

Prevalence of *Cysticercus bovis* in Cattle Slaughtered at Addis Ababa Abattoir Enterprise and Its Public Health and Economic Significance

Yitagesu Belachew Sendafa

Sude

Ufaysa Geraro

ufaysage@gmail.com

Werabe University

Abenezer Gemechu Woldegiorgis

Farmers and Urban Agriculture Development Commission

Daniel Demissie Doliso

Hadiya Zone

Adane Mulugeta Rago

Hadiya Zone

Dereje Daniel Milkiso

Hadiya Zone

Research Article

Keywords: Abattoir, Addis Ababa, Beef cattle, *Cysticercus bovis*, *Taenia saginata*

Posted Date: October 7th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10850347/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Bovine cysticercosis is a major foodborne parasitic disease affecting food safety, public health, and livestock production in Ethiopia. This study aimed to determine the prevalence of *Cysticercus bovis* in cattle slaughtered at Addis Ababa abattoir enterprise and assessed its associated public health and economic significance.

Methods

A cross-sectional study was conducted from October 2023 to February 2024 to determine the prevalence of *Cysticercus bovis* in cattle slaughtered at Addis Ababa Abattoir Enterprise. The tongue, masseter muscle, liver, triceps muscle, heart and lung were organs inspected for the presence of *C. bovis*. The study was complemented by a retrospective analysis of abattoir records covering the preceding ten years (2013–2022). A questionnaire survey was also conducted among 110 residents of Addis Ababa Lemi-Kura sub-city to assess the public health significance of human taeniasis. Furthermore a survey of 23 randomly selected medical supply stores in Lemi-Kura Sub-City, Addis Ababa, was undertaken to determine the annual expenditure on taenicial drugs in the study area during the 2022/2023 fiscal year. Data were analyzed using STATA 21, with prevalence calculated as the proportion of positive samples and associations assessed using logistic regression and Pearson's chi-square test at $p \leq 0.05$.

Result

A total of 602 cattle carcasses were subjected to routine post-mortem inspection, of which 6 (0.83%) were found to be infected with *C. bovis*. The cysts were detected in the triceps muscle (3), liver (1), tongue (1), and masseter muscle (1), with the triceps muscle being the most frequently affected tissue. Out of 110 respondents, 47 (42.73%) reported having experienced *Taenia saginata* infection at least once in their lifetime. Furthermore, 67% of respondents were aware that consumption of raw or undercooked beef is a major risk factor for *T. saginata* transmission. The occurrence of taeniasis was significantly associated with respondents' sex, occupation, and knowledge of disease transmission and prevention ($p < 0.05$). A survey of medical supply stores indicated that 89,428 adult taeniasis treatment doses, equivalent to Ethiopian birr 2,310,965, were marketed for the treatment of human *T. saginata* taeniasis which approximately USD 41,597.37.

Conclusion

Despite the low prevalence of *Cysticercus bovis* and the marked decline in detained carcasses over the past decade, the detection of viable cysts and human *Taenia saginata* infections indicates ongoing transmission. Therefore, the *C. bovis*–*T. saginata* complex remains an important public health and economic concern in Addis Ababa.

INTRODUCTION

Zoonotic diseases constitute a major global public health challenge, accounting for approximately 75% of emerging pathogens and 60% of all infectious disease agents (World Health Organization, 2004). In Ethiopia, the prevalence of zoonotic parasitic diseases has been reported to range from 2.93% to 4.4% across different regions (Muhammed and Birhanu, 2020). Among these, foodborne trematodiasis, leishmaniasis, zoonotic schistosomiasis, cysticercosis, echinococcosis, and toxoplasmosis contribute substantially to the global burden of parasitic zoonoses (Mohammed et al., 2021). Bovine cysticercosis is caused by the metacestode (larval) stage of *Taenia saginata*, known as *Cysticercus bovis*, which develops in the musculature of cattle, whereas the adult *T. saginata* inhabits the small intestine of humans, the definitive host. Cattle serve as the intermediate host, and transmission is maintained through a life cycle in which mature tapeworms release 3–7 gravid proglottids daily, each containing approximately 30,000–50,000 eggs (El-Sayad et al., 2021). Both the larval and adult stages have important veterinary and public health implications, either directly or through their associated complications (Abdala and Ame, 2022).

