# PREVALENCE, PUBLIC AND ECONOMIC SIGNIFICANCE OF HYDATIDOSIS IN THE CATTLE SLAUGHTERED AT MENDI SLAUGTER SLAB WEST WALLEGA, OROMIA, ETHIOPIA.

Tilahun benti, Asmamaw Aki, Tuge temesge

Assosa, Animal Health Diagnostic and Research Laboratory, P.O.BOX 326, cellphone +251902330029, Email address: asmamawaki@gmail.com

**ABSTRACT:** Back ground: Haydatidosis, is one of the zoonotic diseases associated with great public health and economic significance in the worldwide. Objectives: A cross-sectional study was conducted from October 2024 to october 2025 with the aim of determining the prevalence, organ distribution, fertility rate, cyst burden and assessing financial losses and public awareness of hydatidosis in cattle slaughtered at Mendi slaughter slab. Methods: Routine ante-mortem and post-mortem examination were conducted for the presence of hydatid cyst. Post-mortem examination was conducted thorough visual inspection, palpation and systemic incision of each visceral organ particularly the lungs, kidneys, liver and heart. In this study the overall prevalence of hydatid cystic in the cattle slaughtered at mendi slaughter slab was 17.70% (68/384). There was no significant statistical association in all potential risk factors except between animal age categories and body condition score. In this study, cyst count shows 68 total cysts were counted in total infected cattles, which shows great environmental contamination if the offal are not disposed with great caution. Organ distribution shows, Hydatid cysts had a tendency to be located more in the lungs than liver and kidneys. In the present study hydatid cyst characterization showed that 11/36 (30.55%), 25/36(69.44%),23/32(71.87%) and 9/32 (28.12%) were viable, non-viable, sterile and calcified respectively. In this study; an overall annual financial losses due to organ condemnation and carcass weight loss from total infected cattle was estimated to be: 1,952,756.4ETB. Conclusion and recommendations: Large dog population, widespread stray dogs, free access of dogs to offal, inappropriate disposal of offal and inadequate animal health services especially worm control are major predisposing factors which contribute to persisting of the diseases. Majority of the community in this study were at risk to contract the disease due to lack of knowledge on transmission, zoonosis, treatment and control of hydatidosis. These results suggest that the occurrence of the hydatid cyst infection in this area is a great concern for both medical and veterinary authorities. Thus, the development of effective disease management and awareness creation are required to overcome these problems.

[Tilahun benti, Asmamaw Aki, Tuge temesge. **PREVALENCE, PUBLIC AND ECONOMIC SIGNIFICANCE OF HYDATIDOSIS IN THE CATTLE SLAUGHTERED AT MENDI SLAUGTER SLAB WEST WALLEGA, OROMIA, ETHIOPIA.** *N Y Sci J* 2026;19(2):1-16]. ISSN 1554-0200 (print); ISSN 2375-723X (online). http://www.sciencepub.net/newyork. 01. doi:10.7537/marsnys190226.01

**Keywords:** cattle; financial losses; Prevalence; hydatid cyst; Mendi; Public awareness

## INTRODUCTION

### 1.1. Back ground

Ethiopia have an estimated livestock population of approximately 49.3 million cattle, 25.02 million sheep, 27.88 million goats, 8.41 million equines, 1.06 million camels, 20,000 pigs, and 58 million chickens, which stands first in Africa and tenth in the world (CSA,2017). In the country, cattle are important source of income for rural communities and are one of the nation's major sources of foreign currency from export. However, this great potential is not properly exploited. This is because of endemic disease burdens, traditional management system, inferior genetic makeup coupled with malnutrition and absence of well-developed market infrastructure. Among the many prevalent livestock diseases, parasitic disease represent a major constraint to livestock development in the tropics in general and hydatidosis is among the major parasitic diseases contributing to low productivity of meat production due to carcass or organ condemnation, in particular (Parija, 2014).

Hydatidosis, mainly caused by the metacestode of Echinococcus granulosus, is one of the most common zoonotic diseases associated with huge economic losses and great public health significance worldwide (Romig *et al.* 2011). The adult tapeworm in the definitive dog host is harmless unlike the hydatid cyst in the intermediate host animals that is responsible for immense economic and medical importance in infected hosts (Azlaf and Dakkak 2006; Fakhar and Sadjjadi 2007; Battelli 2009; Ibrahim 2010).

The disease induced by the zoonotic tapeworm Echinococcus granulosus is known as hydatid disease (Pal, 2007). Hydatidosis is one of the most common parasitic infections that contribute to decreased meat production output owing to carcass or organ condemnation (Abebe and Jobre, 2011). It is considered one of the world's leading zoonoses, affecting both people and domestic animals (Cringoli *et al.*, 2007; Pal *et al.*, 2020). Dogs and other canids are definitive hosts for the parasite, while livestock are intermediate hosts. Man is an aberrant intermediate host. The outcome of infection in livestock and man is hydatid cyst development in lung, liver or other organs. The importance of hydatidosis can be evaluated from both the public health and economic losses point of view. The economic significance of hydatidosis in livestock leads to considerable economic losses due to condemnation of edible offal, primarily liver, lung and other organs or even whole carcasses. In severe infection, the parasite may cause retarded performance and growth, reduced quality and yield of meat, milk or wool (Eckert *et al.*, 2001). The life cycle of Echinoccoccus involves two mammalian hosts. The definitive host of parasite, E.granulosus, is dog which harbor adult tapeworms in the small intestine excrete the parasite eggs along with their feces while livestock and human are the main intermediate hosts (WHO, 2012).

After ingestion of egg by an intermediate hosts the oncosphere penetrates the wall of the small intestine. A secretion from oncosphereaids is penetrated in to the intestine. Up on gaining access to a venue, the oncosphere is passively transported to the liver, where some retained, others reach the lung, and few may be transported further to the kidney, spleen, muscle, brain and other visceral organs. Once the oncosphere has reached its final location, it develops in to the hydatid cyst (Oku, *et al.*, 2004).

Protoscolecies containing Hydatid cysts is ingested by a suitable definitive host, due to the action of pepsin in the stomach, they evaginated in the upper duodenum in response to a change in PH, exposure to bile and to increased temperature. Then they develop into sexually mature adult tapeworm, approximately four to six weeks after infection, depending on the species and strain, and on the susceptibility of the host (Eckert *et al* 2001).

The prevalence and public health impact of cystic Echinococcosis is higher in rural communities of developing countries where there is close contact between dogs, intermediate host species and man (Ibrahim, 2010; Romig *et al.*, 2011). In Ethiopia cystic echinococcosis is an endemic disease and has enormous medical and veterinary importance due to suitable factors such as predominant home slaughtering of cattle, sheep, goats and camels with improper disposal of affected organs. Moreover, uncooked carcass wastes and offal's are traditionally fed to dogs and cats in the country. As a result cystic echinococcosis is implicated as one of the major causes of organ condemnation and carcass weight loss in slaughtered animals in Ethiopia. Cystic echinococcosis in cattle has been reported from some parts of the country (Abebe *etal*, 2013;)

In Ethiopia, the absence of proper meat inspection procedures and the presence of a large stray dog population are thought to contribute significantly to the prevalence of the disease (Kebede *et al.*, 2009). The problem associated with tapeworm is more serious in Ethiopia because of the common habits of consuming uncooked meat (Kebede, 2010). In Ethiopia, some studies have been conducted on hydatidosis, and the prevalence rates changed between 13.7 and 72.44% in cattle and 9.9 and 35% in sheep in the Assela, Adama, Gondar, Bahir Dar and Dire Dawa abattoirs(Jobre *et al.*, 2011; Kebede *et al.*, 2009).

