically distinct strains of *E. granulosus* have been identified from different parts of the world [36,48].

The different strains of *E. granulosus* have different epidemiological and socio-economical significances, and geographical ranges [23,49]. Based on the extent of the genetic, morphological and biological similarity and heterogeneity, they have G1-G3, strains of *E. granulosus* and are called *E. granulosus sensu stricto*, while G4, G5, and G6-G10 are grouped under the species names *E. equines, Echinococcus ortleppi* and *Echinococcus canadensis*, respectively [36,50,51].

Among the different strains of *E. granulosus* so far characterized, seven of them (G1, G2, G3, G5, G6, G7, and G9) were reported to have public health importance. In Africa, six strains of *E. granulosus,* the common sheep strain (G1), Tasmanian sheep strain (G2), horse strain (G4), cattle strain (G5), camel strain (G6), and lion strains *(E. felids)* were reported. From these, four of them (G1, G2, G5 and G6) were reported to infect humans in different parts of the world. Most of CE cases in humans are caused by the sheep strain (G1) and camel strain (G6) of *E. granulosus* [51-53].

Life Cycle

Echinococcos granulosus is a Cestode whose life cycle involves dogs and other canids as definitive hosts for the intestinal tapeworm, as well as domestic and wild ungulates as intermediate hosts for the tissue-invading metacestode (larval) stage. The adult *E. granulosus* is a very short about 7 mm long and has no more than six segment that resides in the small intestine of the definitive hosts, dogs or other canids. Gravid proglottids contains as many as 500 eggs they are spherical in shape, brown in color, measures (30µm-40µm) which are discharged into the faeces from the ruptured segment that eggs are passed in the feces [44,54-56].

After the eggs are ingested by a suitable intermediate host (under natural conditions: sheep, goat, swine, cattle, horses, camel), the egg hatches in the intestine and releases an oncosphere that penetrates the intestinal wall and migrates through the circulatory system into various organs [57,58]. Hydatid cysts developed in the internal organs of the intermediate host as large fluid-filled sacs, mainly in the liver and/or lungs and more rarely in other sites such as the brain, and bone marrow [54,56,59]. The definitive host becomes infected by ingesting the cyst-containing organs of the infected intermediate host. After ingestion, the protoscolices evaginated, attach to the intestinal mucosa and develop into adult stages in 32 to 80 days [60,61] (Figure 1).

Epidemiology of Hydatidosis/Cystic echinococcosis

CE has a world-wide geographic distribution and represents a major economic and public health problem in some regions [27,62]. CE is not found in Antarctica and has been eliminated through comprehensive control programs in Iceland, New Zealand, Tasmania, Falkland Islands, and Cyprus. Hydatidosis due to *E. granulosus* is commonly prevalent in sheep-raising areas of the Mediterranean, Australia, New Zealand, Eastern Africa, South America and the Middle East including Saudi Arabia [63-65].

It is considered endemic with high parasite prevalence in parts of Mediterranean region, central Asia, western China, Russian Federation and adjacent independent states, the People's Republic of China, Australia, South America (Peru, Chile, Argentina, Uruguay, southern Brazil) and Africa (northern including Algeria, Egypt, Libya, Morocco, and Tunisia and eastern regions including parts of Sudan, Ethiopia, Kenya, and Uganda) [18,34]. In Africa, the disease is reported more commonly in cattle and sheep raised in a free range associated intimately with dogs [66,-68].

Cystic echinococcosis typically occurs in poor pastoral regions in which sheep or other livestock are raised and in which dogs are kept, for herding or property guarding, in close proximity to households. Dogs in such regions are frequently fed offal, and, for religious and other reasons, their populations might not be curtailed [69,70]. Maintenance and spread of the disease in endemic areas are known to be influenced by the diversity of livestock production systems, poor and unsupervised slaughter-houses, illegal and family slaughtering, low public awareness of the disease, and a large stray dog population [18,71].

The G1 genotype of *E. granulosus sensu stricto* is responsible for the vast majority (88%) of human cases worldwide [72]. It has a cosmopolitan distribution and is associated with transmission from sheep as an intermediate host [18]. Camel genotype *E. canadensis* (G6) of *E. granulosus* is the most prevalent strain endemic in camels, goats, and cattle as well as humans, while cattle strain (G5) is confined to cattle in the Sudan. *E. canadensis* G6 and G7 are responsible for 7.3% and 3.7% of infections worldwide, respectively [65,73]. The human incidence can exceed 50 per 100,000 person-years in areas of endemicity and prevalence rates as high as 5% to 10% can be found in parts of Peru, Argentina, east Africa, and China [34,69].

