A purposive study was conducted from November 2011 to April 2012 with the objective of determining the characteristics of hydatid cysts and to assess the current status of economic losses of hydatidosis in cattle slaughtered at Adama municipality abattoir. Hydatid cysts were characterized on the basis of their size, fertility and viability. Routine meat inspection procedure was conducted on organs namely lung, liver, kidney, heart and spleen involving visualization and palpation to detect the presence of hydatid cysts. Out of the total of 2276 hydatid cysts counted, 1126 (49.5%), 913 (40.1%) and 237 (10.4%) were found to be small, medium and large size respectively. Out of the total of 300 cysts examined for the fertility test, 29 (9.6%), 188 (62.6%) and 83 (27.6%) were found to be fertile, sterile and calcified respectively. The rate of cyst calcification was higher in the liver than in the lung while fertility rate was higher among the cysts of the lung. The direct financial loss during the study period was 8,749 ETB. This result was assessed from the mean retail market price of each organs multiplied by the total number of organs condemned at Adama abattoir during the study period.
infection in intermediate hosts like sheep, cattle, goat, pig, etc is typically asymptomatic. In intermediate host, hydatid cyst found in the liver or lung is usually tolerated without any clinical signs and the majority of infections are only detected at the abattoir [6].

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 growth and performance, reduced quality and yield of meat, milk or wool [7].

The life cycle of Echinococcus 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 [8].

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 vanule, 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 metacestode stage (hydatid cyst [9].

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 tapworm, approximately four to six weeks after infection, depending on the species and strain, and on the susceptibility of the host [6].

In Ethiopia, hydatidosis is one of the major infectious zoonotic diseases especially where sheep, goat, cattle, camel and pig are slaughtered traditionally and offals are easily accessible to scavenging dogs and wild carnivores. About 85% Ethiopian population are rural inhabitant and mostly practiced backyard slaughtering with improper disposal of affected organ with hydatid cyst. As a result, stray dog have a free accesses to infected organs of slaughtered animals. The absence of proper meat inspection procedures, presence of large population of stray dogs and lack of public awareness about the disease contribute significantly to the high prevalence of the disease in Ethiopia.

Therefore, the objective of this study was to assess the characteristics of hydatid cysts in Adama municipality abattoir.

Materials and Methods

Study area

The study was conducted in Adama district, East Shoa zone of Oromia Regional State which is located about 94 km East of Addis Ababa with an altitude of about 1850 meters above sea level. The main rain season is from June to September with an average annual rainfall 800 ml. the annual average temperature ranges from 12.3oc with an average of 17.7oc and highest temperature is reached in May [10].

Adama is one of the most populous from the regional states and is located at an important multi directional trade route. Farmers around the town are practiced a mixed crop–livestock farming system. The numbers of livestock on the basis of species are 70,662 cattle, 36,142 sheep and 42,968 goats. The town has one municipality abattoir, the sanitary facilities such as water and electricity supply and removal of effluent are minimal and the working environment in the abattoir is not conducive for proper meat inspection. Drainage is not good and carcass is dragged on unhygienic floor to transfer from one section to the other. The abattoir is giving local community service rather than exporting meat and meat products and its design is the old fashioned pattern and badly designed system. Each day on average 50 heads of cattle originate from Arsii, Harar, Bale, Borana and Adama are slaughtered in the abattoir starting from mi night [11].

Study animals

The study was undertaken on both sexes of local breeds of cattle and on some exotic breeds brought from different agro ecologic zones of Ethiopia that were slaughtered at Adama municipality abattoir. Most of cattle’s slaughtered at the abattoir were adult males of local breeds. A few exotic females were culled due to old age, poor performance and reproductive problems were also slaughtered.

Sample size determination

The sample size for the study was determined according to the method described by [12]. Considering 95% confidence interval at a desired accuracy level of 5% and with expected prevalence of 29% [13] and hence, a total of 316 positive animals were included in this study.

Study Design and Methodology

Cross sectional

A cross sectional study was performed to assess the characteristics of hydatid cyst in Adama municipality abattoir through meat inspection conducted on 316 positive cattle’s during the study period from November 2011 to April 2012.

Anti-mortem inspection

A study was made for anti-mortem inspection on individual animals for assessment of animal origin, body condition and age determination. During anti-mortem inspection each of the study animal was given an identification number based on enumerates mark on its body tagged before slaughter.

Post mortem inspection

During post mortem inspection procedure was conducted on organs namely lung, liver, kidney and spleen involving visualization and palpation to detect the presence of hydatid cysts. Number of hydatid cysts that were found per organ and
Results of fertility and viability tests on hydatid cysts from cattle were carried out in the veterinary parasitology laboratory of the school of veterinary medicine and the cysts were transported using ice box to determine the fertility and viability of the cysts.

