Prevalence and Economic Significance of Bovine Hydatidosis
(Study in Janamora Wereda, Ethiopia)

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Abstract:
A cross-sectional study was conducted from January 2017 to October 2017 in Janamora Wereda. The objectives of this study are to determine the current prevalence rate of hydatidosis in cattle and to determine the direct and indirect economic losses due to the diseases. Hydatid cyst count and characterization were conducted based on routine meat inspection procedure. During study period ante mortem and postmortem inspection was conducted from a total of 441 slaughtered animals examined, 598 hydatid cyst found and out of these 434 (72.57%) of them had hydatid cyst in lung, 157 (26.25%) of in the liver, and 7 (1.17%) in the heart. With regards to the origin Mekane Birhan 51.72%, Deresgie 45.45%, Chiroleva 30.26%, Asenga 28.23%, Denkolako 25%, Rob Gebeya 19.39% and Gasha Jagrie kebele 0%. During this study there is no constructed abattoir in Janamora Wereda. Slaughtering animals occurred in illegal places such as road side, in the river, on the school, church side etc. This traditional slaughtering habit exposed animals and human for many diseases additional to hdatidosis. The socio cultural and ecological factors supporting the maintenance of the life cycle of the parasite were discussed and recommendations for control were forwarded.

Keywords: Prevalence; Hydatidosis; Economic Losses; Bovine; Janamora Wereda.

1. INTRODUCTION
Diseases of livestock are caused by either microorganisms or parasitic infestation. Parasitic diseases in the tropics are responsible for greater losses to the meat industry than any other diseases [1]. Similarly like many other tropical African countries, it is well known that parasitic diseases are among the major factors responsible for the low productivity of livestock in Ethiopia [2],[3].These infestations not only cause clinical diseases and mortalities but also cause economic losses due to condemnation of carcass and specific organs at slaughter [4].
Echinococcal disease is caused by infection with the metacestode stage of the Tapeworm Echinococcus, which belongs to the family Taenidae. At present four species of Echinococcus recognized, namely; Echinococcus granulosus and Echinococcus multilocularis are the most common, causing cystic echinococcosis (CE) and alveolar echinococcosis (AE), respectively [5].

In Ethiopia haydatidosis is one of the major infectious zoonotic diseases especially where sheep, goat, cattle and pigs are still slaughtered traditionally and offal’s are easily accessible to scavenging dog, and other wild carnivores. Factors like absence of proper meat inspection procedures, poor management of food animals, traditional practices of back yard farming system, lack of awareness about food borne diseases, the presence of large stray dog population, Economic losses due to liver and lung condemnation and carcass weight loss as a result of haydatidosis have also been reported in different parts of Ethiopia [6].

Hydatid cyst in intermediate hosts occur most frequently in livers and lungs, but they can also develop in other internal organs including the central nervous system, the skeletal muscles and in the marrow cavity of bones, so that hydatidosis in food animals is detected by performing postmortem examination of visceral organs such as liver, lungs, and other organs [7].

Therefore, the objectives of this study is
1) To determine the current prevalence rate of hydatidosis in cattle.
2) To determine the direct and indirect economic losses due to the diseases.

2. MATERIAL AND METHODS
2.1. Study area
Janamora Wereda is located in North Gondar Zone of Amhara region, at the latitude and longitude of 12°59’N 38°07’E at a distance of about 180km from Gondar town. Janamora Wereda is well-known with Semien mountain National Park, Ras Dashen i.e the highest point in Ethiopia and it is a home to a number of endangered species including the Ethiopian Wolf, waliya ibex, and a wild goat which no found in elsewhere in the world. The area has an altitude range of 2900 meters above sea level. The region is marked by numerous mountains, hilly, and sloppy areas, plateaus, rivers, and many streams. Livestock population of the area comprises 100,386 cattle, 32,975 sheep, 131,041 goats, 2,540 horses, 634 mules, 7758 donkeys, 119,347 poultry [8].

