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Original Research

Prevalence of Bovine Hydatidosis in Nekemte Town, Oromia Regional State, Western Ethiopia

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Abstract

Hydratidosis is a neglected tropical disease with public health concerns. It is caused by Echinococcus granulosus larvae and affects pastoralists and urbanites globally. A cross-sectional study studied hydatid cyst frequency in the municipal abattoir in Nekemte, Oromia, western Ethiopia. Pre-slaughter and routine meat inspections were done on 384 animals. Nekemte Municipality abattoir murdered native and crossbred zebu. Animals came from several districts. The study animals' lung, heart, liver, spleen, and kidney were randomly chosen. Pre- and post-mortems were scheduled three days a week. Hydatidosis was found in 24 (6.2% of 384) abattoir cattle the study area. Cattle with poor body conditions had 17.5% more hydatid cysts than those with favorable conditions (2.4%). Change was significant ($p<0.05$). Seven (7.7%) female and seventeen (5.8%) male cattle were present, but no connection ($p > 0.05$). animals older than five years (7.4%) showed a much higher frequency than younger animals (4.8%) ($p > 0.05$). Communities and breeds in the research area had similar hydratidosis rates ($p > 0.05$). The liver had 0.8%, heart 0.3%, and lungs 5.2% hydatid cysts. Recent research finds bovine hydatidosis widespread. Disease prevention and control are crucial in the research region because diseases impair livestock productivity and community health.

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INTRODUCTION

In the words of Eckert and Deplazes (2004), Echinococcus granulosus larvae are known to cause cystic echinococcusis, also known as hydatidosis, and they require vertebrate hosts to continue their life cycle. Dogs are the parasite's primary and final hosts, according to Budke et al. (2006), even if humans and livestock could accidentally turn into intermediate hosts. Hydatidosis remains widespread worldwide and is a public health concern in many regions, including Ethiopia (Magambo et al., 2006). Hydatidosis is one of the primary endemic diseases in Ethiopia because of the customary slaughter of sheep, goats, cattle, camels, and pigs, as well as the easy access of offal to scavenging dogs and

other wild animals. Additionally, it affects the quality of meat, milk, and wool produced, disapproves of edible parts, and produces major financial losses for the cattle sector (Ame, M. et al., 2023; Kumsa, 2019). The high prevalence, persistence, and emergency of E. granulosus in the region are therefore thought to be largely caused by several factors, including inadequate meat inspection protocols, inadequate care for food animals, ignorance of food-borne illnesses, and an inadequate number of abattoirs relative to the rapid population growth in the area. In the later phase of E. granulosus' life cycle, two hosts are involved. Although people are the unintentional intermediate hosts and cattle are the main intermediate hosts, carnivores are the definitive hosts because they have adult tapeworms in their intestines and excrete the parasite eggs along with their waste. According to Magambo et al. (2006), the two most significant zoonotic and pathogenic hydatid cyst parasite species for humans and other domesticated animals are E. granulosus and E. multilocularis. A slowly progressing parasitic disease is typically caused by an Echinococcus granulosus infection, with the liver accounting for 52–77 percent of cases (Budke et al., 2006). Eatable eggs found in dog excrement can infect humans. When Echinococcus proliferates in huge numbers, it can cause severe enteritis, but otherwise, the adult is thought to be safe for the final host. Older animals may be extensively infected, despite having few larvae (Kassa, S. A. 2012). Similarly, studies conducted in Ethiopia by Jemere and Butako (2011), Fufa et al. (2011), Melaku et al. (2012), Endrias et al. (2010), Berhe, et al., (2010), Yohannes, G., & Masresha, S. (2019) showed significant increases in prevalence with age. The disease hydatidosis is a leading cause of death in many regions of the world and is very hard to eradicate. It will require several years of persistent efforts to achieve such a goal with present control approaches. The disease's incidence in developed nations has significantly decreased as a result of efficient waste management strategies and laws that forbid the admission of dogs, cats, birds, and other wild animals into abattoirs (Terefe et al., 2012). Hydatidosis is still a serious public health concern in numerous nations and is a developing or reemerging illness in a few more, despite recent improvements in treatment. There is currently no information available regarding the prevalence of sickness in the research area, despite claims of the frequency of metacestodes in the area. Determining the incidence of hydatid cysts in the town of Nekemte, Oromia, in western Ethiopia was the aim of this inquiry.