Bovine cysticercosis is a major foodborne parasitic disease affecting food safety, public health, and livestock production worldwide (Tegegne et al., 2018). It is estimated that approximately 77 million people are infected with *Taenia saginata* globally, with nearly 40% of cases occurring in Africa. In Ethiopia, bovine cysticercosis has been recognized as an important cause of economic losses in the livestock sector and a persistent public health concern. Its widespread occurrence has been associated with inadequate sanitation, ineffective meat inspection and control systems, poor animal husbandry practices, and the widespread cultural practice of consuming raw or undercooked beef (Mohammed et al., 2021). Consequently, numerous epidemiological studies have investigated the distribution and prevalence of bovine cysticercosis in different regions of the country (Edao and Korso, 2019).

Cattle contribute approximately 45% of the meat consumed domestically in Ethiopia and represent a major source of live animal exports. Despite the country's considerable potential to supply livestock and animal products to markets in the Middle East and North and West Africa, export performance continues to be constrained by animal health problems, including bovine cysticercosis and human taeniasis (Biruk, 2017). Although previous studies have assessed the prevalence of *C. bovis* in cattle slaughtered at Addis Ababa Abattoir Enterprise, information on community awareness of taeniasis, its economic burden, and long-term retrospective trends of bovine cysticercosis remains limited. Therefore, this study was undertaken to determine the prevalence of *C. bovis* in cattle slaughtered at Addis Ababa Abattoir Enterprise, assess the prevalence and associated risk factors of human taeniasis, estimate treatment costs, and evaluate the public health significance of these infections in selected areas of Addis Ababa.

MATERIALS AND METHODS

Description of the Study Area

The abattoir survey was conducted at Addis Ababa Abattoir Enterprise, located in Kirkos sub-city, whereas the questionnaire survey was carried out in Lemi-Kura sub-city, Addis Ababa (Fig. 1). Addis Ababa is located at approximately 2,500 meters above sea level in Ethiopia's central highlands. The city experiences an average annual temperature of 21°C and average annual precipitation of 1,800 mm. During the wet season, relative humidity ranges between 70% and 80%, while it fluctuates between 40% and 50% during the dry period.

Study Population

For the retrospective component, the study population consisted of all slaughtered cattle recorded at the abattoir from August 2013 to August 2023. For the active abattoir survey, the study population included all cattle of both sexes brought to Addis Ababa Abattoir Enterprise for slaughter from October 2023 to February 2024. Local zebu (*Bos indicus*) and crossbreeds originating from different parts of Ethiopia were included for the study. For the questionnaire survey, all individuals living in Lemi-Kura sub-city of Addis Ababa including butchers and abattoir workers, food-related merchants, non-food-related merchants, and students were targeted.

Study Design and Sample Size Estimation

Cross-sectional and retrospective studies conducted from October 2023 to February 2024 were included. Cattle of different ages and sex permitted for slaughter at Addis Ababa Abattoir Enterprise were enrolled. An abattoir-based survey was conducted from October 2023 to February 2024. Using systematic sampling, animals were selected for inspection at 10-cattle intervals over the course of a three-day abattoir survey within a week. The estimated prevalence of bovine cysticercosis at Addis Ababa Abattoir Enterprise (26.83%) as reported by Tesfaye, 2018, at 95% confidence interval and absolute precision of 5%, was used to determine the total number of animals included, according to Thrusfield (2018):

$$n = 1.96^2 \times P \exp (1 - P \exp) / d^2$$

Where n is the necessary sample size, d is the desired absolute precision, and Pexp is the predicted prevalence (26.83%). The required sample size was 301 cattle. To maximize the precision of the estimate, the sample size was doubled, resulting in a total of 602 cattle examined. Throughout the study period, physical examinations were performed before and after slaughter, and the raw data were recorded in a spreadsheet.

Techniques and Protocols for Data Collection

Retrospective study

A retrospective survey of abattoir data was conducted based on daily record findings for *Cysticercus bovis* from abattoir examination reports. The relevant 10 years of data were extracted from the Addis Ababa Abattoir Enterprise record book covering the period between August 2013 and August 2023.

