

**Research Paper**

**Prevalence of Hydatidosis of Cattle Slaughtered at Adigrat Municipal Abattoir, Ethiopia**

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**ABSTRACT**

**Aim:** To determine prevalence and associated risk factors of hydatidosis and to assess burden and size of cysts in cattle slaughtered at Adigrat municipal abattoir.

**Study Design:** Cross - sectional study

**Place and duration of the study:** Adigrat municipal abattoir, Ethiopia, between September 2012 and February 2013.

**Methodology:** A total of 360 cattle slaughtered were selected randomly and subjected to ante and post mortem examination. During ante mortem examination age, sex, body condition and breed of each cattle was recorded. During post mortem examination each visceral organ were inspected by visual inspection, palpation and incisions.

**Result:** Out of the total examined cattle, 67 (18.61%) were infected with hydatidosis. A significant higher infection was detected in above five years (14.17%) ( $\chi^2 = 15.593$ ,  $P = .000$ ) than below five years (4.44%). Regarding body condition, highest prevalence (11.94%) was in poor followed by medium and good body condition scores 4.44 % and 2.22%, respectively ( $\chi^2 = 124.894$ ,  $P = .000$ ). However, no significant variation ( $\chi^2 = 4.077$ ,  $P = .13$ ), was observed with related to breed of cattle. From the total examined cattle, 38 (10.56 %) have hydatid cyst in their lungs, 16 (4.44%) in livers, 4(1.11%) in heart, 3 (0.83%) in spleen, 2(0.56%) in kidney and 4 (1.11%) in multiple organs. From the total 202 hydatid cysts recovered, 50.49% were small, 27.23% medium and 22.28% large sized cysts. Concerning cyst size distribution in different organs, higher numbers of medium and large sized cysts were found in lung, while highest numbers of small sized cysts was in liver.

**Conclusion:** Hydatidosis is one of the most important zoonotic diseases in the study area. Therefore, it is necessary to design appropriate strategy for prevention and control.

**Keywords:** *Adigrat abattoir, Cattle, Ethiopia, Hydatidosis, Risk factors, Prevalence, Burden, Cyst size*

**1. INTRODUCTION**

Hydatidosis or Cystic Echinococcosis (CE) is a chronic zoonotic disease, name given to a condition due to infection with the larval stage (hydatid) of the dog tapeworm *Echinococcus granulosus* (*E.granulosus*) [1]. CE requires two vertebrate hosts to uphold the lifecycle [2]. Dogs are the primary definite host for the parasite while livestock and human are intermediate hosts [3]. Hydatidosis occurs throughout the world and causes considerable economic losses and public health problems in many countries [4, 5]. The disease cause decreased livestock production and condemnation of offal containing hydatid cysts in slaughter houses. Despite the large efforts that have been put in to the research and control of hydatidosis, it remains endemic in livestock rearing area of the world and is inflicting public health problems in the Middle East, Mediterranean, Central and South America, Asia and Africa including Ethiopia [6 - 10]. Several reports from different parts of Ethiopia indicated that hydatidosis is highly

prevalent and leads to huge economic losses [9-15]. However, the prevalence of hydatidosis with respect to host related risk factors is limited in Adigrat. Therefore, this study was undertaken to determine prevalence and associated risk factors of hydatidosis and to assess the burden and size of cysts in cattle slaughtered at Adigrat municipal abattoir.

## 2. MATERIALS AND METHODS

### 2.1 Study area

The study was conducted from September 2012 February 2013 at Adigrat municipal abattoir. Adigrat town is located in Tigray regional state of Ethiopia, which is situated 921 km north of Addis Ababa, capital city of Ethiopia and 138 km from Mekelle city, capital city of Tigray regional state. It is found at 014°16'34" N latitude and 039°27'51"E longitude and its altitude ranges from 2000 to 3000 meter above sea level. The mean annual rain fall of the study area is 400 to 600mm and the annual minimum and maximum temperature is 6°C and 21.8°C, respectively. Agriculture is the main occupation of the population of the area and their agricultural activity involves both cattle and crop production.