### 1.2. Statement of the Problem

Independence in food production, increase in rural income and foreign currency earning of the country through improving the quality and quantity of market oriented livestock and their items are the main objectives of the agricultural development polices of Ethiopia. However, hydatidosis still causes great health and economic problems in market oriented livestock due to in fact that slaughtering of livestock is predominant and uncooked offal and carcass wastes are normally given for dogs in the country. Despite of these, there is limited information on the current status of hydatidosis of cattle, their implications on financial concerns and public awareness in Mendi town. Study of these parasites together with associated risk factors and determination of the economic significance are very important in planning and implementation of control strategies, and to understand the risk of spreading of the disease both to domestic animals and humans. In view of addressing the problem, this research was to invstigate of occurrence of hydatid cyst in cattles slaughtered at Mendi abattoirs and to bridge the information on current public knowledge and economic significance; so as to generate base line data that may assist for control of the disease.

### 1.3. General Objectives

To investigate the prevalence, fertility and viability cyst, and economic significance of cattle hydatidosis at Mendi slaughter slab and assessing public health awareness in Mendi town

### 1.4. Specific objectives

- To determine the prevalence of hydatid cyst in cattle slaughtered at Mendi slaughter slab.
- To estimate the monetary losses from organ/carcass condemned and carcass weight loss due to the metacestode
- To assess the public health awareness of hydatidosis in Mendi town
- To dermine organ distribution of and fertility and viability of the cysts.

## 1. MATERIAL AND METHODS

### 2.1 Study Area

The study was conducted from October 2024 to September 2025 at Mendi town, which is found in West Wollega zone of Oromia Regional State, approximately 596 km away from Addis Ababa to west direction located between latitude 90 48'N and longitude 35 06'E at an elevation of 1821 meter above sea level. It is characterized by tropical climate of heavy rain fall, warm sometimes hot temperature and long wet period. Mendi town is the administrative center of Manasibu woreda, which is bordered on the south by Jarso, on the south west by Begi, on the North by the Benishangul Gumuz Region and on the South west by Nedjo (Mekonnen and Wale, 2017).

The climate varies from wet and humid during heavy rains between May and September to hot and semiarid condition between November and April. Rain fall received during summer, which lasts from late May to early September, constitutes about 70% of the total Annual rain fall reaching the area. Generally average annual rain fall in the zone ranges between 1200-2000mms. Maximum temperature in Mendi town is on the average $23.9^0$c. On the other hand minimum temperature is between $11^0$c and160c during the months of October to December. Mendi town has an area of 5826 square kilometers with a population density of 78.5 per square kilometer.

Based on the census report by the central statistics authority for 2007 indicated that the population of Mendi town is about 70,000(30,000 are male and 40,000 female). The farming system of the area was mixed farming where 85 % of the total population engaged in agriculture. Crop and livestock sales are important source of income for all wealth groups. The livestock population that are found in menesibu woreda includes cattle (88,784 million); sheep (34,446 million), (30.2 million) goats.

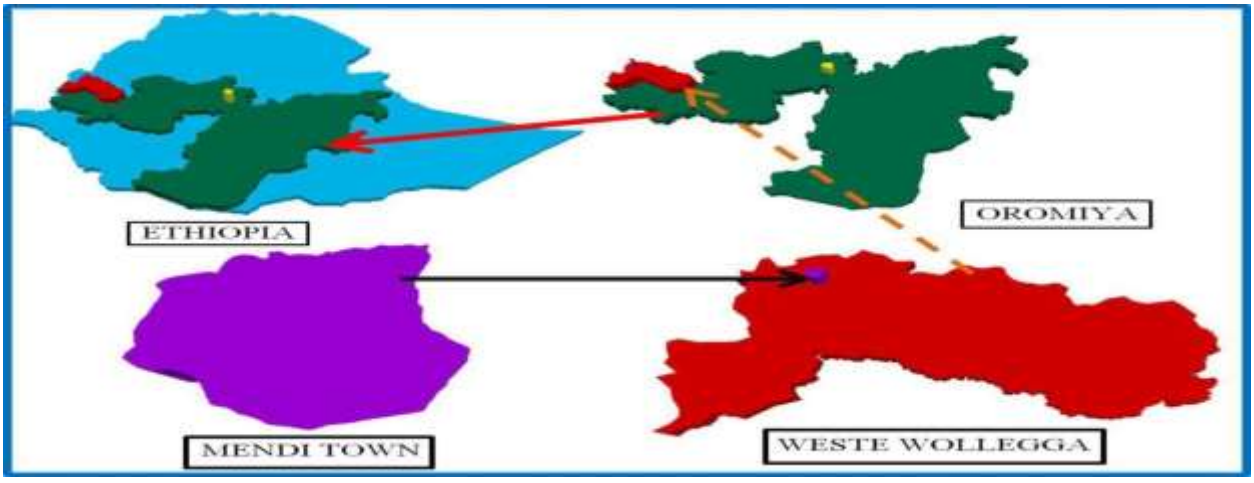


**Figure 1. Map of the study area**

### 2.2 Study animals

The study animals were local and cross breed cattle originated from neighbouring localities presented to Mendi slaughter slab for slaughtering.

### 2.3 Study Design

A cross-sectional study was conducted according to the standard procedures recommended for ante-mortem and post-mortem inspection by food and agriculture organization (FAO) from October 2024 to October 2025, to determine the prevalence of hydatid cyst at Mendi slaughter slab. Questionnaire survey**:** aiming to assess public awareness about hydatidosis and the risk factors for its occurrence was carried out at mendi town during the study period. The questionnaires querying the extent of awareness on the disease, control measures taken and other related factors of the respective individuals, such as householders, abattoir workers. The detail format is found on Annex.

### 2.4 Sample Size Determination and Sampling Techniques

The number of animals required for the study were determined using the formula given by Thrusfield (2007), by using 95% level of confidence, 50% expected prevalence and 0.05 desired absolute precision.

$$n = \frac{1.96^2 \, Pexp \, (1-Pexp)}{d^2}$$

**Where**: n = required sample size, P exp= expected prevalence and d = desired absolute precision.
Accordingly, the required sample size for this study was 384 cattle examined to determine the presence of hydaid cyst by postmortem examination of different visceral organs. These study animals were selected by simple random sampling technique. For a questionnaire survey sample size was calculated based on the formula recommended by Arsham (2002).

$$N = 0.25/SE^2$$

Where N=sample size, SE=standard error assuming the standard error of 5% at a precision level of 0.05 and the confidence interval of 95%. Accordingly, 100 volunteer individuals were selected and interviewed considering different age, sex, education level and working conditions.

### 2.5 Ante mortem and postmortem Examination

#### 2.5.1 Ante mortem examination

During ante-mortem examination each individual animals were given an identification number and grouped in to different categories of animal origin, age and body condition score according to (Lahunta and Habel 1986). Immediately before slaughter, a complete ante-mortem examination of cattle was conducted to examine for obvious signs of illness at rest and/or in gesture.

#### 2.5.2 Postmortem inspection

A post-mortem examination was carried out through visual inspection, palpation and incision of visceral organs (lung, liver, heart, and kidney) and the presence of hydatid cysts and their organ distribution were recorded. Each organ Hydatid cysts were carefully removed and separately collected (in organ basis) in clean containers for further cyst characterization. Hydatid cyst characterization was made to assess the status of the cysts (Herenda *et al.,* 1994).

#### 2.5.3 Cyst Characterization

##### *2.5.3.1 Fertility and Viability test*

The individual cysts from each of the infected organs of cattle were grossly examined for degeneration, and then cysts selected, carefully incised and examined for protoscoleces. The content of the fluid was aspirated using 18 gauge needle and 20ml syringe into sterile cylinder container to reduce pressure and risk of entering the eye. After being punctured, the pressure was reduced and the cysts were incised using scalpel blade and the whole content was transferred into beaker. Then about 10 ml was poured to the test tube and centrifuged at 500 resolutions per minutes for 5 minutes to separate the contents clearly from the liquid part. The supernatant was discarded and the sediment left in the test tube was examined under a microscope (40X) for the presence of protoscolices in the cyst. The cysts which contain protoscolices were classified as fertile cysts (Daryani *et al*., 2007). Fertile cysts were further subjected to viability test. A drop of cyst fluid was placed on the microscope glass slide and covers with cover slip and was observed for amoeboid like peristaltic movement with (40X) objective. For clear vision, a drop of 0.1% aqueous

eosin solution was added to cyst fluid on microscope slide with the principle that viable protoscolices completely or partially exclude the dye while the dead ones take it up (Dalimi *et al*., 2002).