The farming system of the study area is characterized by a mixed crop-livestock production system. Transhumance, from the highlands to western lowlands, is practiced as an important strategy to secure grazing resources for the highland livestock during the dry season of the year. In the case of the lowlands, crop farming is not as intensive as high and mid-highland areas and livestock has larger contributions to the farmer’s livelihoods [8].

The study animals are cattle which is slaughter in Janamora Wereda that has been bought in the Market. The market is found within Janamora kebeles such as Mekane Birhan, Deresgie, Chiroleva, Asenga, Denkolako, Rob Gebeya, and Gasha Jagrie Kebeles. During sample collection, there was a big difficult condition that is Janamora Wereda has no slaughter house. People make slaughter animals illegally in different places.

2.2 Study Animals and Sample size
The study animals are cattle which is slaughter in Janamora Wereda that has been bought in the Market. The market is found within Janamora kebeles such as Mekane Birhan, Deresgie, Chiroleva, Asenga, Denkolako, Rob Gebeya, and Gasha Jagrie Kebeles. Simple random sampling method was used for sampling and using the 95% confidence interval the sample size were determined by the formula:

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

Where;  
- \( n \): required sample size
- \( P_{exp} \): expected prevalence
- \( d \): desired absolute precision [9].
The expected prevalence rate of hydatidosis in Janamora Wereda is 24.3 % [6]. As stated above the Confidence interval chosen was 95% so that d=5%. By substituting the values in the formula the required. Sample size was calculated to be 272, but 441 cattle were sampled so as to increase the precision of the study.

2.3. Study Design
A cross sectional study was conducted from January 2017 to October 2017 in Janamora Wereda. To estimate the prevalence of bovine hydatidosis meat inspection was conducted. During ante mortem examination each study animal was given an identification number and age, sex, breed and origin of animal was recorded. The age was determined based on dentations and owner information. The association of body condition scoring and hydatid cyst count will be analyzed. Body condition of animals will be classified in to three as poor (score 1, 2 and 3), medium (score 4, 5 and 6) and good (score 7, 8 and 9) [10]. During the meat inspection was carried out on different organs of each of slaughtered animal, particularly lung, liver, spleen, kidney, heart and the muscle was occurred. Each organ was accessed macroscopically either by visual inspection or palpation and where necessary one or more incisions was made in order to detect small hydatid cysts. The infected organs from each positive animal was collected and recorded. The total number of hydatid cysts was counted and recorded per infected organs. The cyst counts were recorded in correspondence with body condition scoring. The size of the diameter of collected hydatid cyst was measured and classified as small (diameter less than 5cm), medium (diameter between 5 cm and 10 cm) and large (diameter greater than 10 cm) [11].

2.5. Prevalence study
Hydatidosis that is responsible for the condemnation of organs was registered and the prevalence will be estimated based on the total number of animals slaughtered.

2.6. Assessment of economic losses
The annual economic loss from hydatidosis in cattle was estimated based on the direct losses from cost of offal condemned and from carcass weight losses.

2.7. Data analysis
Data obtained in the study was subjected to Pearson’s chi-square statistical analysis and Fisher Exact Test for possible significance difference between rejection rates of specific organs. The total prevalence was calculated by dividing the number of hydatidosis positive animals by the total number of animals examined.