Cyst characterization

Cyst size: The size of the hydatid cyst was measured and classified as small if the diameter is less than 4 centimeter, medium if the diameter is between 4 centimeter and 8 centimeter and large if the diameter is greater than 8 centimeter [14].

Cyst fertility: Presence or absence of protoscoleces in hydatid fluid was assessed and cysts are classified as fertile and infertile respectively. Fertile cysts were subjected to viability test. A drop of sediment containing the protoscoleces was placed on the microscopic glass slide and a drop of 0.1 % eosin solution was added to protoscoleces in hydatid fluid on microscopic slide and covered with cover slip and then examined under a high power microscopy (40x) with the principle that viable protoscoleces should completely or partially exclude the dye while the dead ones take it up [15].

Direct financial loss assessment

Organ condemned due to hydatidosis was properly recorded then; the total number of organ condemned was multiplied by retail market price of each organ (Ethiopian birr). Accordingly, the direct economic loss assessment due to hydatidosis was measured.

All livers, lungs, hearts, kidneys and spleens which were positive for hydatidosis, were totally condemned. The total annual economic losses associated with condemnation of these organs due to hydatidosis was assessed according to standard method described by [16].

Data analysis

Data collected from anti-mortem and laboratory findings were entered into Ms-Excel program (Microsoft Corporation, USA) and the data was analyzed using SPSS (Statistical Package for Social Science) 15 version. One way ANOVA was used to determine the association between the dependent and independent variables.

Results

Cyst characterization

Over all 2276 hydatid cysts were encountered in 316 cattle slaughtered at Adama abattoir. Out of these 237 (10.4%) were large sized, 913 (40.1%) were medium sized and 1126 (49.5%) were small in size. The results of occurrence of cyst of different size in different organs are presented in (Table 1). Cyst size have significant association with organ, age and body condition (p<0.05) but no significant association with origin of the animal at (p>0.05). The highest proportions of large cysts were observed in lung.

In this study, 300 cysts were collected from different infected organs and subjected to fertility and viability tests. Of these 29 cysts (9.67%) were fertile cysts, while the remaining ones were non fertile. Of the fertile cysts 18 (6%) were viable and 11 (3.6%) were nonviable. Fertility has significant association with age and organ (p<0.05). The highest proportions of fertile cysts were observed in lungs while highest proportions of calcified cysts were observed in liver (Table 2).

Direct financial losses

The average annual numbers of slaughtered cattle at the Adama abattoir were 18,000. Due to cattle hydatidosis lung, liver, kidney and spleen were condemned during the study period with an economic loss of 3970 ETB, 45 ETB, 4 ETB and 10 ETB respectively. This result was assessed from the mean retail market price of each organs multiplied by the number of organs condemned during the study period. Annual financial losses were estimated by considering annual slaughter rate of cattle and percentage of hydatidosis per each organ and current market price. The overall estimated financial loss due to hydatidosis in Adama abattoir was 496,340.16 ETB Per year (Table 3).

Discussion

The present study showed that overall 2276 hydatid cysts were encountered out of these 10.4 % were large, 40.1 % medium and 49.5% small in size. Out of this 300 cysts were taken for laboratory test, 6% were viable, 3.6% sterile and 27.6% were calcified. The variation of results among different workers is probably due to difference in sample size, age of slaughtered animals and strain of E.granulosus.

The characterization of hydatid cysts were obtained from different studies was: 48.7% were small, 34.3% medium and 17.1% large size, 9% viable,1.8% nonviable, 20.4% sterile and 21.3% calcified [17], 40% were small, 9.17% medium and 3.55% large, 71.43% viable, 28.5% nonviable, 73.4% sterile and 24.66%

| Organ | No of cyst Examined | Large | Medium | Small | Total |
|-------|---------------------|-------|--------|-------|-------|
| Lung  | 1888                | 210   | 802    | 827   | 1888  |
| Liver | 378                 | 26    | 106    | 287   | 378   |
| Heart | 3                   | 0     | 0      | 3     | 3     |
| Kidney| 2                   | 0     | 0      | 1     | 2     |
| Spleen| 5                   | 1     | 20     | 80    | 5     |
| Total | 2276                | 237   | 913    | 205   | 2276  |

| Organ | Total nox cysts examined | viable | % Fertile | % Sterile | % Calcified | Total |
|-------|--------------------------|--------|-----------|-----------|-------------|-------|
| Lung  | 194                      | 16     | 8.2       | 6         | 3.1         | 158   |
| Liver | 96                       | 2      | 2.1       | 5         | 5.2         | 20    |
| Heart | 3                       | 0      | 0         | 0         | 3           | 100   |
| Kidney| 2                       | 0      | 0         | 0         | 0           | 100   |
| Spleen| 5                       | 0      | 0         | 0         | 5           | 100   |
| Total | 300                      | 18     | 10.3      | 11        | 8.3         | 188   |

