

## Prevalence and Economic Significance of Hydatidosis in Bovine Slaughtered at Kindo Koysha Woreda Municipality Abattoir, Ethiopia

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**Abstract:** A cross-sectional study of bovine hydatidosis was conducted in Bele Municipality Abattoir from December, 2016 to August, 2017 to estimate the prevalence and economic impact of hydatidosis in cattle slaughtered at Bele Municipality Abattoir. Abattoir survey of hydatidosis was conducted during routine meat inspection activity on randomly selected 384 cattle encountered at Bele Municipality Abattoir. Ante-mortem examination was conducted to note the breed, age, sex and body condition of study animals. These animals were given number in order to identify them during the postmortem examination. Post mortem examination was conducted to note the presence of hydatid cysts. A total of 56 (14.57%) cattle were affected with hydatid cyst. The study shows that there was significant variation in the prevalence of hydatid cyst in different peasant association ( $p < 0.05$ ). However, no such association was observed in prevalence of hydatid cysts according to sex, age, breed and body condition of slaughtered animals ( $p = 0.499$ ,  $p = 0.086$ ,  $p = 0.613$ ,  $p = 0.140$ , respectively). The study period of the economic loss due to organ condemnation associated to bovine hydatidosis at the abattoir was estimated 6,720.00 Ethiopian Birr. It was concluded that, hydatidosis was one of the most important parasitic diseases in cattle slaughtered at Bele municipal abattoir and thus it deserves due attention.

**Keywords:** Abattoir, Cattle, Economic Importance, Hydatid Cyst, Organ Condemnation

**List of Abbreviation:** BCs..... Body condition score,  $\mu\text{m}$  ..... Micro meter

### 1. INTRODUCTION

In Ethiopia, meat inspection was started in 1910s with the aim of improving productivity and trade in animals and animal products as well as protecting the public from zoonotic diseases. Despite one century of experience on modern animal health activities, there exist very few legislation and regulation animal diseases control and meat inspection (DACA, 2006).

Hydatidosis or Cystic Echinococcosis (CE) is a chronic zoonotic disease condition associated to infection with the larval stage (hydatid cysts) of the dog tapeworm *Echinococcus granulosus* (*E. granulosus*) (Elmahdi *et al.*, 2004). It is one of the major parasitic problems of domestic animals that cause considerable economic losses and public health problem worldwide (Majorowski, *et al.*, 2005; Azlaf and Dakkak, 2006); the reason is mainly due to ability of this tape worm to adapt to a wide variety of domestic and wild intermediate hosts (Torgerson, 2002). A wide variety of animal species, both domestic and wild, that act as intermediate hosts have made *E. granulosus* to be widely distributed across the globe (Thompson and McManus, 2002).

The life cycle consists of the definitive and intermediate hosts. The definitive hosts are carnivores which harbor mature tapeworm in the intestine (Khuroo, 2002; Zhang and McManus, 2003) and excrete the parasite eggs along with their feces and play a major role in the epidemiology of the disease, while livestock and humans are intermediate hosts (Seimenis, 2003; Okuaet *et al.*, 2004). The transmission of Echinococcosis species from intermediate to definitive host is the result of predator-prey relationship existing between hosts, however it can be modified by human behavioral factors for synanthropic cycles (Thompson and McManus, 2002) and man is usually a dead end intermediate host (Zhang and McManus, 2003).

The outcome of infection in humans and animals is the development of hydatid cysts in lung, liver or other organs (Muller, 2001). In domestic animals disease due to hydatid cyst is rare, but in human being it is more dangerous. The significance of domestic animals as host of this parasite is therefore mainly that they act as the reservoir of the infection for man (Taylor, *et al.*, 2007). As the cysts gradually increase in size, they may impair the health status of the host and causes dyspnea when they occur in the lung or digestive disturbance and possible as cites when the liver is affected (Eckert and Delplazes, 2004). The pathogenicity of hydatidosis depends up on the extent and severity of infection and the organs on which it is situated. Rupture of hydatid cysts often leads to Sudden death due to anaphylaxis, hemorrhage and metastasis (White *et al.*, 2004).