### 2.2 Study Animals

The study animals were cattle brought to the abattoir for slaughter from districts around Adigrat town such as Ganta Afeshom, Erob, Atsbi-Wenderta, Saese-Tsaeda Amba and Hawzen. The study animals constitute local, barka and exotic/cross breeds. All slaughtered animals were male.

### 2.3 Sample Size Determination

The required sample size was estimated using formula described by Thrusfield [16] as follows:

$$n = \frac{z^2 p(1 - p)}{d^2}$$

Where, "n" is required sample size, "Z" is standard value, "P" is expected prevalence and "d" is desired absolute precision. At 95% confidence interval Z=1.96 and d = 5%. The reported prevalence of hydatidosis in the study area was 20.3 % [9].

$$n = \frac{(1.96)^2 (0.2 \times 0.8)}{(0.05)^2} = 246$$

However to increase the level of accuracy of determining the prevalence the sample size was increased to 360 cattle and study animals were selected using random sampling method.

### 2.4 Study Design

A cross sectional study was conducted to determine prevalence and associated risk factors of hydatidosis and to assess burden and size of cysts in cattle slaughtered at Adigrat municipal abattoir.

## 2.5 Study Methodology

Regular visits (two days per week) were made to conduct ante and post mortem examination of slaughtered cattle. During ante mortem examination age, sex, breed and body condition of each animal was recorded. The age of the animals was determined on the basis of the dentitions as described by Kelly [17] and two age groups were considered; below and above five years. The body condition scoring was done according to Nicholson and Butter Worth [18] and classified in to three categories as poor, medium and good. Since almost all the cattle presented to slaughtering in the study area were male, infection prevalence regarding sex variation was not included. During post mortem examination each visceral organ particularly the liver, lung, heart, kidney and spleen were systematically inspected by visual inspection, palpation and incisions for the presence of hydatid cyst [19] and total numbers of hydatid cysts were collected and counted per infected organ. After that size of the cysts was measured using a ruler and classified as small cyst (< 5cm), medium (5-10cm) and large (> 10cm) [20, 21].

## 2.6 Statistical Analysis

Collected data were coded and stored in to Microsoft excel and analyzed by using SPSS version 16. Descriptive statistics were computed. The prevalence was calculated as the number of positive samples divided by the total number of examined samples. Chi-square ( $\chi^2$ ) test was used to evaluate the association of different host related factors such as age, body condition and breed of cattle with prevalence of hydatidosis and  $P$  value < .05 was considered as significant.

## 3 RESULTS

### 3.1 Prevalence of hydatidosis

Out of the total 360 cattle slaughtered and examined at Adigrat municipal abattoir, 67 (18.61%) were found to be infected with one or more hydatid cysts involving different visceral organs. Infection prevalence of hydatidosis was correlated with age group and body condition score of cattle. Rate of infection of hydatidosis with respect to age group showed that higher prevalence was in cattle above five years (14.17%) than in below five years (4.44%) ( $\chi^2 = 15.593$ ,  $P = .000$ ) and with respect to body condition of cattle, highest prevalence (11.94%) was in poor body condition followed by medium and good body condition scores 4.44 % and 2.22%, respectively ( $\chi^2 = 124.894$ ,  $P = .000$ ). However, no significant variation ( $\chi^2 = 4.077$ ,  $P = .13$ ), was observed with related to breed of cattle (Table 1).