Sources of Infection and Mode of Transmission

Humans acquire primary CE infections by oral uptake of *E. granulosus* eggs excreted by infected dogs or other carnivores. The infection may be acquired by handling infected definitive hosts, egg-containing feces or egg-contaminated plants or soil followed by direct hand-to-mouth transfer. Foodstuffs, drinking water or surfaces may possibly be secondarily contaminated with *Echinococcus* eggs via wind, birds, beetles, and flies are a potential source of infection for humans and livestock [44,54,56,74]. Transmission of CE to intermediate hosts takes by ingesting the microscopic eggs while grazing pastures that are contaminated with dog faeces. The definitive hosts are infected by the means of eating infected cyst-containing organs condemned at the abattoirs [18,54,75].

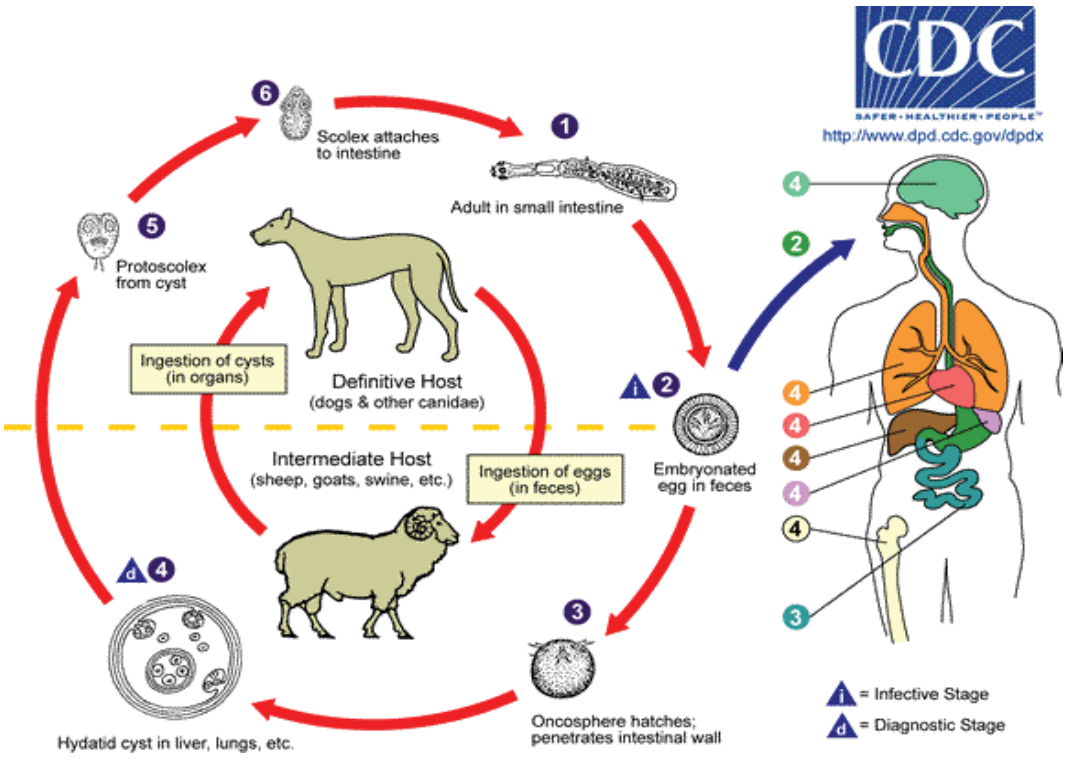

Figure 1: Life Cycle of E. granulosus.