3. RESULT
3.1. Prevalence of Hydatidosis
The prevalence of hydatidosis in cattle slaughtered in Janamora Wereda was found to be 27.7% during the study period. From the total of 441 animals examined the infection rate on the basis of body condition score 151 were poor body condition and 290 medium body condition. Out of 151 poor body condition 70(17.9%) were positive and out of 290 medium body condition 52 (46.35%) were found positive at P=000 ($X^2 = 40.097$) that indicate significance difference. The distributions of hydatid cyst based on breed were significance difference both in local and cross breed. From the total of 441 animals examined 433 are local and 8 are cross. Out of 433 local breed 177 (27.02%) were positive and 8 are cross breed 5 (62.5%) were positive P=0.040 ($X^2 = 4.941$). The prevalence of hydatidosis in different areas from where animals brought to the slaughting area is the highest prevalence observed from cattle of Mekane Birhan 51.72% & followed by Deresgie 45.45%, Chiroleva 30.26%, Asenga 28.23%, Denkolako 25%, Rob Gebeya 19.39% and none from Gasha Jagrie Kebeles there is significance difference observed in the area and Origen P=0.005 ($X^2 = 20.140$).
Table 1. Prevalence of hydatidosis by body condition score and Breed summarized as;

<table>
<thead>
<tr>
<th>Variable</th>
<th>No of examined</th>
<th>Positive</th>
<th>Prevalence (%)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>151</td>
<td>70</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>290</td>
<td>52</td>
<td>46.35</td>
<td></td>
</tr>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>433</td>
<td>177</td>
<td>27.02</td>
<td></td>
</tr>
<tr>
<td>Cross</td>
<td>8</td>
<td>5</td>
<td>62.5</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Prevalence of hydatidosis by origin of animals

<table>
<thead>
<tr>
<th>The Origin of the animals in Janamora Kebeles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mekane Birhan</td>
</tr>
<tr>
<td>Prevalence</td>
</tr>
</tbody>
</table>

Table 3. Number of cyst condition in relation to size and nature of cyst

<table>
<thead>
<tr>
<th>Organs</th>
<th>small (%)</th>
<th>medium (%)</th>
<th>large (%)</th>
<th>Total (%)</th>
<th>calcified</th>
<th>Non calcified</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>188</td>
<td>103</td>
<td>143</td>
<td>434</td>
<td>39</td>
<td>395</td>
<td>434 (72.57)</td>
</tr>
<tr>
<td>Liver</td>
<td>97</td>
<td>43</td>
<td>17</td>
<td>157</td>
<td>145</td>
<td>12</td>
<td>157 (26.25)</td>
</tr>
<tr>
<td>Heart</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>7(1.17)</td>
<td>0</td>
<td>7</td>
<td>7 (1.17)</td>
</tr>
<tr>
<td>Total</td>
<td>287 (47.9%)</td>
<td>149 (24.9%)</td>
<td>162 (27%)</td>
<td>598</td>
<td>184 (30.7)</td>
<td>414 (69.2)</td>
<td>598</td>
</tr>
</tbody>
</table>

A Total of 598 hydatid cysts were examined from Lung, Liver and Heart to identify the size and nature of cyst. Out of 598 cyst 287 (47.9%) small, 149 (24.9%) medium, 162 (27%) large size cyst, where as 184 (30.7%) cyst are calcified and 414 (69.2%) were non calcified cyst were found.

3.2. Economic Loss Due to Organ Condemnation

The direct economic loss due to organ condemnation is estimated as the total of 83 lungs, 46 livers and 3 hearts were condemned due to hydatidosis with an economic loss of 1245, 1610 and 27 ETB respectively. This was calculated from mean market price of cattle lung (15 birr), liver (35 birr) and heart (9 birr) by total number of organs condemned during study period.

For calculating the indirect loss due to carcass weight reduction, a 5% carcass weight loss brought by hydatidosis described by Polydorous, [12] and 126 kg an average carcass weight of an. Ethiopian zebu was considered and the result shows that 470,357.118 ETB per annual economic loss obtained in cattle slaughtered at Janamora Wereda due to hydatidosis.

4. DISCUSSION

Hydatidosis is known to be important in live stock and public health in different part of the world and adversely affecting the production and reproduction potential of the animals. Its prevalence and
economic significance has been reported by different geographical areas. The parasite disease is primarily responsible for condemnation of liver and lung causing significant economic loss.