**Table 1. Prevalence of hydatidosis based on host related risk factors in cattle in Adigrat abattoir**

| Risk factor    | No of examined | Number(%) infected | $\chi^2$ | P -value |
|----------------|----------------|--------------------|----------|----------|
| Age            |                |                    |          |          |
| < 5 years      | 164            | 16 (4.44)          | 15.593   | .000     |
| > 5 years      | 196            | 51 (14.17)         |          |          |
| Body condition |                |                    |          |          |
| Poor           | 64             | 43 (11.94)         |          |          |
| Medium         | 120            | 16 (4.44)          | 124.894  | .000     |
| Good           | 176            | 8 (2.22)           |          |          |
| Breed          |                |                    |          |          |
| Barka          | 53             | 7(1.94)            | 4.077    | .13      |
| Exotic/cross   | 29             | 9(2.5)             |          |          |
| Local          | 278            | 51 (14.17)         |          |          |

**3.2 Cyst count and size determination**

From the total examined cattle, 38 (10.56 %) have hydatid cyst in their lungs, 16 (4.44%) in livers, 4(1.11%) in heart, 3 (0.83%) in spleen, 2(0.56%) in kidney and 4 (1.11%) in multiple organ as mixed infection (Table 2). From the total 202 hydatid cyst recovered, 102(50.49%) were small, 55(27.23%) medium and 45(22.28%) large sized cysts (Table 3). Distribution of cysts based on size in different organs showed that higher numbers of medium and large sized cysts were found in lung, while highest numbers of small sized cysts was in liver.

**Table 2: Prevalence of hydatidosis in different organs of cattle slaughtered in Adigrat abattoir**

| Organ        | No of examined | No of infected | (%)   |
|--------------|----------------|----------------|-------|
| Lung         | 360            | 38             | 10.56 |
| Liver        | 360            | 16             | 4.44  |
| Heart        | 360            | 4              | 1.11  |
| Kidney       | 360            | 2              | 0.56  |
| spleen       | 360            | 3              | 0.83  |
| Lung & liver | 360            | 3              | 0.83  |
| Lung & heart | 360            | 1              | 0.28  |
| Total        | 360            | 67             | 18.61 |

**Table 3: Distribution of cysts based on size in different organs of cattle in Adigrat abattoir**

| Organ  | No (%) small cyst | No (%) medium cyst | No (%) large cyst | No (%) total cyst |
|--------|-------------------|--------------------|-------------------|-------------------|
| liver  | 62(83.78)         | 8(10.81)           | 4(5.4)            | 74(36.63)         |
| lung   | 33(28.95)         | 43(37.72)          | 38(33.33)         | 114(56.44)        |
| spleen | 3(50)             | 2(33.33)           | 1(16.67)          | 6(2.97)           |
| Heart  | 2(50)             | 1(25)              | 1(25)             | 4(1.98)           |
| Kidney | 2(50)             | 1(25)              | 1(25)             | 4(1.98)           |
| Total  | 102(50.49)        | 55(27.23)          | 45(22.28)         | 202 (100)         |

## 4 DISCUSSION

The overall prevalence (18.61%) recorded in this study was comparable with previous studies conducted in the same study abattoir (20.3%) by Kebede et al. [9], in Mekelle (17.5%) by Gebremeskel and Kalayau [22], in Wolayita Soddo (16.85%) by Bekelle and Butako [11], in Gondar (17.3%) by Genet et al. [23], in Addis Ababa (19.7%) by Fikire et al. [12], in Wollo (17.5%) by Alemu et al. [13], in Dire Dawa (20.05%) by Miheret et al. [15]. However, it was higher than the prevalence of 7.5% in Shire abattoir by Kebede et al. [9], 6.8% in Modjo luna export abattoir by Daniel et al. [24], 11.26% in Mizan Teppi by Jemere et al. [14], in Mekelle Abergelle export abattoir (11.6%) by Yitbarek et al. [25], 2.1% from Zambia by Fredrick et al. [26], 6.99% from Iran by Ahmadi and Meshkehkar [27], 2.8% from Sudan by Sahar Adam and Atif Elamin [28] and 10.6% from Morocco by Azlaf and Dakkak [5].