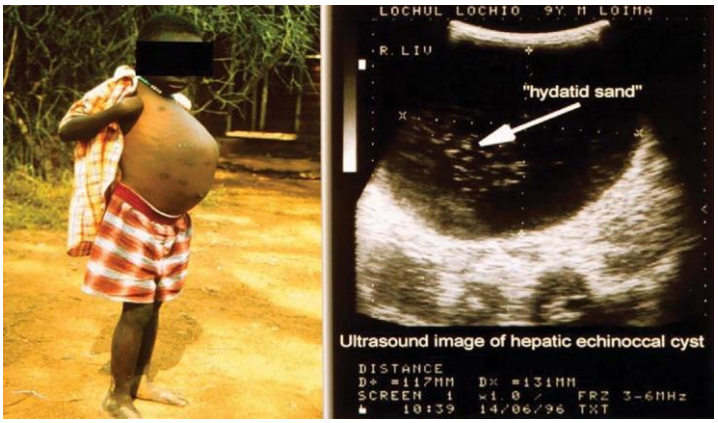

Figure 2: Boy with abdominal distention due to cystic echinococcosis of the liver as shown by Ultrasound imaging.

PREVALENCE OF HYDATIDOSIS/CYSTIC ECHINOCOCCOSIS IN ETHIOPIA

In Animals

In Ethiopia, abattoir-based reports from different regions of the country indicated that hydatidosis is highly prevalent disease incurring economic loss and affecting public health. The studies conducted in various parts of the country showed that prevalence of hydatidosis in cattle ranges from 6.51% in Debra Berhan [76] to 54.5% in Jimma [77].

In Ethiopia, the status of CE in sheep and goats has been reported by many researchers in different parts of the country showed that prevalence of CE in sheep ranges from 8.02% in Addis Ababa [78] to 60.2% in Adama [79]. In addition, prevalence of CE in goats ranges 0% in Gindhir to 24.8% in Jimma [80]. Prevalence of Hydatidosis/CE in small ruminants in different parts of Ethiopia was by many researchers. I compiled and summarized in the following table (Table 1,2).

In Ethiopia, the status of camel Hydatidosis has been reported from different parts of the country showed that prevalence ranges from 11.69% to 65.47% in Addis Ababa (Table 3).

Prevalence of Hydatidosis/Cystic Echinococcosis in Human

The detailed status of Hydatidosis/CE in humans are not thoroughly studied in Ethiopia and information is so far scanty; but, a retrospective study performed in Bahir Dar showed that the prevalence of 0.067% and mean annual incidence rate of CE to be 2.3 cases per 100,000 patients admitted for ultrasound examination [81,82]. However, only little hospital based retrospective study analysis are available (Table 4).

Pathogenesis and Clinical Features

The pathogenesis of hydatid cyst depends on the severity of infection and the organ in which it is situated. During natural course of infection, some cysts may growth to certain size and continue to remain so without producing any pathological change for many years [71,83]. Other cyst may rupture spontaneously or collapse and disappear completely [84,85]. Pressure effect by cyst may develop insensitive areas. Hydatid may cause blocking effects and mechanical compressions to leading to collapse of infective bones; blinding and rupture of cyst induce sudden anaphylactic shock [86,87].

The adult tapeworm is not pathogenic or comparatively harmless to the dog, although in large numbers, enteritis may be seen. In domestic animals the hydatid in the liver or lungs is usually tolerated without any clinical signs, but the majority of hydatid cysts cause little apparent disease as they are in the liver or lung, their presence only becoming disclosed at abattoirs [14,88]. However, in symptomatic cases, the clinical manifestation of the disease is highly variable depends on the organ involved, size of the cyst and their sites with the involved organ, interaction between the expanding cysts and adjacent organ, and complication caused by rupture of cyst [71,89,90].

In humans, clinical signs may occur after a highly variable incubation period of several month or year. The liver cysts may remain asymptomatic for periods of 10-12 years. But they cause pain in the upper abdominal region, cholestasis, hepatomegaly, biliary cirrhosis, portal hypertension, ascites, and a variety of other manifestations. However, most of the people with echinococcosis infections are asymptomatic, especially at early stage. If the cysts eventually grow, it starts causing varieties of symptoms, such as abdominal pain and mass, cholestasis, obstructive jaundice, dilation of the biliary duct and fistula formation in cases of hepatic CE. Generally, fever, thoracic pain, dyspnea, chronic cough, and bloody sputum are some of the most common symptoms in patients with pulmonary CE.