Hydatidosis occurs throughout the world and causes considerable economical and public health problems in many countries. Its distribution is usually more prevalent in developing countries especially in the rural communities where the dog lives in close quarters with man and domestic herbivores (Jobre, 1996). Despite substantial research and control efforts hydatidosis remains endemic in many livestock rearing area of the world including Middle East, Mediterranean, Central and South America, Asia and Africa, including Ethiopia (Kebede *et al.*, 2009; Endrias *et al.*, 2010).

In Ethiopia, Hydatidosis has been known and documented as early as 1970's. It is the major cause of organ condemnation in most slaughters houses causing huge economic losses (Lobago, 1994). The studies conducted in different abattoirs indicated that Cystic Hydatidosis is prevalent and considerable economic losses as associated with it. Certain deeply rooted traditional activities could be commonly described as factors substantiating the spread and high prevalence rates of the diseases in some areas of the country. These may include the widespread backyard animal slaughtering practice, the corresponding absence of rigorous meat inspection procedures and long standing habit of the most Ethiopian people to feed their dogs with condemned offal which in effect, facilitate the maintenance of the perfect life cycle of *E. granulosus* and consequently high rate of infection of susceptible hosts (Jobre, 1996).

In Kindo Koysha Woreda, livestock rising is an important activity from which food and non-food commodities are produced. But the productivity remains very low due to lack of disease control and poor husbandry practice. And previously there was no any data on the study area to determine the prevalence of the disease and its rate in different organs. Hence, the objectives of this paper were:

- To determine the prevalence of hydatidosis
- To estimate economical loss associated with organ condemnation

## **2. MATERIALS AND METHODS**

### **2.1. Description of the Study Area**

The study was conducted in Kindo Koysha Woreda which is one of the 12 Woredas of Wolaita Zone in SNNPRs. Kindo Koysha Woreda is found in Wolaita Zone at about 37 Kilometers south west of Wolaita Sodo and 220km far from the regional city, Hawassa. It is located at 37<sup>o</sup>.14'E latitude and 7<sup>o</sup>.58 N longitudes. The area is bounded by Boloso Bombe woreda in the north, Offa Woreda in the south, Sodo Zuriya Woreda in the south east, Damot Sore woreda east and Kindo Didaye in the west. And the total area of Kindo Koysha Woreda is 17,187 hectare.

Based on the relationship between elevation and temperature, Kindo Koysha Woreda contains three agro-ecological zones Kolla 62%, Woina Dega 22% and Dega 16%, although there is no clear cut distinction between their boundaries. The mean amount rainfall ranging between 1200 mm and 2800mm and average temperature is 15<sup>o</sup> c – 35<sup>o</sup> c. There are both wet and dry seasons. Wet seasons runs from June to September and dry season's ranges from October to March.

However, in these dry seasons, there is small variable amount of rain especially through January. From March to May, there is a short rainy season which is locally called Belg rain. The major cropping seasons are two namely Belg and Meher.

As common in many parts of Ethiopia, agriculture is the main occupation of population in Kindo Koysha Woreda. It involves subsistence rainfall cultivation of crops and breeding of livestock. Agricultural is an ox-plough and traditionally which is supplemented by activities such as pottery,

carpenter and plantation of root crops and some fruit crops around their home. The dominant crops in the area coverage, production and consumers number in the study area are cereals, pulses and root crops such as maize, sorghum ,teffa, haricot bean, peas and root crops like inset, cassava , yam and sweet potatoes. With regard to livestock,horses, mules, donkeys, goats, sheep, cattle's and poultry are common.

The major livestock reared in this area are cattle, sheep, goat, donkey, horse and poultry. The number of animal population in this area estimated to constitute 90,437 cattle's, 17,986 goats, 10,252 sheep, 1,053 equine and 45,544 poultry.