Citation: Belachew T, Abay M, Gunse T (2019) Bovine Hydatid Cyst: Prevalence, Characterization, Public Health and Economic Importance at adama Abattoir, Central Ethiopia. Int J Vet Sci Res 5(1): 014-018. DOI: http://dx.doi.org/10.17352/ijvsrc.000035
Table 3: Financial loss assessment in cattle due to hydatid cyst at Adama abattoir during the study period.

| Organ      | No of organ Condemed | Price per organ | Total price (ETB) |
|------------|-----------------------|----------------|------------------|
| Lung       | 307                   | 10             | 3070             |
| Liver      | 112                   | 50             | 5600             |
| Heart      | 3                     | 15             | 45               |
| Kidney     | 2                     | 12             | 24               |
| Spleen     | 5                     | 2              | 10               |
| Total      | 429                   |                | 8749             |

calcified (Habtamu, 2010)[12], 68.3% sterile, 22.6% calcified and 9.1% fertile [18], 84.96%, 10.27% and 4.77% were small, medium and large size respectively, 61.47%, 0.92% and 37.61% were sterile, fertile and calcified cysts respectively [19], 77.3% were small, 12.4% medium and 10.3% large, 25.7%,33.3% and 41.1% were fertile, sterile and calcified cysts respectively [20], 39.4% were small, 15.5% medium and 7.9% large , 39.8% sterile and 54.2% were viable among fertile cysts [21].

The result of the current study indicate that the rate occurrence small size cysts is higher than the occurrence of medium and large size cysts; this is in agreement with [13,17,19,20] and (Fikre, 1999). The higher proportion of small size cysts may indicate infection of animals as a result of heavy rain fall and continuous grazing in the past rainy season or due to immunological response of the host which might have reduced the expansion of cyst size. Moisture and rain fall favor the survival of eggs of E. granulosus species and at the same time eggs may get chance to be disseminated by flood [25–27].

The rate of occurrence of fertile cysts that are found in the current study is agree with [17,18], disagree with [13,21]. The variation of results among fertility may be due to difference in geographical location, nature of infected host and the site of infection. The result of the present studyrevealed that lung is the most common organ which harbored fertile cysts. This result is similar to other workers such as [28]. It has been stated that the relatively softer consistency of the lung allow easier development of cyst; and fertility of hydatid cysts may show a tendency to increase in advanced age of the host. This may also be to reduction in immunological compatibility of hosts at their old age of infection [29].

Animal with more than 5 years of age were highly affected. The difference in infection rate could be mainly due to longer exposure time to E.granulosus. This finding is similar to the finding of [21]. Most of slaughtered animals at Adama abattoir were old and hence they were exposed to the disease (parasitic ova) over a long period with an increasing possibility of acquiring the infection. In addition, the wide spread tradition of offering un cooked infected offal to pet animals around home stead, poor public awareness about the disease, the absence of fencing and disposal pits for slaughtered houses (where dog and other carnivores get an easy access) and the habit of disposing dead wild or domestic animals, un buried and left open for scavenging carnivores creates favorable condition for environmental contamination by Echinococcus granulosus by maintaining the life cycle in stray dogs and wild carnivores.

In this study, high economic loss was incurred due to hydatid disease with an estimated annual loss of 496,340.16 ETB in cattle industry per year. This finding is disagree with [13] who reported the annual economic loss of 215,588.17 ETB in the same study area. Previous workers also estimated the annual financial losses associated with hydatidosis from other parts of the country. For example, [30] reported financial losses of about 813,526.46 ETB from DebreZeit abattoir; [31] estimated annual financial losses of 90,646.95 ETB from Gonder; [32] reported financial loss of 131,190.45 ETB from Jimma and [33] reported financial loss of about 77,587.02 ETB attributable to hydatidosis from Nekemte abattoir. The result obtained in this study varies from the others which may be due to number of animals slaughtered and variation in the retail market price of the affected organs [34].

Conclusion and Recommendations

Echinococcosis or hydatidosis is a disease of considerable importance from both public and economic importance point of view. The present study has shown that bovine hydatidosis is a major cause of organ condemnation at Adama abattoir. This is relatively higher prevalence of hydatidosis and the associated economic losses calls for serious attention. Therefore; the following recommendation is forwarded:

Stray dogs should be eliminated from pastures and places of slaughter and persons who own dogs should be advised to confine their dogs within their premises to reduce the rate of contamination of the pasture with the eggs of the parasite.

Prohibit back yard and road side slaughter activities, and construction of fenced abattoirs in towns and villages controlled by properly trained meat inspector.

Public should be aware about the rout of infection, to maintain personal hygiene, especially to wash hands after handling dogs and their feces.
Further detailed investigation in to the basic local epidemiological factors governing the spread of hydatidosis must be carried out in the region to establish regional control strategy.

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