Diagnosis of Hydatidosis/Cystic Echinococcosis

In the intermediate host, the most reliable diagnostic method is cyst detection during meat inspection at post mortem examination. Hence, the presence of hydatid cysts in internal organs is a very important diagnostic tool which confirms the disease [44,86]. In definitive hosts Arecoline purgation and necropsy of the small intestine are major diagnostic methods [44,71]. However, imaging techniques, such as Computer Tomography (CT) scans, Ultrasonography (US), and Magnetic Resonance Imaging (MRI) are used to detect cysts and after a cyst has been detected, serologic tests may be used to confirm the diagnosis in humans [54,56,87,90,].

Treatment of Hydatidosis/Cystic Echinococcosis

Echinococcus tapeworms are more difficult to remove than other Taenia, but several drugs, notably praziquantel, are now available which are highly effective. After treatment it is advisable to confine dogs for 48 hours to facilitate the collection and disposal of infected faeces. In man, hydatid cysts may be excised surgically, although Mebendazole, Albendazole, and Praziquantel therapies have been reported to be effective [71,88].

Treatment of CE in humans depends on the site and size of hydatid cyst(s) in the body. In human beings, surgery remains the only reliable means of treatment of hydatid cyst, and chemotherapy especially albendazole is proposed only in a case

Table 1: Prevalence of Hydatidosis in Cattle slaughtered in different parts of abattoirs in Ethiopia.

Place	Prevalence	Reference
Bushoftu	42.86%	(62)
Adama	48.7%	(4
Adama	54%	(25)
Jimma	54.5%	(77)
Nekemte	17.1%	(29)
DebreTabour	24.1%	(16)
DebreBerhan	35.7%	(63)
Mekele	25.26%	(43)
Mekele	22.2%	(41)
WolaytaSodo	11.21%	(21)
ArsiDodola	50.78%	(82)
Asella	44.27%	(47)
DebreBerhan	6.51%	(76)
AddisAbaba	20.16%	(13)
AddisAbaba	19.7%	(95)
DireDawa	20.05%	(55)
DebreTabour	27.64%	(57)
Harar	9.4%	(37)
Arbaminch	20.50%	(10)
Adigrat	18.61%	(7)
Shire	32%	(19)
BahirDar	18.75%	(50)
Wollo	17.4%	(8)
Kombolcha	33.5%	(74)
Gonder	28.6%	(49)

Table 2: Prevalence of Hydatidosis/CE in Small Ruminants in different parts of Ethiopia.

Pace	Sheep	Goats	References
Jimma	29.5%	24.8%	(80)
AddisAbaba	8.52%	8.91%	(40)
AddisAbaba	13.47%	-	(95)
AddisAbaba	8.02%	6.8%	(78)
Bushoftu	14.3%	3.6%	(67)
Bushoftu	17.2%	6.9%	(52)
BahirDar	15%	-	(70)
Dessie	13.61%	-	(53)
Dessie	9.02%	1.90%	(2)
Adama	60.2%	-	(79)
Asella	10.8%	0%	(64)
Mojo	7.7%	6.13%	(35)
Mekele	11.6%	-	(83)
Gindhir	10.8%	0%	(98)

Table 3: Prevalence of Hydatidosis/CE in Camel.

Place	Prevalence	References
Dire Dawa	28.6%	(1)
Borena, Kareyu, And Harar	22.6%	(58)
Jigjiga	23%	(39)
Akaki	65.47%	(22)
Akaki	61.6%	(31)
Yabello	25.7%	(24)
Ayssaita, Afar	34.2%	(68)
Dire Dawa	29%	(61)

Table 4: Retrospective analysis of Hydatidosis/CE in different hospitals in Ethiopia.

Places	Year	No of admitted cases	No of +ve Cases (%)	References
Addis Ababa	2008-2012	25,840	27 (0.1)	(78)
Adama Hospital	2008-2012	23,601	33 (0.14)	(32)
Asella Hospital	2008-2012	12,096	34 (0.28)	(32)
ARH, HC and UC	2011-2013	121,785	44 (0.03)	(79)
FHH, GH and KMC	2007-2010	68,179	30 (0.044)	(70)
FHH, GH and KMC	2002-2006	36,402	24(0.067)	(81)

Note: ARH -Adama Referral Hospital, HC - Hebert Clinic, UC - Universal Clinic
FHH - Felegehiwot hospital, GH - Gambi Clinic, KMC - Kidanemeheret Clinic

Table 5: Annual Economic loss due to Cystic Echinococcosis.