### 2.6 Data analysis

Microsoft excel 2010 data base system was used for entry, coding and simple calculation of collected data. All statistical data analyses were done by using statistical software for social science (SPSS) version 20.The statistical association between hydatid cyst infection and risk factors were analysed by multiple logistic regression model. A statistically significant difference between variables exists when value $p < 0.05$ at 95% confidence level (CI). Burden of the cyst was calculated by using Microsoft excel .

## RESULTS

### 3.1 Prevalence and Associated Risk Factors

A total 384 slaughtered local and cross breed cattle were examined during the study period by using routine meat inspection procedures at Mendi slaughter slab. The overall prevalence of hydatid cyst was 17.70% (68/384).

### 3.2 Association of Major Risk Factors with Occurrence of Hydatid Cyst

The present study revealed that the number of slaughtered local and cross breed of cattle were 330 and 53 respectively, with higher prevalence recorded in local breed 62/330(18.78% ) than in the cross breed 6/53(11.32%). Based on the age of slaughtered animals Higher hydatid cyst occurrence (27.3%) was recorded in animals greater than 9 years old followed by (16.81%) in 5- 9 years old, and (12.79%) in 3-5 years old, the difference was statistically significant (P = 0.001*). Highest prevalence of hydatid cyst was recorded in cattle with poor body condition score (47.62%) followed by medium (26.47%) and good body condition scores (9.69%), which was statistically significant (P = 0.000). Based on the origin of an animal, higher hydatid cyst (22.3%) occurrence was recorded in in Homichala, followed by (20%) in Wajete, (14.58%) in mendi town and (11.11%) in Bijit as indicated in the following (Table 2) but the difference of the recorded prevalence among different origin of an animal was statistically not significant (P>0.05).

Table 1 Prevalence of cattle hydatidosis on the basis of associated risk factors

| Risk factors | Categories | No. Examined | No. Positive | Prev.% | $x^2$ | P- value |
|---|---|---|---|---|---|---|
| Breed | Local | 330 | 62 | 18.78 | 1.74 | 0.2 |
| | Cross | 53 | 6 | 11.32 | | |
| Sex | Female | 39 | 4 | 10.25 | 1.65 | 0.19 |
| | Male | 345 | 64 | 18.55 | | |
| Age | 3-5 years | 86 | 11 | 12.79 | 11.24 | 0.001* |
| | 5-9 years | 232 | 39 | 16.81 | | |
| | >9years | 66 | 18 | 27.27 | | |
| BCS | Good | 227 | 22 | 9.69 | 22.54 | 0.000* |
| | Medium | 136 | 36 | 26.47 | | |
| | Poor | 21 | 10 | 47.62 | | |
| Origin | *Mendi twon* | 96 | 13 | 13.54 | 4.89 | 0.2 |
| | Wajete | 95 | 19 | 20 | | |
| | Homi chala | 121 | 27 | 22.31 | | |
| | Bijit | 72 | 8 | 11.11 | | |

According to multivariable logistic regression analysis, statistically significant difference was observed between animals with different age groups 5-9 years old (P=0.000*,OR=0.146 and > 9years old (P =0.000 ,OR= 0.375)(Table 2). Animals from local breed were more likely to be exposed to *hydatid cyst* than cross breed. Male slaughtered cattle were more exposed to hydatid cyst infection than female (p = 0.19, OR = 0.228). Animals with

body poor condition score were more exposed than animas with medium body condition score (p=0.000, OR = 0.909). Based on the origin of an animals from Homichala, Wajete and Mendi town were more exposed to hydatid cyst (p=02, OR=1.59, 025 and0.157) respectively. Statistical analysis showed that except among age categories and body condition score of slaughtered animal there was no statistically significant association between prevalence of the infection and all potential risk factors.

**Table 2** Multivariable logistic regression analysis for the association between potential risk factors hydatid cyst positive status

| Risk factors | Categories | No. Examined | No. Positive | Prev.% | OR(95% conf.int) | P- value |
|---|---|---|---|---|---|---|
| Breed | Local | 330 | 62 | 18.78 | 0.23 | 0.2 |
| | Cross | 53 | 6 | 11.32 | Ref. | |
| Sex | Female | 39 | 4 | 10.25 | Ref. | 0.19 |
| | Male | 345 | 64 | 18.55 | 0.228 | |
| Age | 3-5 years | 86 | 11 | 12.79 | Ref. | 0.001* |
| | 5-9 years | 232 | 39 | 16.81 | 0.1467 | |
| | >9years | 66 | 18 | 27.27 | 0.375 | |
| BCS | Good | 227 | 22 | 9.69 | Ref. | 0.000* |
| | Medium | 136 | 36 | 26.47 | 0.107 | |
| | Poor | 21 | 10 | 47.62 | 0.909 | |
| Origin | *Mendi twon* | 96 | 13 | 13.54 | 0.157 | 0.2 |
| | *Wajete* | 95 | 19 | 20 | 0.25 | |
| | *Homi chala* | 121 | 27 | 22.31 | 1.59 | |
| | *Bijit* | 72 | 8 | 11.11 | Ref. | |

### 3.3 Anatomical distribution in different organs and size of hydatid cysts

The distribution of hydatid cyst in liver, lung, heart, and kidney was found to be 48.52% (33/68), 39.70 %( 22/68), 7.35 % (5/68), and 4.41 %( 3/68), respectively. In the majority of animals harboring hydatid cyst, the cysts had the tendency to be located more in liver (48.52%) followed by lung (39.70%), heart (7.38%) and kidney (4.41%). From the total of 68 cysts counted, 61.7% (42), 29.41% (20) and 8.82% (6) were small, medium, and large size measurement respectively as indicated in the following (Table 4).

**Table 3.** Anatomical distribution and size of hydatid cysts in different organs

| Organ | Large | | Medium | | Small | | Total account | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| Lung | 4 | 66.66 | 8 | 40 | 15 | 35.71 | 27 | 39.70 |
| Liver | 2 | 33.33 | 11 | 55 | 20 | 47.61 | 33 | 48.52 |
| Heart | 0 | 0 | 1 | 5 | 4 | 9.52 | 5 | 7.35 |
| Kidney | 0 | 0 | 0 | 0 | 3 | 7.14 | 3 | 4.41 |
| Total | 6 | 100 | 20 | 100 | 42 | 100 | 68 | 100 |

### 3.4 Characterization of the Cyst

**Fertility and Viability test**: From the total 68 hydatid cyst collected at the abattoir during postmortem examination and subjected to fertility and viability test, 36(52.94%) of them were fertile, and 32(47.05%) were non-fertile; out the fertile cysts, 11 (30.55%) were viable and 25 (69.44%) non-viable; again, among the non-fertile, 23(71.87%) sterile and 9 (28.12%) calcified (Table 5).