The current prevalence of bovine hydatidosis was found to be 27.7% during the study period. This finding is in line with that of Roman [6] who recorded a prevalence rate of 24.3%. This indicates that not appropriate control measures were taken in the control of bovine hydatidosis. In general terms in Ethiopia, there had been different magnitude record of hydatidosis in bovine with low, medium and high rates of occurrences. Low prevalence rate were reported in Ethiopia from Debre-Berhan 7.2% [13], Moderate to high prevalence rates were reported from Jimma, 22.4% [14], Gondar 24.3% and 37.7% [15], 25.7% in Konso [16], 33.6% in Mekelle [17], 34.05% in Bahir dar [18], and 46.5% Debret Zeit [19].

The variation prevalence in different countries and region may be attributed mainly due to strain difference in *Echinococcus granulosus* that exist in different geographical situation and other factor like social activity and altitude to dog in different region may contribute to this variation [20]. Significance difference between different body condition score was obtained for the prevalence of hydatidosis in that animal with poor body condition were found to have higher hydatid cyst count than animal with medium body condition. The parasite may cause retarded performance and growth, reduced quality of meat and milk as well as live weight loss [21].

Animal with more than 4 years of age were highly affected. It is mainly due to exposed to the disease (parasitic ova) over a long period of time with an increased possibility of acquiring the infections [22].

There is significance difference between breed. Local breeds are highly exposed to the disease than cross breed. It is mainly due to production system. Local breeds are used for extensive production system so animals are exposed to the parasite. While the cross breed are used for intensive farming system and cut and carry system so less exposed to the parasite.

The organ prevalence study showed that lungs are more affected than liver 72.57% respectively. Lungs harbored higher number of large sized and non calculated cyst, liver was found to harbor higher number of small sized and calculated cysts. The large size of cyst in the lungs may be due to relatively softer consistency of the lung allows easier development of the pressure cyst [23]. The higher yield of calculated cyst in the liver could be attributed to relatively reticulo-endothelial and abundant connective tissue reaction of the organ [24]. Out of the total 598 hydatid cyst there is 287 (47.95%) small, 149 (24.9%) medium and 162 (27%) large cyst. The high proportion of small cyst may be due to immunological response of the host which might reduced the expansion of cyst size. Small cyst were found to be more calcified than medium and large cyst which can be due to the host defense mechanisms of dealing more efficiency with parasite larva at the early stage of development [25].

5. CONCLUSION AND RECOMMENDATIONS

Cystic *Echinococcus* is an important parasitic disease that affects both animals and humans. It is worldwide distribution. In Ethiopia the prevalence of hydatidosis in ruminants is high and economically significant. During study period, hydatidosis causes a major economic loss due to organ condemnation of cattle. This indicates that lack of plan based control measure against the source of infection of the disease. The economic impact caused by hydatidosis was enormous in the study area this is due to the variation in the prevalence of the disease and variation in the market price of liver, lung, heart, kidney and beef.

Based on the above conclusion, the following recommendation was forwarded;

- Janamora Wereda has not well constructed abattoir. So Promoting construction of abattoir with their appropriate disposal pits.
- In Janamora wereda slaughtering of animals are adapted on the field, road sides, in the farmers plant, in the town and sometimes in the rivers illegally, this slaughtering habit expose the people and animals by hydatidosis. So they must construct abattoir and make slaughter properly.
- During meat inspection, the veterinarian should strictly examine the organs like lung and liver of the slaughtered animal for strict condemnation.
- Back yard slaughtering of animal should be prohibited through designing and reinforcing of legislation.
- All the affecting visceral organs should be buried or destructed in order to prevent hydatid infection
From farm animal and as well as dogs.

- Public awareness should be created about the situation to make them participate in prevention of Continuous cycling of this parasite.
- Establishment of policy on dog keeping and handling as well as slaughtering activities.
- Emphasis should be given to make the people well aware of the disease by giving mass education.

6. REFERENCES


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