MATERIALS AND METHODS

Study area

From September 2022 to January 2023, the research was carried out at Nekemte town, East Wallagga, Oromia region, Ethiopia (Figure 1). Nekemte is located in East Wallagga Zone, western Ethiopia, 331 kilometers west of Addis Ababa. The town is situated at 9.083°N " 36.55°E and latitude 9°5°N 36°33°E, respectively. 2,088 meters are above sea level there. The zone receives 1850 mm of rain on average, with a maximum of 1500 mm. Its distinguishing characteristic is the way it farms both crops and animals together. With a total land area of about 769,725 hectares, the entire area is divided into four categories: 336,220 hectares for crop

production, 182,412 hectares for animal grazing, 256,901 hectares for forest cover, and 20,492 hectares for other uses. EWZAO (2020) estimates that there are 78,178 cattle, 1598 horses, 665 mules, 6477 goats, 3287 donkeys, and 9894 sheep in the area. The region grows rapeseed, linseed, nug, teff, wheat, barley, maize, sorghum, peas, beans, and chickpeas as major annual crops. According to EWZAO (2020), the zone's highest and lowest temperatures are 26°C and 14°C, respectively.

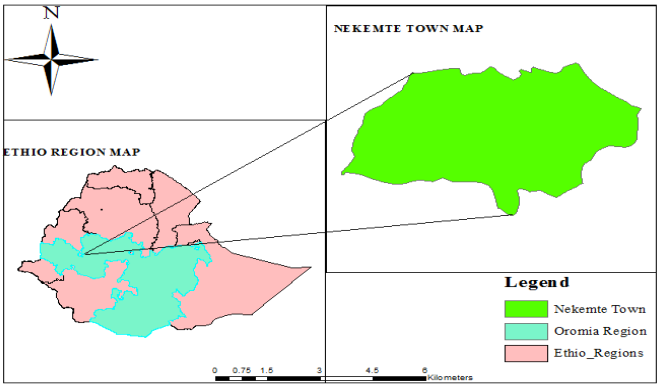

Figure 1. *An arc GIS map of the study region (Nekemte)*

Study Population and Design

Zebu cattle, both native and hybrid, were transported to the Nekemte Municipal abattoir for execution from a variety of districts. It was challenging to pinpoint the exact provenance of every animal that was killed at the abattoir and to relate the hydatidosis research to a specific region. The majority of the adult male cattle killed in the abattoir were between the ages of under five and above five, with both good and poor body status. The cross-sectional study design aimed to collect data on the prevalence of hydatidosis at the municipal abattoir of Nekemte between September 2022 and January 2023.

Determining the sample size

Using Thrusfield's (2018) random sampling formula, the sample size was calculated as follows:

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

Where Pexp = expected prevalence, N = total number of sample sizes, and d = desired absolute precision.

Hence, 384 animals made up the entire study sample size based on a 50% prevalence in the study area.

Sampling Techniques

Organs from the study animals, including the liver, heart, lung, kidney, and spleen, were removed after 384 cattle in total were selected using a random sample technique. A regular visit to perform pre- and post-mortem examinations on killed animals was scheduled for three days a week. The animals' sex, age, breed, and physical status were appropriately documented during antemortem examinations. By classifying cattle into two age groups those under five years old and those over five Kelly's description of the dentition was used to determine the age of the animal. The results were categorized as either good or poor using

the Nicholson and Butterworth bodily condition assessment system.

Sample Collection Methods

The presence of a hydatid cyst was methodologically investigated in each visceral organ, specifically the liver, heart, lung, and kidney, using palpation, ocular inspection, and incision during post-mortem inspection. Each affected animal's total number of hydatid cysts was collected and tallied.

Data analysis and processing

An MS Excel spreadsheet was created using the information gathered throughout the inspection. With SPSS 20, the analysis was carried out. The number of animals positive for hydatid cysts divided by the total number of animals evaluated yielded the prevalence of hydatidosis as a percentage with a 95% confidence interval (CI). The chi-square test revealed a significant difference in the incidence of hydatid cysts. The relationship between risk factors and prevalence was examined, including breed, age, sex, and physical status.

RESULTS AND DISCUSSIONS

Results

Of the 384 cattle (n = 384) that were examined in the abattoirs and tested for hydatidosis, 24 (6.2%) had hydatid cysts overall in the study region. Of the infected organs, the liver, lungs, and heart exhibited the highest infection prevalence—0.5%, 0.8%, and 0.30 percent, respectively (Table 1 and Figure 2).