**Table 4.** Distribution of Hydatid Cyst fertility and Viability in different organs

| Organ | No. of Fertile cyst 36/68 (52.94%) | | No. Non- fertility cyst 32/68(47.05%) | | Total |
|---|---|---|---|---|---|
| | Viable cyst | Non- viable cyst | Sterile cyst | Calcified cyst | |
| Lung | 5 | 15 | 2 | 5 | 27 |
| Liver | 6 | 7 | 16 | 4 | 33 |
| Heart | 0 | 3 | 2 | 0 | 5 |
| Kidney | 0 | 0 | 3 | 0 | 3 |
| Total | 11/36(30.55%) | 25/36(69.44%) | 23/32(71.87%) | 9/32 (28.12%) | 68 |

### 3.5 Estimation of Economic losses

From the total of 384 cattle examined, 68 (17.70%) were found harboring hydatid cysts. Among them, 27 (39.70%), 33 (48.52%), 5 (7.35%) and 3(4.41%) of the hydatid cysts were collected from the lungs, liver, heart and kidneys, respectively. The overall occurrence of hydatid cyst and percentage involvement of lung, liver, heart and kidney were used as input to estimate the financial loss attributable to organs condemned and carcass weight loss in the present study.

According to information obtained from butcher house in Mendi town average market price of cattle lung, liver, kidney, heart, and a kilogram of beef was found to be 20, 20, 25, 30, and 600 Ethiopian Birr (ETB) respectively. The mean annual numbers of cattle slaughtered at Mendi municipal abattoir during the last two years was 2830, and the overall occurrence of hydatid cyst was found 68/384(17.71%) during the study period.

Hence, direct financial losses due to condemnation of organs and indirect financial losses due to carcass weight loss were calculated as follows on annual basis.

DL = (AS × PLu × CLu) + (AS × PLi × CLi) + (AS × PKid × CKid) + (AS × PHr × CHr)

(2830 × 20 × 0.397) + (2830 × 20 × 0.485) + (2830 × 25 × 0.044) + (2830 × 30 × 0.074).

DL = (22,470) + (27,451) + (3,113)+ (6,282.6) = **59, 316.6** ETB.

Where ;

DL = direct losses associated with hydatid cyst

AS = estimated mean annual slaughter;

PLu = percent involvement of the lung;

CLu = local retail price of a lung;

PLi = percent involvement of the liver;

CLi = local retail price of a liver;

PKid = percent involvement of the kidney;

CKid = local retail price of a kidney;

PHr = percent involvement of the heart;

CHr = local retail price of a heart.

**Indirect losse**s (IL) = 5%NAS × PH × CPB × 126 kg (0.05 × 2830 × 0.177 × 1000 × 126) = 31,557,330 ETB.

Where 5% = A reduction of 5% in meat production due to hydatid cyst;

NAS = average number of cattle slaughtered annually;

PH = prevalence of hydatid cyst;

CPB = current average price of 1 kg of beef at Mendi;

126 kg is the dressed average carcass weight of adult cattle.
Total economic loss (TL):
The total economic loss can be evaluated by considering both direct economic loss and in direct economic loss as follows:
TL = DL + IL (59, 316.6 + 1,893,439.8) = **1,952,756.4ETB**

### 3.5 Community Awareness and Knowledge on cattle hydatidosis

#### *3.5.1 Background information of the interview respondents*

This aspect of the analysis deals with the personal data on the respondents of the questionnaires given to them. The total numbers of questionnaires distributed were 100 and all of the questionnaires were returned. All respondents completed the questionnaires in suitable form. The demographic characteristics of the respondents include: gender, level of education, age and habit of raw meat/vegetable consumption. Out of the total 100 interviewed respondents, majority (58%) of the respondents were males while 42% were females. In the present survey, dominant participants (48%) were greater than 35 years age followed by 44% in16-25 years age and 8% of them were in 25-35 of the age categories. Higher respondents were secondary school graduate 32% followed by (30%) illiterate; 26% primary school; and 12% college level. The table below shows the details of back ground information of the respondents.

Table 5 Background of the questionaries' respondents (n=100)

| Risk factors | Categories | No. of positive respondents | Percent (%) |
|---|---|---|---|
| Sex | Female | 42 | 42% |
| | Male | 58 | 58% |
| Age | 16-25 | 44 | 44% |
| | 25-35 | 8 | 8% |
| | >35 | 48 | 48% |
| Education level | Illiterate | 30 | 30% |
| | Primary school | 26 | 26% |
| | Secondary school | 32 | 32% |
| | College | 12 | 12% |
| Consumption habit | Cooked | 48 | 48% |
| | Raw | 52 | 52% |

#### *3.5.2 Assessment on the risk factors*

In the current study out of 100 respondents interviewed in the Menedi town, 60% (60/100) owned dogs. On the other hand, 46% of the respondents reported that they usually exercise back yard slaughtering on holydays. Moreover, 36% of them allow their dog to roam outside their compound. The feeding practice of dog owners was also assessed and the result showed that 94% (94/100) of the dog owners feed raw condemned visceral organs without cooking or checking for any abnormality on the organs. On hand washing practice, the participants reported that 96% (96/100) they wash their hands especially when they are going to eat foods, but most of the people reported to wash their hands without soap. Study participants respondent showed that 96% of them Practice washing vegetables before raw consumption (Table 6).

Table 6: Potential risk factors of hydatidosis based on the questionaries' interview in the Mendi town

| Variables | Response | No. respondent | Percent |
|---|---|---|---|
| Dog ownership | Yes | 60 | 60% |
| | No | 40 | 40% |
| Dog Housing/management system | Indoor | 64 | 64% |
| | Outdoor | 36 | 36% |
| Hand washing practice after contact with dog, dog feces and soil | Yes | 96 | 96% |
| | No | 4 | 4% |
| Practice washing vegetables before raw consumption | Yes | 96 | 96% |
| | No | 4 | 4% |
| Presence of separate housing for dog | Yes | 44 | 44% |
| | No | 56 | 56% |
| Home slaughtering of animals | Yes | 46 | 46% |
| | No | 54 | 54% |
| Feed offal to their dogs | Yes | 94 | 94% |
| | No | 6 | 6% |

*3.5.3 Assessment of zoonosis and transmission mechanism of hydatidosis***.**

In this study out of 100 interviewed respondents: 14% had no information about bovine hydatidosis, 88 % do not know that hydatid cyst can be shared between human and dogs, 94% of interviewed participants do not know as dogs can be affected by eating raw uncooked offal, and 96% participants of the study do not know that raw/ uncooked vegetables and contaminated soil serve as source of hydatidosis in human infection (Table 9)

Table 7. Interview result on zoonosis and transmission mechanism of hydatidosis (n=100)

| Variables | Response | No. respondent | Percent |
|---|---|---|---|
| Knowledge on the transmission of disease by eating uncooked viscera | Yes | 92 | 92% |
| | No | 8 | 8% |
| Do you know if dogs transmit disease to humans | Yes | 88 | 88% |
| | No | 12 | 12% |
| Treat or vaccinate their dogs | Yes | 72 | 72% |
| | No | 28 | 28% |
| Frequency of dog treatment | once a year | 30 | 30% |
| | twice a year | 16 | 16% |
| | not at all | 54 | 54% |
| Knowledge on the transmission of disease from dogs to human | Yes | 72 | 72% |
| | No | 28 | 28% |
| Knowledge on dog tapeworm | Yes | 34 | 34% |
| | No | 66 | 66% |
| Knowledge on hydatidosis | Yes | 14 | 14% |
| | No | 86 | 86% |

## 2. DISCUSSION

Hydatid cyst in cattle are important because they are main cause of meat condemnation contributing to significant economic problems and they cause human infectious disease, especially in poor and developing countries. The prevalence of bovine hydatidosis varies from country to country or even within the country and has been reported by different scholars from developing countries under extensive production system (Sisay *et al*., 2015; Reza *et al*., 2018)**.**

In the current study the prevalence of hydatid cyst in cattle slaughtered at Mendi municipal abattoir during the study period was 68/384(17.71%). This proportion of recorded is comparable to findings by Kebede *et al.* (2009a, 2009b), who reported a 16% prevalence in Wolita Sodo, as well as Assefa and Tesfaye (2014) with 18.61% in Adigrat, and Alebie *et al.* (2016), who found a prevalence of 17.97% in Debrezeit. In contrast, this prevalence exceeds those documented in previous studies such as Bezuayehu *et al*. (2014) with 11.3% in Harar, Ochi *et al.* (2016) reporting 3.99% in Juba, South Sudan, Abera and Teklebran (2017) with 11.21% in Wolayta, and Akeberegn *et al.* (2017) at 6.5% in Debre Berhan. These differences highlight the variability in hydatid cyst prevalence across different regions, as regional differences in cultural practices, social behaviors, and attitudes toward dogs (Oostburg *et al*., 2000). The current prevalence observed was lower than the prevalence reported by Kebede *et al*. (2009a, 2009b), who documented 34.5% in Bahir Dar; Regassa *et al*. (2010), with 52.69% in Hawassa; Nuraddis *et al*. (2017), reporting 63.7% in Asella; and Kebede and Mekonnen (2020), who found 40.2% in Dodola. Conversely, the finding was higher than those reported by Aregawi *et al.* (2024) in a recent systematic review focusing on the Horn of Africa, where prevalence rates of cyst in cattle ranged from 0.9% to 25.8%.