Place	AnnualEconomicLossesinETB	References
Adama	39,868	(4)
Adama	896,378.4	(25)
AddisAbaba	345,334.84	.(13)
AddisAbaba	19,847,704.50	(32)
ArsiDodola	3,318,512.60	(82)
BahirDar	1,112,796.85	(50)
Bishoftu	941,635.82	(67)
Bushoftu	1,287,179.99	(52)
DebreBerhan	3,140,767.99	(63)
DebreTabour	920,378.00	(16)
Gonder	751,725.00	(49)
Harar	841,419.3	(37)
Jimma	3,362,212.9	(77)
Kombolcha	1,848,849.765	(74)
Mekele	1,480,451.5	(43)
Nekemte	8561.61	(30)
Nekemte	3,996,000.00	(29)

where surgery cannot be recommended. A combination of surgery with benzimidazole mebendazole prevents the development of protoscoleces into hydatid cyst and makes the cyst dry. Membrane collapse if the drug has given to the patient before surgery [71,91].

Prevention and Control Hydatidosis/Cystic Echinococcosis

Since prevention is better than cure, it is therefore better to stop the occurrence of disease before it could inflict considerable damages that require more costs and energy to eradicate it [71]. The control of hydatidosis involves the elimination of hydatid tapeworms from dogs by carrying out recommended control measures. The infection of dogs with a tapeworm, and the dissemination of the disease to the other animals including human subjects can be prevented [54]. Vaccination of sheep with an *E. Granulosus* Recombinant Antigen (EG95) offers encouraging prospects for prevention and control. The elimination of farm slaughter of sheep reduces the risk that dogs will be infected from this source [34,71].

Several options for the control of *E. granulosus* have been thoroughly evaluated and are described in detail elsewhere. One option (type I) emphasizes long-term measures of public health education with primary health care and veterinary public health activities, such as the improvement of slaughter hygiene and meat inspection, dog registration and sanitation measures [71]. Another option (type II) is based on legislation and includes specific measures targeted to interruption of parasite transmission. Prior to the attack phase of the program, base-line data are collected to serve as references for measuring control progress [92].

Specific control measures include stray-dog control, registration of all owned dogs, spaying of bitches, and treatment of all (or most) dogs with praziquantel at predetermined intervals, for example every 6 or 8 weeks. These measures are complemented by upgrading of meat inspection, slaughter hygiene, slaughter offal disposal, public health education, and other measures. Control programs in various countries have shown that the attack phase can be successfully concluded in less than 15 years if the necessary measures can be performed without major constraints and financial restrictions [34,71].

SOCIO-ECONOMIC IMPACTS OF HYDATIDOSIS/CYSTIC ECHINOCOCCOSIS

Public Health Importance

Cystic echinococcosis in humans is an infection, which is caused by larval stage, the metacestode of *Echinococcus species* and may result in asymptomatic infection to severe disease, which may be fatal. It is a major public health problem in some countries, and it may be emerging or reemerging in some areas. Approximately 2-3 million human cases are thought to occur worldwide. CE is the most common form of the disease in people and domesticated animals, is caused by *E.granulosus sensu lato* [36,71,93].

Echinococcus granulosus following primary infection may inhibit many anatomic sites. Hydatid cyst is mainly located in the liver (70%) or lungs (20%), but occasionally they may find their way to other organs (kidney 2%, spleen 2% and brain less than 2%) [94]. Hydatid cyst causes Sever disease and death in humans and results in economic loss for treatment costs, lost wages and livestock annual production loss [71,95].

Mechanical dysfunction of organs due to the cysts and anaphylaxis, as a consequence of the cyst burst and releasing fluid, is a serious manifestation in human. Hydatidosis is characterized by the presence of cysts containing numerous tiny protoscoleces that most often develop in the visceral organs, CNS and skeletal system as well as thyroid glands, subcutaneous tissues, body cavity and musculature [66,96]. The incubation period for all species of *Echinococcus* varies from months to years or even decades. It largely depends on the site and speed of the cyst development in the body [97]. Hydatid cysts are often fertile in humans, and numerous observations indicate that the high number of cases may be due to increased infectivity or pathogenicity of *E. granulosus sansu lato*. Asymptomatic infection often predominates unless other mechanical complications including rupture, compression of vital structures and haemorrhage occur. This could be due to evasion of host immunity by the parasite [36,38,54,71].