## **2.2. Study Animals**

During the study period a total of randomly selected 384 animals were carefully inspected for the presence hydatid cyst at Bele Municipal abattoir. The study animals were all cattle brought from different parts of Kebeles to market.

## **2.3. Study Design**

A cross-sectional abattoir based survey was conducted from December 2017 to August 2017 on randomly selected cattle to investigate the prevalenceof hydatidosis infestation rate.

## **2.4. Sample Size Determination**

Sampling of study animals for the abattoir survey was conducted by randomized systemic sampling method. Determination of sample size was done according to Thrusfield (1995), by considering 50% expected prevalence and taking 95% confidence interval and 5% desired absolute precision( $d=0.05$ ). Accordingly, the calculated sample size was found to be 384.

$$n = \frac{(1.96)^2 P_{exp} (1 - P_{exp})}{d^2}$$

Where;  $n$ = required sample size

1.96 = the value of Z at 95% confidence level

$P_{exp}$ = expected prevalence (50%)

$d$ = desired absolute precision (5%)

Therefore, the sample size was 384 cattle

## **2.5. Study Methodology**

### *2.5.1. Data Management and Analysis*

#### *Ante-Mortem Examination*

Physical clinical examination of study animals was done prior to slaughter to record the breed, sex, age and body condition status of study examination according to De Launta and Habel, (1986) and animals were classified as young (< 5 yrs) or adult (> 5 yrs).The body condition of the animals were ranked as poor, medium and good.

#### *Post-Mortem Examination*

Important visceral organs (lung, liver, heart, and spleen) of all study animals were inspected by visual inspection, digital palpation and systematic incision to detect presence of hydatid cysts.

#### *Estimation of Financial Losses Due to Bovine Hydatidosis*

To estimate the economic losses associated to bovine hydatidosis, only direct losses associated to condemnation of locally usable visceral organs liver, lung, spleen, kidney and heart was considered.

#### *Data Management and Statistical Analysis*

The data collected from abattoir survey and physical evaluation of hydatid cysts was entered on to Microsoft Excel spreadsheets and analyzed using SPSS version 20. Associations between explanatory variables (age, sex, breed , body condition and peasant association score ) and prevalence was done by chi-square ( $X^2$ ) test.  $P < 0.05$  was set as cut point indicating significant variation (association) (Thrusfield, 2005).

### 3. RESULTS

An abattoir survey of hydatidosis was conducted in 384 cattle over the period from December, 2017 to August, 2017. Among the study animals, 375 (97.65%) cattle were indigenous breeds whereas 9(2.35%) were exotic and local cross breeds. Two hundred fifty (65.1%) of the animals were males while the remaining 134(34.9 %) were females. In addition, 115 (29.9%) were young and the remaining 269 (70.1%) were adult and 5 (1.3%), 115 (29.9%), 264 (68.8%) of the study animals had poor, medium and good body conditions, respectively.

#### 3.1. Prevalence of Hydatid Cyst Based on Sex Category

**Table1.** Prevalence of hydatid cyst based on sex category

Category	Examined	Positive	Prevalence (%)	$\chi^2$	p-value
Male	250	37	9.63	0.027	0.499
Female	134	19	4.94		
Total	<b>384</b>	<b>56</b>	<b>14.57</b>		

$\chi^2 = \text{chi-square}$

#### 3.2. Prevalence of Hydatid Cyst Based on Body Condition Scores

**Table2.** Prevalence of hydatid cyst based on body condition scores

Body condition	Examined	Positive	Prevalence (%)	$\chi^2$	p-value
Good	264	33	8.6	3.937	0.140
Medium	115	21	5.46		
Poor	5	2	0.51		
Total	384	56	14.57		

#### 3.3. Prevalence of Hydatid Cyst in Different Age Groups

**Table3.** Prevalence of hydatid cyst in different age groups

Category	Examined	Positive	Prevalence (%)	$\chi^2$	p-value
Young	115	12	3.13	2.268	0.086
Adult	269	44	11.44		
Total	<b>384</b>	<b>56</b>	<b>14.57</b>		

#### 3.4. Prevalence of Hydatid Cyst in Different Peasant Association

The study shows that there was significant variation in the prevalence of hydatid cyst in different peasant association ( $P < 0.05$ ).