In the present study high prevalence of bovine hydatid cyst was recorded in the local cattle breed 18.78% than cross breed 11.32% , which is align with Ermias . (2019) reported comparable findings in Denber Birhan, hydatid cyst of 30.10% in local breeds and 19.20% in crossbreeds. This suggests that the exposure to risk factors is likely uniform across different sexes and breeds, possibly due to animals being equally susceptible regardless of their genetic background. A higher prevalence of hydatid cyst was recorded in older cattle aged over 9 years, with an infection proportion of 27.3%, compared to cattle aged 5-9 years with infection proportion 16.81%, and younger cattle aged 3-5 years with an infection proportion12.72%. These findings align with previous research, such as Zewdu *et al*. (2010), who reported 22.91% in older cattle and 6.78% in adults; Mandefro *et al*. (2019), with 66.1% in old and 29.5% in adult animals; Akeberegn *et al*. (2017), noting 8.71% in old and 2.8% in adults; and Kebede and Mekonnen (2020), who found 43.4% in old and 19.0% in adult cattle. Similarly, Ermias G. (2019) in Dember Birhan observed a prevalence of 28.6%, with 14.5% in adults and 42.9% in older cattle. The increased hydatid cyst prevalence in older animals may be attributed to prolonged exposure to the infection, allowing more time for hydatid cyst development and possibly a decline in immune function due to longer exposure periods.

In the current study slaughtered Cattle with poor body condition score tend to have higher infection, with moderate and good condition animals showing comparatively lower prevalence. This pattern aligns with findings by Melaku *et al.* (2012) and Bezuayehu *et al*. (2014). One possible reason is that animals in poor condition may, severe infections can impair growth and performance, decrease meat and milk quality, and cause weight loss, as explained by Polydorous (2021) and Himonas (2001). In the present study except among the cattle age categories ( p =0.001*) and body condition score( p= 0.000*) there was no statistical significant association between the prevalence of hydatid cyst and all potential risk factors.

In the current study cystic echinococcosis was frequently encountered in the liver, followed by lungs, heart and kidneys. This is explained by the fact that lungs and livers possess the first great capillaries sites encountered by the migrating echinococcus oncosphere (hexacanth embryo) which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved (Kebede *et al*., 2009a, 2009b). In addition, that ruminant is slaughtered at older age. During this period the liver capillaries are dilated and most cysts directly pass to the lungs. Additionally, it is possible for the hexacant embryo to enter the lymphatic circulation and be carried via the thoracic duct to the heart and lungs in such a way the lungs may be infected before or instead of the liver (Romig et al., 2017).

In the current study, the predominant size of the hydatid cysts was seen to be small. The high proportion of small cysts may indicate late infection of the animals due to immunological response of the host which might preclude expansion of cyst size. The fertility rate of cysts was higher in lungs than liver due to softer consistency of lung tissue which allows easier development of the cysts and favors their fertility rate (Getaw *et al.*, 2010). The economic loss due to cystic echinococcosis in the current study was the sum of direct economic loss, the loss associated with condemned organs and the indirect economic loss that is the loss associated with reduced carcass weight.

The questionnaire survey indicated that hydatidosis is not familiar to the communities in the study areas, as the majority of the respondents reported that they did not hear or aware about hydatidosis. This is consistent with other studies in Tanzania, majority of the respondents have not aware of (Ernest *et al*., 2009) hydatidosis and in Iran found that very low level of knowledge about hydatidosis in the pastoralist. Higher proportion of the respondents closed

contact with non dewormed dogs. The close association of people with dogs especially children who can acquire this disease when they are still young and signs come later in life further exacerbates this factor. Similar results reported in Tanzania, many households (89.1%) had dogs which did not deworm regularly and managed under free-range system (Ernest *et al*., 2009) . This idea was supported by (Gathura and Kamiya, 1990) that they reported with high incidence rate in the northern (higher contacted of dogs) than in the southern Kenya due to cultural difference.

Backyard slaughter of cattle and disposal of raw condemned organs through offering to dogs were the common practice, a situation which may lead to the increased environmental parasitic load. Similar results were observed in Tanzania, majority of community had their dogs managed freely with feed raw condemned materials to their dogs (Ernest et al., 2009)

In this study, only a small proportion (14%) of the participants had an awareness of hydatidosis. This is low compared to with the work of Tigre (2012) who reported that 32.2% of the study participants had an awareness of hydatidosis. The awareness level of participants in this study was similar to that reported by (Kebede et at.2010) and (Zelalem,2012) who indicated an awareness level of 15% of the households had awareness about zoonotic hydatid cyst.

In this study, 60 % of the participants owned dog(s) and 36% of them said they let their dogs freely roam outside of their house. The presence of large numbers of non-restricted dogs plays a crucial role in contaminating the environment with hydatid cyst which could subsequently infect humans. Among the dog owners, 94% of them reported that they fed offal to their dogs regardless of the safety status of the offal. Feeding the viscera of infected slaughter animals to dogs was reported to facilitate the transmission of the Echinococcus granulosus and this was suggested to consequently increase the risk that humans will become infected (Moro and Schantz, 2009).

The total annual economic loss due to bovine hydatidosis was estimated to be 1,952,756.4 ETB which is important to establish a health center in one district. The indirect economic loss in this study was significantly higher than direct economic loss indicating the widespread nature of hydatid cyst and moderate degree of livestock infestation rate in Mendi town. Backyard slaughter, poor veterinary services, resistance to the commonly used anthelmintics (Schantz *et al*., 1982; Enrico Brunetti, 2023), the abundant nature of stray dogs, and wandering of animals in an open pasture allowing contact with dogs might be associated as major reasons for the exaggerated economic loss documented in the current study

## 3. CONCLUSION AND RECOMMENDATIONS

The current study finding indicated the bovine Hydatid cyst in slaughtered cattle at the Mendi municipal abattoir. Besides its animal and public health risks, hydatidosis attributed meaningful financial losses from organ condemnation and carcass weight loss. The questionnaire survey in this study showed that the major predisposing factors which contribute to persisting of the diseases in the study area were free access of dogs to offal, inappropriate disposal of offal, widespread stray dogs and inadequate animal health services. Lack of community knowledge on transmission, zoonosis, treatment and control of hydatidosis were potential factors for public .health risk. Thus, the development of effective disease management and awareness creation are required to overcome these problems.

Based on the above conclusions, the following recommendations were forwarded

- Sustainable and integrated control strategies against hydatidsis should be designed and implemented.
- Stake holders, butchers, abattoir workers and meat sellers in the area shall also implement parasitic lifecycle breaking the control and prevention methods.
- Focused awareness creation program is required to avoid the improper disposal of condemned offal's, denying access of dogs into raw offal, stray dogs and for appropriate animal management.
- Adequate animal health services especially worm control should be implemented.
- Public education on zoonosis, transmission and control mechanism is required.
- Further detail epidemiological studies involving different species of livestock, dogs, wildlife, and humans in different zones of Ethiopia is required to establish a clear information system for launching a control programme.