The prevalence in this study was lower than the studies carried out by Gebretsadik [29], Ernest et al. [30], Regessa et al. [31], Getaw et al. [32], Fromsa and Jobre [33], and Terefe et al. [21] who reported 32.1, 48.7, 52.69, 46.8, 72 and 40.5%, respectively. The possible explanation for such variation in prevalence of hydatidosis may be due to strains of *E. granulosus* distribution [34]. On another way this variation could attributed to different livestock management system, backyard slaughtering of cattle, un appropriate removal of infectious carcass and keeping of animals in close relation with dogs [35]. In most rural communities dogs, which are the primary factor for the disease transmission are used as guards. A study conducted in Iraq revealed that the prevalence of *E. granulosus* worms in the intestines of dogs was found 49.5% [36] and Mehraban et al. [37] reported two - to- several thousand of *E. granulosus* worms from infected dogs from Iran. Similarly dogs were examined in Ambo municipal abattoir, 25% of them harbours to *E. granulosus* worms in their intestine [10]. The abattoir in which the present study has been conducted is not fenced and large numbers of dogs visit the abattoir to feed the offal which deemed unfit for human consumption [personal observation].

The prevalence of hydatidosis in this study shows significance association with age and body condition scores of the cattle. However, there was no significance association with breed of the cattle. Animals above five years of age were highly infected. This finding is in agreement with the reports of Endrias et al. [10], Reregassa et al. [31], Genet et al. [23], Miheret et al. [15], Endalew and Nuraddis [38]. This could be mainly due to their longer exposure to *E. granulosus* and to lower immunity against the infection. In addition, the reason for lower prevalence in below five years cattle may be early culling of the infected young cattle through slaughtering before they reach old age. Animals with poor body condition were also highly infected with hydatidosis. This is similar with previous studies [12, 15, 29, 39]. This could be due to the retarded growth, weight loss and moderate to severe infection in such animals [40].

The given result indicated that the occurrence of hydatid cyst was highest (10.56%) in the lungs than other organs. Similar findings were reported from different part of Ethiopia [13, 14, 21, 29, 38, 39] and from other countries, Anwar et al. [41] from Pakistan, Islam et al. [42] from Bangladesh and Ahmadi and Meshkehkar, [27] from Iran. However, according to Yitbarek et al. [25], Miheret et al. [15] and Jarjees and Al-Bakri [43], the most affected organs were livers. This might be due to the fact that cattle are slaughtered at older age, during which period the liver capillaries are dilated and most cysts directly pass to the lung. Additionally, it is possible for the hexacanth embryo to enter the lymphatic circulation and be carried via the thoracic duct to the heart and lungs in such a way that the lungs may be infected before or instead of liver [34].

The study revealed that out of the total recovered cysts, the highest cysts was small sized followed by medium and large sized cysts, respectively. Regarding distribution of cysts based on size in different organs, higher numbers of medium and large sized cysts were found in lung, while the highest numbers of small sized cysts in liver. This result is in agreement with other studies conducted by Endrias et al. [10], Bekelle and Butaka [11], Fikire et al. [12], Miheret et al. [15], Getaw et al. [32] and Melaku et al. [39]. The higher proportion of small sized cysts in this study may indicate infection of animals as a result of heavy rain fall and continuous grazing in the past rainy seasons or due to immunological response of the hosts which might have reduced the expansion of cyst size [44]. In addition to that, it might be due to the case in which the infected cattle are slaughtered before the cysts become larger in size. The reason for higher numbers of medium and large sized cysts in the lung is may be due to softer consistency of the lung.

## 5 CONCLUSION

The prevalence of hydatidosis in cattle slaughtered at Adigrat municipal abattoirs is high and this showed that hydatidosis is one of the most important zoonotic disease in the study area. Therefore, the zoonotic impacts of hydatidosis which deserves serious attention by the communities in order to reduce losses and safe guard the public health. Establishment of policy on dog keeping, treatment and elimination of stray dogs and promoting construction of abattoir with their appropriate disposal pits in the study area are highly essential. Further studying on economic loss due to hydatidosis in cattle and cysts fertility and viability for understanding the potential public health hazard in humans are recommended.

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## COMPETING INTERESTS

Authors declare that they have no competing interest.

## AUTHORS' CONTRIBUTIONS

This study was conducted in collaboration of both authors. Author Alembrian was designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author Haylegebriel managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

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