Table 1

Overall prevalence of hydatidosis in the study area

Examined	Positives	Percent (%)	X^2	P - Value
384	24	6.2 %	0.006	0.997
Total 384	24	6.2%		

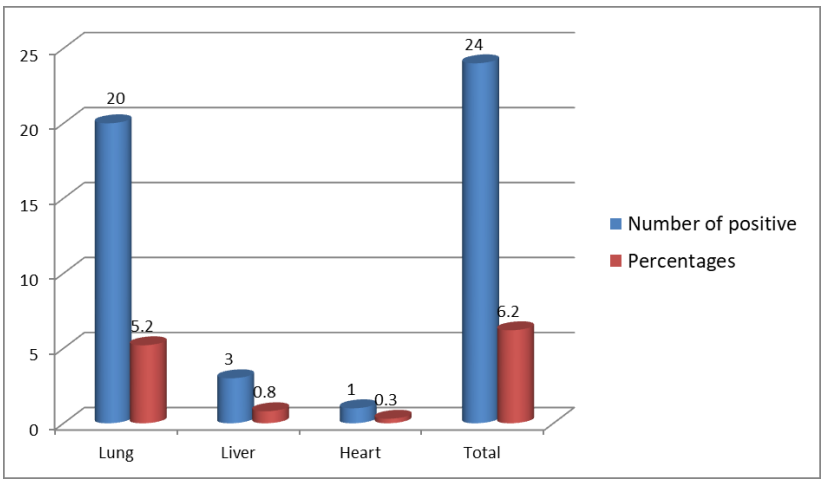

Figure 2. *Organs impacted by the hydatid cyst in the research area.*

Impact of Sex Risk Factors on Hydatidosis Prevalence

Of the 384 cattle that were killed and tested for hydatidosis, 7 (7.7%) of the females and 17 (5.8%) of the males tested positive for the case. As shown in Table 2, males had a greater prevalence (5.8%) than females. P > 0.05, on the other hand, indicated that no statistically significant difference existed.

Table 2

Effects of sex on the hydatidosis prevalence

Variables	Categories	No of examined	No of Positives	Percent (%)	X^2	P - Value
Sex	Male Female	293 91	17 7	5.8% 7.7%	0.423	0.515
Total		384	24	6.2 %		

Age's impact on the prevalence of hydatidosis

Among the two age groups, as observed in Table 3, there was no discernible difference in the prevalence of hydatidosis (p > 0.05). When compared to the other age categories, a greater prevalence was seen in animals older than or equivalent to five years of age, but this was statistically insignificant.

Table 3

Effect of age on Hydatidosis Prevalence

Variables	Categories	No of examined	No of Positives	Percent (%)	X^2	P - Value
Age	< ≥	167 217	8 16	4.8 % 7.4%	1.074	0.300
Total		384	24	6.2%		

Effect of Body Condition on Hydatidosis Prevalence

When comparing animals in good body condition 7 (7.4%) with animals in poor body condition 17 (17.5%), the latter had a higher prevalence. Additionally, a significant difference (p<0.05) was noted (Table 4).

Table 4

Body Condition's Impact on the Prevalence of Hydatidosis

Variables	Categories	No of examined	No of Positives	Percent (%)	X^2	P - Value
Body Condition	Poor Good	97 287	17 7	17.5 % 2.4%	28.162	0.00
Total		384	24	6.2 %		

Breed effect on the Prevalence of Hydatidosis

In contrast to cross-breeds, which had a prevalence of 2%, the native breeds had a larger prevalence of 7.6%. Nevertheless, table 5 indicated that there was no substantial variation in the animal breeds or prevalence of the diseases (P > 0.05).

Table 5

Breed Impact on the Prevalence of Hydatidosis

Variables	Categories	No of examined	No of Positives	Percent (%)	X^2	P - Value
Breed	Cross Local	97 287	2 22	2. % 7.6 %	1.544	0.214
Total		384	24	6.2 %		

The study's overall infection rate of 6.2% was considerably lower than that of Akeberegn, D et al. (2017) (37%) at Debre berhan municipal abattoir. However, it was comparable to past research conducted at the Bishoftu Manucipal abattoir by Fesseha, H., and Asefa, I. (2023). On the other hand, comparing the current result to other authors' findings from different parts of the nation, it was likewise incredibly low. For instance, prevalence of hydatidosis at Fedis district 17.5% by Ibsa Tasse (2024), at South Gonder Zone 18.5% by Sendekie et al. (2024), at Ambo Municipal abattoir was 29.69% (Endrias et al. (2010); in Tigray region it was 32.1% (Berhe et al., 2010), 46.8% at Hawassa municipal abattoir (Getaw et al., 2010), 31.44% at Jimma municipal abattoir Tolosa et al. (2009), and 40.2% at Hawassa manucipal abattoir Yohannes & Masresha (2019), 17.9% at Gessa manucipal abattoir by Mathewos M., et al. *(*2022*).*This is a result of societal shifts in cultures and ideas that rejected the existence of sizable dog populations, which are important factors in the cyst's spread. Comparably, in the study area, there may be less animal slaughter at backyard practices. The main causes of the decline in hydatidosis prevalence were a well-built abattoir fence and prompt action against stray dogs. As stray dogs are a crucial factor for the continuity of the E. granulosus life cycle, previous research by other researchers suggested that this could raise the infection rate of hydatidosis. Favorable conditions for the disease's spread include the widespread custom of feeding raw offals to pets near the homestead, the failure to treat adult dogs against E. granulose, low public awareness of the illness, inadequate fencing that allows dogs and other carnivores' easy access to an abattoir, improper meat inspection techniques, and the poor practice of leaving cadavers on a field, which facilitates conditions for scavenging carnivores.