Active abattoir survey

The abattoir survey was conducted three days per week for five months, and 10 carcasses were examined per day. Each study animal underwent thorough ante-mortem and post-mortem examinations. A unique identification number was assigned to each study animal. The animals' age, sex, and body condition scores were recorded. Body condition was assessed using the following criteria: poor (hide bound with obvious bony prominences and a deep-sunk tail base), medium (ribs and other bony prominences noticeable on visual inspection, but with fair fleshy background on palpation), and good (bony structures observable only on palpation). This classification was based on (Neary and Yager, 2002). The age of an animal was estimated using their teeth as reference as stated by (DeLahunta and Habel, 1986). Animals were then categorized into juvenile (< 5 years) and adult (> 5 years) groups. During post-mortem examination, the heart, liver, lung, tongue, triceps muscle, and masseter muscle were visually inspected, palpated, and incised to identify *Taenia saginata* cysts.

Recovered cysticerci were separated from surrounding tissues and transported to the Parasitology Laboratory of Addis Ababa University College of Veterinary Medicine and Agriculture, Bishoftu Ethiopia for viability testing. The cysticerci were incubated for 1–2 hours at 37°C in 40% ox bile solution. The scolex was examined under a stereomicroscope to assess viability. During incubation, cysticerci in which the scolex evaginated were considered viable (Blate et al., 2023). In contrast, solid or empty cysts were regarded as non-viable or degenerating (Anwar et al., 2024). In parallel, species confirmation as *Taenia saginata* metacestodes was based on the size of the cysticercus and the absence of a hook on the rostellum of the evaginated cyst (WHO, 1983; Gracey et al., 1999).

Questionnaire survey

The structured questionnaire survey was conducted in Lemi-Kura Sub-City, Addis Ababa, Ethiopia. The required sample size was calculated using Arsham's (2002) formula, ($n = 0.25/SE^2$), where (n) is the required sample size and (SE) is the standard error. With the standard error set at 5% (0.05), the calculated sample size was 100 participants. Allowing for a 10% non-response rate, the final sample size was increased to 110 respondents. Before data collection, the purpose and procedures of the study were explained to the participants through a brief group discussion, and informed consent was obtained from each participant. Participants were selected randomly from the study population based on their willingness to participate. A structured questionnaire was developed specifically for this study to assess

the food safety and public health significance of bovine cysticercosis and human *Taenia saginata* taeniasis. The questionnaire collected information on participants' consumption of raw or undercooked beef, frequency of consumption, history of *T. saginata* infection, and observation of *T. saginata* proglottids in feces or on clothing. Information on sociodemographic characteristics, including age, sex, marital status, and educational level, was also collected. In addition, participants' knowledge of *T. saginata* transmission, risk factors, and prevention was assessed. Human *T. saginata* taeniasis was assessed based on participants' self-reported history and observation of proglottids rather than laboratory-confirmed diagnosis.

Inventory and questionnaire survey at pharmacy shops

Economic losses due to *T. saginata* taeniasis treatment in human cases were estimated using a one-year retrospective drug shop inventory. The number and price of pharmaceuticals sold annually to treat taeniasis were obtained from inventories of 23 randomly selected pharmacy stores in Lemi-Kura sub-city in Addis Ababa. Buyers' age, gender, residential status (rural or urban), and whether prescription was required were recorded. In addition, the most commonly sold medication during the year was listed.

Study population for drug inventory

Lemi-Kura sub-city of Addis Ababa has 212 commercial pharmacies, 2 government-run pharmacies in Kenema, and 9 health centers, all of which have their own pharmacies.

Data Organization and Interpretation

Microsoft Excel was used to store data collected from the active abattoir survey and the questionnaire survey. STATA version 21 was used for statistical analysis. Prevalence was calculated as the number of positive samples divided by the total number of samples. The association between *Taenia saginata* prevalence and risk factors, and between *Cysticercus bovis* prevalence and host-related risk factors, was assessed using binary logistic regression and the Pearson chi-square test, respectively. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

From the 602 animals examined at abattoir, the overall prevalence of *cysticercus bovis* was 0.83% (6/602) with 95% CI of (0.15–1.03) (Table, 1). No significant association was observed between *C. bovis* occurrence and body condition score, sex, age, or breed. Regardless of the number of animals analyzed, the prevalence of *C. bovis* was 0.43% in juvenile animals and 0.7% in adult animals.