**Table4.** Prevalence of hydatid cyst in different peasant association

Peasant Association	Examined	Positive	Prevalence	$\chi^2$	p-value
Hanaze	139	33	8.6	16.316	0.000
Gale	122	15	3.9		
BeleZuriya	123	8	2.2		
Total	384	56	14.57		

#### 3.5. Prevalence of Hydatid Cyst Based on Breed

**Table5.** Prevalence of hydatid cyst based on breed

Category	Examined	Positive	Prevalence (%)	$\chi^2$	p-value
Local	375	55	14.32	0.089	0.613
Cross	9	1	0.25		
Total	<b>384</b>	<b>56</b>	<b>14.57</b>		

### 3.6. Economic loss Assessment

#### Direct Economic Loss

**Table 6.** Direct economic losses associated with hydatid cyst in Bele municipal

Organ	No of organ condemned	Price per organ	Total price ETB
Lung	23	20	1020
Liver	19	300	5700
Total	<b>42</b>	<b>320</b>	<b>6720</b>

ETB- Ethiopian birr

## 4. DISCUSSION

This study revealed that bovine hydatidosis is a significant disease in Bele with the prevalence rate of 14.57% (n=384) which is a bit higher than studies conducted in Harar (11.3 %) by Buzuayehu *et al.*, (2013), Usually free access of dog and lack of proper removal of infections carcass. MizanTepi (11.26%) by Jemereet *et al.*, (2013), in Burdur (Turkey) 13.5% by Umur (2003) and in Thrace (Turkey) 11.6% by Esatgil, Tuzer (2007.)

However, this prevalence was lower than several studies conducted in South Wollo (17.95%) by Degefu and Damet (2013), in Arba Minch municipality abattoir (20.50%) by Tilahun and Terefe (2013), in Tigray municipality abattoir (22.98%) by Kebede *et al.* (2009) and in Jimma municipality abattoir (36.3%) (2013). This variation in prevalence of hydatidosis could be due to various factors of husbandry systems, hygiene differences, strains difference in *E. granulosus* that exist in different geographical situations, difference in culture, social activity and attitude to dog in study area.

The prevalence of hydatidosis in male animals (9.6%) found to be significantly moderate than the female animals (4.94%). Similar finding has been reported in Zambia by Banda *et al.*, (2013). This might be attributed to management practices of male and female cattle. Milking cow usually managed around homesteads for milking purposes which expose them to come in contact with infected dog. There was no statistical variation in prevalence rates between the different breed, body condition and age groups.

In the current study, the lung was the most frequently affected body organ 23 (5.6%) followed by liver 19 (4.5%) heart (0.781%) and spleen (0.26%). This could be due to the fact that liver and lung are the first large capillary fields encountered by the blood born onchosphere and the lungs have larger capillary bed than any other organ. This could account for the observed higher prevalence than seen in other organs.

No significant differences in hydatid cyst prevalence were observed between body conditions. However, higher prevalence was observed in cattle having good (8.6 %) than poor (0.51 %) body condition. The economic loss during the study period due to bovine hydatidosis at Bele municipality abattoir from organ condemnation was estimated to be 6720 ETB.

## 5. CONCLUSION AND RECOMMENDATIONS

From the present study, it can be concluded that hydatidosis was important parasitic diseases in condemnation of cattle organs slaughtered at Bele municipality abattoir. The lung and liver were the most frequently affected organs. The results indicated the presence of inappropriate disposal of condemned organs with hydatid cyst in the study areas and lack of regular deworming of dogs.

Recommendations:

- There should be proper disposal of organs with hydatid cyst
- Pet animal owners should be advised to deworm their animals

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