## 4. REFERENCES


Abbasi, I., A. Branzburg, PM. Campos, SK. Abdel Hafez and F. Roul, 2003. Copro- diagnosisis of Echinococcus granulosus infection in dogs by amplification of newly identified repeated DNA sequence. American Journal of Tropical Medical. Hygiene **69**: 3254- 3360. 39.

Abdel-Rahman, N., N. Daragmeh, M. Adwan, D. Al-Qaoud and SK. Abdel Hafez, 2001. Human Cystic Echinococcosis in the west bank of Palestine: Surgical incidence and Sero- epidemiological study. p. 19. 5.

Abebe, A., Beyene, D., Kumsa, B., 2013. Cystic echinococcosis in cattle slaughtered at Gondar Elfora export Abattoir, northwest Ethiopia. *J. Parasit.* Dis. **38 (4),** 404–409.

Abebe, A., Beyene, D., Kumsa, B., 2014. Hydatidosis in three selected regions in Ethiopia: an assessment trial on its prevalence, economic and public health importance. *Revue de Medicine Veterinare*,**147:** 797-804.

Abebe, F. and Jobre, Y., 2011. Prevalence of hydatidosis (Echinococcusgranulosus) in domestic animals in Ethiopia: A synthesis report of previous surveys. *Ethiopia Veterinary Journal*, **15:**11-33.

Abebe. F. and Y. Yilma, 2013. Estimated annual economic loss from organs condemnation, decreased carcass weight and milk yield due to bovine hydatidosis. *Ethiopian Veterinary Journal* **16(2):** 1-14.22.

Akeberegn, D., 2017. The Prevalence of Bovine Hydatidosis among Slaughtered Cattle at Debre Berhan Municipal Abattoir, North Shewa Zone, Ethiopia. *Journal of Veterinary Science and Medicine* .**1**: 5.

Alemayehu, L., 1990. The prevalence of hydatidosis in cattle, sheep and goats and Echinococcus granulosus in Dogs in Arsi administration region. Dvm thesis faculty of veterinary medicine, Addis Ababa University, Debrezeit, Ethiopia: **85.**

Annon, A., 1990. FAO WHO guide line for servilance, prevention and control of echinococcus/Hudatidiosis servilance World organization, pp. 146-153.

Anus, D.P., 2006. Molecular discrimination of Hydatid Cestodes. *Parasitaol Int*.,55**:** 531-532.

Atsede, B. and A. Belay2015. Epidemiological Investigation of Hepato-Pulmonary Bovine Hydatidosis and its economic and zoonotic Importance at Jimma Municipal abattoir, Ethiopia. Journal of Biology Agriculture and Health Care.; **5**: 11.

Azlaf R, Dakkak A (2006) Epidemiological study of the cystic Echinococcosis in Morocco. *Vet Parasitol* **137**:83–93.

Battelli G (2009) Echinococcosis: costs, losses and social consequences of a neglected zoonosis. *Vet Res Communication* **33:** 47–S52.

Belding, L. D., 2005. Textbook of parasitology. New York, centur, crofts. Division of Meredith publishing company.**(3)**., 626-627.

Belina, T, A. Alula, M. Nenyou, Y. Azena and G. Sisay, 2012. Prevalence and Public health significance of bovine hydatidosis in Bah 94. Agricultural Growth Project (AGP), 2013. Value Chain Analysis for Ethiopia: Livestock Market Development. **21**;87.

Berhe G (2009) Abattoir survey on cattle hydatidosis in Tigray Region of Ethiopia. *Trop Anim Health Prod* **41:** 1347-1352.

Bersissa, K., 1994. Hydatidosis in Nekemte: Prevalence in slaughtered cattle and sheep, estimated economic loss and incidence in stray dogs. AAU, FVM, DVM Thesis. Debre Zeit, Ethiopia.

Abdelrahim and M. Ahmed, 2011. Hydatid disease, a morbid drop needs awareness. *Ann. Saudi Med. J***.6**, 122:56-64.

Brehane, A. and B. Abeba, 2015. Epidemiological Investigation of Hepato- Pulmonary Bovine Hydatidosis and its economic and zoonotic Importance at Jimma Municipal abattoir, Ethiopia. Journal of Biology Agriculture and Health Care **5** : 11.

Brunetti, E., 2010. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. Acta Tropica **40**:1-16..

Budke, C.M., P. Deplzes and P.R. Torgerson, 2006. Global socio-economic impact of Cystic Echinococcosis. Emerging Infectious Disease, **12(2):** 296-303. 57.

Center For Disease Control (CDC), 2013. Hydatid Disease, retrieved 20 March 2014.

Craig, PS., DP. Mc Manus, MW. Lightowlers, JA. Chabalgoity and HH. Garcia, 2007. Prevention and control of Cystic echinococcosis. Lancet Infectious Disease **7:** 385-394.

Cringoli, G., Rinaldi, L., Musella, V., Veneziano, V., Maurelli, M., Di Pietro, F., Frisiello, M. and Di Pietro, S., 2007. Geo-referencing livestock farms as tool for studying cystic echinococcosis epidemiology in cattle and water buffaloes from southern Italy. *Geospatial Health*, **2**:105-111.

CSA (Central Statistics Authority), 2004. Ethiopian Agricultural Sample Survey Report on live-stock, Poultry and Beehives Populations, CSA, Addis Ababa, Ethiopia.

CSA, 2008. Central Statistical Authority of Ethiopia. North Gondar, Agricultural office, Statistical Report on Livestock and Farm Implement.

Cummings, H., M. Rodriguez-Sosa and AR. Sat Oskar, 2009. Hydatid disease. In Sat Oskar AR, Simon GL, Hotez PJ, Tsuji M (Eds.), Medical parasitology .**50.**146-152..

Dakkak A (2010) Echinococcosis/hydatidosis: a severe threat in Mediterranean countries. *Vet Parasitol* **174**:2–11.

Daryani, A., M. Sharif, A. Amouei and M. Nasrolahei, 2009. Fertility and viability rates of hydatid Disease in Wales. Br Medical Journal **312:** 674-675.

Daryani, A., R. Alaei Arab, M. Sharif, MH. Dehghan and H. Ziaei, 2007. The prevalence intensity and viability of hydatid cyst in slouthered animals in the Arab provinces of North West Iran. Journal of helminthology **18**: 13-17.

Debas, E. and N. Ibrahim, 2013. Prevalence and Economic Importance of Hydatidosis in Cattle Slaughtered at North Gonder Elfora Abattoir, European. Journal of Applied Sciences **51** 29-35

Dechassa, T., K. Kibrusfaw, B. Desta and W. Anteneh, 2012. Prevalence and financial loss estimation of hydatidosis of cattle slaughtered at Addis Ababa Abattoirs Enterprise. J Veter Med and Anim Health.; **4**: 42-47.

Demissie, G. and J. Kemal, 2014. Bovine Hydatidosis and its Economic Importance at Kara-Alo Abattoir PLC, Addis Ababa, Ethiopia. *Journal of Veterinary Science & Technology* **5**. 62.

Department of National Resource (DNR), 2009. Echinococcosis (Cystic hydatidosis) **34;** 2-4..

Eckert J, Gemmell MA, Mesin FX, Pawlowsk ZS (2001) WHO/OIE Manual on Echinoccocus in humans and animals. Link: https://goo.gl/nzGZqD

Eckert, J. and P. Deplazes, 2004. Biological, epidemiological and clinical aspects of Echinococcus, a zoonosis of increasing concern. Clinical. Microbiology Review **17**: 107-135.