In the current investigation, there was no evidence of a significant correlation (P > 0.05) between cow sex and hydatid infection. Male infection rates were 5.8%, while female infection rates were 7.7%. Hydatidosis can affect both sexes; however, it affects females significantly more frequently. This result validated the earlier studies conducted by

Okolugbo et al. (2014). This outcome could be explained in part by the fact that fewer females than males were killed in the abattoir. Once more, this may have to do with weight loss, which typically results from immune-suppressive physiological events like pregnancy, lactation, parturition, and malnourishment. These factors most likely served as a precondition (exposure) for an increase in female hydatid cyst infestation rates relative to male rates, according to Akeberegn, et al. (2017).

A noteworthy correlation was discovered between the cattle's physical condition scores and the prevalence of hydatidosis in the study region. Infections with hydatidosis were more common in those in poor physical health (17.5%) compared to those in excellent physical condition (2.4%). These animals may be suffering from diminished growth, weight loss, and moderate-to-severe infections from a variety of comorbid illnesses. The largest infection rate is seen in cattle with lean body characteristics, which may be a sign of a high cyst load. Research has been done on the frequency of hydatid cysts in various cattle breeds. Breed-to-breed variations in infection rates were observed, with native breeds showing a higher incidence than crossbreeds ($P<0.05$). This is because crossbreeds were typically kept indoors, whereas native breeds were typically maintained on meadows. Over-five-year-old animals had greater infection rates than younger animals, but there was no statistically significant difference ($p > 0.05$). Their extended exposure to E. granulosus and their weekend immunity as a result of a concomitant viral infection may be the main causes of this discrepancy. Furthermore, early culling of sick young calves, which involves killing them before they reach adulthood and old age, may account for the reduced incidence among cattle below five years of age.

It was discovered that the most often injured organs were the liver and lungs. The research animals' hearts showed the least degree of damage. Similar results, as stated by the authors, showed that the organs most frequently affected by hydatid cysts were the liver and lungs. This may be explained by the bigger capillary fields in the liver and lungs, which enable these organs to effectively filter ingested oncospheres from the blood. Only those oncospheres that persist forward eventually reach further tissues and systemic circulation. The liver and lung are successively invaded by the portal veins before the invasion of other organs, and this is followed by pulmonary filtration action (Mathis et al., 1996). Hydatid disease is mostly endemic, according to a survey on the illness conducted on the research area's cattle.

CONCLUSION

Hydatidosis, a cystic parasitosis of great financial and public health importance, is brought on by the Echinococcus granulosus larval stage. The primary means by which this parasite is kept alive are through domestic and sylvatic life cycles, notably in dogs. This keeps the diseases alive and makes control and eradication efforts more difficult. Due to organ condemnation and lower weight gain, the diseases limit the systems used in animal production. It is estimated that animal infections impact two to three million people globally. Bovine hydatidosis was shown to be one of the most relevant diseases in the research area that required special consideration for prevention and control,

despite its low prevalence. These highly attributable diseases in animals that result in significant economic loss suggest a strategy for controlling hydatid cysts in the research area that pays careful attention to veterinary interventions; including improving the sanitation of slaughterhouses and conducting appropriate meat inspections.

Recommendations

Therefore, the following recommendations are made in light of the above conclusion:

1) Constant reporting of public education regarding the risks of zoonotic illness, disease control, and contemporary animal husbandry should be established.
2) To control and prevent diseases, veterinarians, public health experts, and legislators must collaborate through a one-health strategy.
3) The expansion of abattoir facilities, proper examination of meat, and disposal of affected organs need to be reinforced.
4) Legislation should encourage the regular deworming of pets and disease control efforts.

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DECLARATION

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY

Data will be made available on request

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