Although, Cystic Echinococcosis is a potentially life-threatening disease, the cysts are usually well tolerated unless they damage adjacent tissues or rupture. Many cysts are asymptomatic throughout the individual life and may be incidental findings at surgery or autopsy. This form of echinococcosis is usually treatable; however, some infections can be fatal if the cyst ruptures and causes anaphylactic shock, or if it damages vital organs. The prognosis for symptomatic cysts located in the brain, kidney, heart or other vital organs is grave [36,71].

The presence of hydatid cyst in liver, lung and other organ can lead to varied clinical manifestations such as: In the liver: Tumor, hepatomegaly, cholestasis, jaundice, secondary biliary cirrhosis, biliary colic like symptoms, liver abscess, calcified lesions in the liver, portal hypertension and thrombosis [87,98]. In the lung: Lung tumor, chest pain, chronic cough, dyspnea, hemoptysis, pneumothorax, pleuritis and lung abscess. In the heart: Pain, tumor, cardiac insufficiency and embolism. In the bone and muscles: Pain, bone outgrowth, bone fragility, muscle cyst. In the brain and spine: tumor with neurological symptoms and back pain. In the eyes: Pain, ptosis and visual disturbances. Cyst rupture in the liver to the biliary tree leads to biliary colic, cholesteotic jaundice, cholangitis, fever, pancreatitis and anaphylaxis [87]. Cyst rupture in the bronchial tree leads asthma like symptoms, coughing, dyspnea and hemoptysis, fever [36,44,54,60] (Figure 2).

Economic Significance

Hydatidosis is a disease of major economic importance in both humans and animals. The direct economic losses due to hydatid cyst infection in livestock are due to condemnation of carcass and visceral organs including the liver lungs, spleen, heart and kidneys [93]. In food-producing animals the major indirect economic impacts of cystic echinococcosis are: lost productivity, such as reduction in carcass weight, milk production, delayed performance and growth [26,27].

In humans, the economic loss is associated with the direct monetary loss due to diagnosis, hospitalization, and surgical interference or percutaneous treatments. Therapies, post-treatment care and travel for both patient and family members and other indirect costs, which may be mortality and suffering [93]. In addition to economic and social consequences of disability associated with undiagnosed and, therefore, untreated cases, there is also loss of working days or production and abandonment of farming or agricultural activities by affected or at-risk persons need to be considered. Furthermore, in most reports, between 1% and 2% of CE cases are fatal [26,71,93].

The annual financial loss (direct and indirect) due to Hydatidosis in Cattle and small ruminants slaughtered in different parts of Ethiopia was reported by different researchers was documented. Abattoir based studies reported the annual economic losses due to CE in animals ranges from 8561.61 ETB in Nekemte [30] 19,847,704.50 ETB in Addis Ababa [32] (Table 5).

CONCLUSION AND RECOMMENDATION

Hydatidosis is one of the most important diseases of public health importance and economic significance in Ethiopia. Livestock infection with hydatidosis is reported from various part of the country. Based on abattoirs surveys hydatidosis is reported with prevalence ranging from 6.5% to 54.5% in bovine, 0% to 29.5% in goats and 7.03% to 60.2% in sheep. As a result, the disease is imposing huge economic loss to the country through affecting production efficiency of livestock and resulting condemnation of organs and carcasses in abattoirs. Abattoirs based studies showed that, the annual economic losses due to hydatidosis from organ condemnation and reducing livestock production is ranging from 8561.61 to 19,847,704.5 ETB. Moreover, since zoonotic diseases are circulating among humans, domestic animals, wild animals and environment; as a result it needs integration of concerned bodies to eliminate the diseases. However, awareness level of community about zoonotic impact, way of transmission, methods of control and prevention is poor.

Therefore, based on above conclusion the following recommendations are forwarded:

- Public education on modern animal husbandry, disease prevention and risk of zoonotic diseases should be reported continuously
- An integration between veterinarian and public health personnel and policy makers through one-health approach is very crucial in order to control and prevent the disease
- Expansion of abattoir facilities, appropriate meat inspection and disposal of infected organs should be strengthened
- Regular deworming of dogs and disease control strategies should be supported by legislations
- Adequate veterinary service should be established in the pastoral and agro-pastoral community.

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