Eckert, J., RL. Rausch, MAG. Gemmell, P. Raudoux and M. Kamiya, 2001. Epidemiology of Echinococonccus multilocularis, Echinococcus vogeli and Echinococcus oligarthus.

Erbeto, K., G. Zewde and B. Kumsa, 2010. Hydatidosis of sheep and goats slaughtered at Addis Ababa Abattoir: Prevalence and risk factors. Tropical Animal Health and Production **42:** 803-805.

Ezana, G., 2008. Major diseases of export oriented livestock in export abattoirs In/Around Ada Liben Woreda, Debre zeit. DVM Theses, Faculty of veterinary medicine, Haramaya University; 21-41

Fakhar F, Sadjjadi SM (2007) Prevalence of hydatidosis in slaughtered herbivores in Qom province, central part of Iran. *Vet Res Commun **31***:993–997.

FAO/UNEP/WHO (1982) Guidelines for Echinoccocosis Hydatidosis surveillance prevention and control, FAO,Rome **29:** 147.

Fromsa, A. and Y. Jobre, 2011. Infection prevalence of hydatidosis (Echinococcus granulosus, Batsch, 1786) in domestic animals in Ethiopia: A synthesis report of previous surveys. *Ethiopian Vet. J.*, **15(2):** 11-33.

Gebreyohannes, M. and M. Wondie, 2014. Hydatidosis: Prevalence and Economic Significance in Cattle Slaughtered at Diredawa Municipal Abattoir, Ethiopia. *IJAVMS* **83;** 64-80.

Getaw, A., D. Beyena, D. Ayana, B. Megersa and F. Abunna, 2010. Hydatidosis: Prevalence and its economic importance in ruminants slaughtered at Adama municipal abattoir, Central Oromia, Ethiopia. Acta Tropica**113**: 221-225

Getaw, A., D. Beyene, D. Ayana, B. Megersa and F. Abunna, 2010. Hydatidosis: Prevalence and its economic importance in ruminants slaughtered at price of organs and mean annual slaughter rate in Adama municipal abattoir, Central Oromia, Ethiopia. Acta. Trop., 113:221-225.

Girma,S., Z. Girma, T. Ketema, J. Tariku 2012. Assessment of awareness on food borne zoonosis and its relation with veterinary public health services in and around Addis Ababa, Ethiopia. *Ethiop Vet J*.; **16:** 15-22.

Guadu, G., 2013. Economic and zoonotic importance of bovine hydatidosis in Shire Municipal Abattoir, North West Zone, Tigray Region, Ethiopia. Acta Parasitologica Globalis **43** 92-98.

Haftu, B. and T. Kebede, 2014. Study on Prevalence and Economic Significance of Bovine Hydatidosis in Bako Muncipal Abattoir, West Shoa Zone, Oromiya Regional State. *Journal of Veterinary Science & Technology* **5**: 197.

Hailemariam Z, Nakao M, Menkir S, Lavikainen A, Yanagida T, Okamoto M, Ito A (2012) Molecular identification of unilocular hydatid cysts from domestic ungulates in Ethiopia: implications for human infections. *Parasitol Int* **61(2):**375–377

Hubbert, WT., WF. Culloch, S. Scnurren and AA. Beger, 1995. Diseases Transmitted from Animals to man. Sixth (Edn.). Choreler C, Thomas Publisher, Spring Field Illinosis, USA, pp. 682-692.

Hussen, W., 2013. Prevalence and characterization of hydatid cysts in cattle slaughtered at Nekemte Municipal Abattoir, Western Ethiopia. *J Vet Med Anim Health* **6** ;280-288.

Ibrahim MM (2010) Study of cystic echinococcosis in slaughtered animals in Al Baha region, Saudi Arabia: interaction between some biotic and abiotic factors. *Acta Trop***113:**26–33

Jahannes, E. and D. Peter, 2007. Biological, Epidemiological and Clinical Aspects of Echinococcosis, azoonosis of increasing concern. Clin Microbiol Rev. **1**: 107-135.

Japheth, M., N. Ernest and Z. Eberhard, 2006. Epidemiology and control of echinococcosis in sub-Saharan Africa. Parasitology International **55**: 193-195.

Jenkins, D., J. Lallen and M. Goullet, 2008. An encroachment of Echinococcus granulosus into urban areas in eastern Queensl and, Australia. *Australian Veterinary Journal* **86**: 294-300.

Jibat, T., G. Ejeta, Y. Asfaw and A. Wudie, 2008. Causes of abattoir condemination in apparently healthy slaughtered sheep and goats at Helmex abattoir, Debre Ziet, Ethiopia. *Revue Med Vet.* ; **5**: 305-311.

Jobre, Y., F. Labag, R. Tirone, G. Abebe and P. Dorchines, 1996. Hydatidosis in three selected regions in Ethiopia: an assessment trial on its prevalence, economic and public health importance. *Revue de Medicine Veterinare,***147:** 797-804.

Kachani, M., 2003. Public health education: importance and experience from the field. Educational impact of ultrasound screening surveys. Acta Tropica **85**: 263-269

Kebebe E, Girma Z, Kumsa B (2010) Hydatidosis of sheep and goats slaughtered at Addis Ababa Abattoir: prevalence and risk factors. *Trop Anim Health Prod* **42(5):**803–805

Kebede, N. (2010). A retrospective survey of bovine hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. *Tropical Animal Health and Production.***42**: 323-325.

Kebede, N., 2010. A retrospective survey of bovine hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. *Trop Anim Health Prod* **42**: 323-325.

Kebede, N., A. Mitiku and G. Tilahun, 2010. Retrospective survey of human hydatidosis in Bahir Dar, north west Ethiopia. **EMHJ**. **16**: 9.

Kebede, N., H. Mekonnen, A. Wossene and G. Tilahun, 2009a. Hydatidosis of slaughtered cattle in Wolaita Sodo Abattoir, southern Ethiopia. *Trop. Anim. Health Prod.***41:** 629-633.

Kebede, T. Kassa, G. Tilahun and C. Macias, 2011. Prevalence of dog gastrointestinal parasites and risk perception of zoonotic infection by dog owners in Wondo Genet, Southern Ethiopia. *Journal of Public Health and Epidemiology* **3**: 550-555.

Kebede,N., Abuhay, A., Tilahun, G. and Wossene, A., 2009. Financial loss estimation, prevalence and characterization of hydatidosis of cattle slaughtered cattle slaughtered at DebreMarkos municipality abattoir, Ethiopia. *Tropical Animal Health and Production,***41:** 1787- 1789.

Khuroo, MS., 2002. Hydatid disease, current status and recent advances. Ann Saudi Medicine **122:** 56-64.

Lema, B., 2014. Prevalence of Bovine Hydatidosis and its Economic significance in Harar Municipality Abattoir, Eastern Ethiopia. American-Eurasian *Journal of Scientific Research* : **67**;143-149.

Lightowlers, MW., 2006. Cestode vaccines: origins, current status and future prospects. Parasitology 133: 27-42 44.

Macpherson CNL, Zeyhle E, Roming T (1985) An Echinoccocosis pilot control program for North West Turkan, Kenya and Ann Trop .*Med Parasite*, **78**: 188- 192

Martinma, EA., 2007. Oxford Concise Medical Dictionary. 7th (Edn.). Oxford University Press, India, Bungar. **3.** 342-343

McM Kebede, M., A. Hagos and Z. Girma, 2009. Echinococcus/ hydatidosis prevalence, economic and public health significance in Tigray region. North Ethiopia, Trop. Anm. Health Prod.**41:** 865-871

Tolosa, T., W. Tigre, G. Teka and P. Dorny, 2009. Prevalence of bovine cysticercosis and hydatidosis in Jimma municipal abattoir, SouthWest Ethiopia. *J. Vet. Res. Health Prod.*, **76:** 323-326.

McPherson LNL (1985) Epidemiolgy of hydatid disease in Kenya. A study of the domestic Intermediate hosts on Masailand. *Tran Roy Soc Trop Med and Hyg* **79(2):** 209-217.

Moro, P.S., 2006. Cystic echinococcosis in the Americas. Parasitology International, **55**: 181 -186.

Mulatu, M., M. Biruk, T. Habtamu and A. Kumar, 2013. Bovine Hydatidosis in eastern part of Ethiopia. Momona *Ethiopian Journal of science* (MEJS). **5**: 107-114.

Nebiou, G., 1990. Study of hydatidosis in cattle slaughter at Bahirdar Municipatal abattoir.Dvm thesis, faculty of veterinary medicine, Addis Ababa University, Debrezit, Ethiopia. **91**. 75.

Negash, K., Beyene, D., Kumsa, B., 2013. Cystic echinococcosis in cattle slaughtered at Shashemanne Municipal Abattoir, south central Oromia, Ethiopia: prevalence, cyst distribution and fertility. Trans. R. Soc. Trop. *Med. Hyg.***107 (4)**, 229–234.

Nigatu, K., M. Abebe and T. Getachew, 2009. Hydatidosis of slaughtered animals in Bahir Dar abattoir, North Western Ethiopia. Trop Anim Health Prod 41: 42-50

Ogunrinade, A. and GO. Adegoke, 1982. Bovine Fasciolosis in Nigeria, Intercurrent Parasitic and Bacterial Infection. *Tropical Animal Health Production* 14(**2**): 121-125.

OIE manual on echinococcosis in humans and animals: a public health problem of global concern; edited by Eckert J, Gemmel MA, Meslin FX, Pawlowsk, ZS, pp. 167.7.

OIE, 2001. World health organization/ Office international des Epizootics: manual on echinococcus in humans and animals. Paris, France 1-126.

Oku, Malgorb R, Benavidezb U, Carmonab C, Kamiyac H (2004) Control program against hydatidosis and the prevalence in Uruguay.*International congress series* **1267:** 98-104. Link: https://goo.gl/qWYbj4

Oku, Y., R. Malgor, U. Banavideze, C. Carmona and H. Kamiya, 2004. International Congress Series.; : 98-104.

Orgerson, P. and C. Budke, 2003. Echinococcosis–an international public health challenge. Research in Veterinary Science, **74(3):**191-202.

Pal, M., 2007. Zoonoses.2nd Edition. Satyam Publishers, Jaipur, India.

Pal, M., Zenebe, N., Woldemariam, T. and Berhanu, G. (2020). Prevalence of cystic echinococcosis in various food animals slaughtered at selected abattoirs in Ethiopia. *Veterinary Research International*,**8:** 118-123

Parija, SC., 2004. Text book of Medicine and Parasitology, Protozoology and Helminthology. (2nd edn), India publishers and Distributors, India, New Delhi, India, . 5-39.

Pednekar, RP., ML. Gatne, RCA. Thompson and RJ. Traub, 2009. Molecular and morphological characterization of Echinococcus from food producing animals in India. Veterinary Parasitology **165**: 58-65.

Pedro, M. and M. Schantz, 2009. Echinococcosis: a review. International Journal of Infectious Diseases. **13**: 125-133.

Pedro. M and MS. Peter, 2009. Division of Parasitic Diseases, Coordinating Center for Infectious Diseases, Atlanta, Georgia, and USA. Center of Disease Control and Prevention **13**: 125-133.

Philip, S., PS. Craig, DP. McManus, W. Marshall and WM. Lightowlers, 2007. Review on prevention and control of cystic echinococcosis. Lancet Infectious Disease **7:** 385-394.

Rahimi MT, Sharifdini M, Ahmadi A, Laktarashi B, Mahdavi SA, Kia EB (2011) Hydatidosis in human and slaughtered herbivores in Mazandaran province, northern Iran. *Asian Pacific J Trop Dis 1***(3):**212–215

Romig, T., RA. Omer, E. Zeyhle, M. Hüttner and A. Dinkel A, 2011. Echinococcosis in sub- Saharan Africa: Emerging complexity. Veterinary Parasitology **181**: 43-47.

Soulsby, EJ., 1986. Helminth, Arthropods and Protozoa of Domesticated Animals (7th edn), Baillere Tindal London, UK, pp. 119-124

Tadesse, B., 2014. Prevalence, public significance and financial loss of Hydatid cyst on cattle slaughtered at Nekemte Municipal abattoir, West Ethiopia. Acta Parasitologica Globalis **65**;151-159..

Terefe, D., 2012. "Prevalence and financial loss estimation of hydatidosis of cattle slaughtered at Addis Ababa Abattoirs Enterprise". Journal of Veterinary Medicine and Animal Health **61**;42-47..

Thompson, RC. And DP. Memanus, 2001. Aetiology : Parasites and Lifecycles: In: WHO/OIE Manual on Echinocosis in humans and animals a public health problems of global concern edited by Eckert J, Gemmen MA, Meslin FX, Pawlowski, ZS, Japan. 9-15. 2.

Thompson, RCA. and CE. Allsopp, 1988. Hydatidosis Veterinary perspectives and annotated bibliography. C.A.B. International, Wallingford, Oxon, UK.. 246.

Thrusfield, M., 2018. Veterinary Epidemiology. John Wiley & Sons.

Tor, M., A. Atasaliki, N. Altuntas, T. Sllue Senol, A. Kir and R. Baran, 2000. Review of Cases with cystic hydatid lung disease in a territory referral hospital located in an endemic region: a 10 years experience. Department of Pulmonary Medicine, Istanbul, Turkey, **67:** 539- 542.

Torgerson, P., R. Karaeva, N. Corkeri, T. Abdyjaparov, O. Kuttubaev and B. Shaikenov, 2003. Human cystic echinococcosis in Kyrgystan: an epidemiological study. Acta Tropica, **85(1):** 51-61.

Torgerson, P.R. and C.N. Macpherson, 2011. The socioeconomic burden of parasitic zoonoses: global trends. Veterinary Parasitology. **59:** 79-95.

Toulah, FH., AA. El-Shafaeis and MN. Alsolami, 2012. Prevalence of Hydatidosis among slaughtered animals in Jeddah, Kingdom of Saudi Arabia. J Egypt Soc Parasitology **42(3):** 563-572.

Tylor, MA., RL. Coop and RL. Wall, 2007. Veterinary Parasitology, 3rd edition. Blackwell, London; 376-377.

Urquhart, GM., J. Armour, JI. Duncan, AM. Dunn and FW.Jennings, 1995. Veterinary Parasitology. 2nd (Edn.). *Blackwell Publishing, USA.* 122-129.

WHO (2015) estimates of the global burden of foodborne diseases: foodborne disease burdenepidemiology reference group 2007-2015

Woubet, M., 1988. A Preminary study on Echinococcusis in Harage region and the efficacy of Glinus lotidus seeds against Echinococcosisgranulosus in pups infected experimentally with hydatid material.AAU, FVM, DVM Thesis Debre Zeit, Ethiopia.

Yemane, G., 1990. Preliminary study on Echinococcosis, in ruminant slaughters at Nazareth abattoir. Dvm thesis, Addis Ababa University faculty of veterinary medicine Debrezeit

Yilkal, A., 1989. Hydatidosis in cattle, sheep and pigs; cysticercus tenuicollis in sheep around dessie and the efficacy of Hygenia abyssinya (Kossa) on Taenia Hydatigenia. Dvm thesis, Addis Ababa University faculty of veterinary medicine, Debrezeit Ethiopia (1989).

Zewdu, E., 2010. Bovine Hydatidosis in Ambo Municipality Abattoir, West Shoa, *Ethiopia. Ethiopian Veterinary Journal* 14 .1 (2010): 1-14. 66.