Table 1
Prevalence of *C.bovis* by risk factors.

Risk factors	Groups	Infected (%)	Negative (%)	χ^2	P-value
Sex	Male	6(0.85)	586(99.15)	0.094	0.759
	Female	0(0)	16(100)		
Age in years	Young (< 5years)	1(1.04)	239(99.57)	0.768	0.382
	Adult(> 5 years)	5(1.09)	363(98.91)		
Body score condition	Good	1(0.68)	147(99.32)	0.455	0.557
	Medium	3(0.77)	386(99.23)		
	Poor	2(1.54)	69(98.46)		
Breed	Local	6(0.87)	572(99.13)	0.219	0.640
	Cross	0(0)	30(100)		

A total of 2,089,266 cattle were slaughtered over the last ten years (Table 2). The largest number of cattle slaughtered in 2017/2018 (259,632). During this period, carcasses containing more than one *C. bovis* at a single incision site were stored in deep freeze for ten days before being released for human consumption. However, carcasses containing more than four *C. bovis* at a single incision site were completely condemned. Across the ten-year period, 313 carcasses were detained due to *C. bovis*. The highest number was recorded in 2013/2014 (125), and no carcass was detained for *C. bovis* in year 2022/2023.

Table 2

Trends of *C. bovis* among cattle slaughtered at Addis Ababa Abattoir Enterprise over the last ten years.

Year	Sex		Age		Total No. of cattle slaughtered	No. of Carcasses detained due to <i>C. bovis</i>
	Male	Female	< 5	≥ 5		
2013/14	123	2	3	122	222,937	125
2014/15	70	1	1	70	186,669	71
2015/16	47	0	1	46	216,509	47
2016/17	26	0	0	26	243,971	26
2017/18	15	0	0	15	259,632	15
2018/19	16	0	0	16	238,807	16
2019/20	6	0	0	6	193,131	6
2020/21	4	0	0	4	178,874	4
2021/22	3	0	0	3	169,349	3
2022/23	0	0	0	0	179,387	0
Total	310	3	5	308	2,089,266	313

Organ distribution of cysticerci and cyst characteristics

Among the six cysts detected, the most contaminated organs were the triceps muscle (3 cases; 75%), followed by the masseter muscle, tongue, and liver, each accounting for 1 case (25%). No cysts were observed in the heart or lungs. Of the six cysts, 3 (50%) were viable, 2 (33%) were non-viable, and 1 (17%) was calcified. The cysts located in the triceps muscle showed the highest relative viability (33%).

Questionnaire survey results

Of the 110 respondents, 47 (42.73%) reported having experienced at least one episode of *Taenia saginata* infection during their lifetime. Among infected respondents, 74%, 19%, and 4% reported using contemporary drugs, traditional drugs, and both types of drugs, respectively. Two percent (2%) of infected respondents reported not using either drug type. Out of the 110 respondents, 36 reported eating raw or partially cooked meat, and only 6 of the female respondents reported having taeniasis. In this study, taeniasis was more common among butchers and abattoir employees (66.67%; p -value = 0.049; χ^2 = 11.106) than among individuals in other occupational categories. Most respondents reported consuming well-cooked meat, which may contribute to reduced *T. saginata* prevalence. The results also showed a statistically significant association between taeniasis prevalence and sex, with higher prevalence among male respondents (53.95%) than female respondents (17.65%) (p -value = 0.001; χ^2 = 12.6493). Cooking of meat was associated with disease prevention (50.68%) compared with other

methods (p-value = 0.014; $\chi^2 = 8.572$). Most infected respondents reported observing proglottids in their feces (39/47) (p-value = 0.001; $\chi^2 = 110.000$). Regarding drug usage, most infected respondents reported using pharmaceutical drugs (35/47) rather than herbal medicine or both (p-value = 0.001; $\chi^2 = 105.977$). Among pharmaceutical treatments, albendazole was the most frequently used drug (53.7%) compared with other pharmaceutical drugs (p-value = 0.001; $\chi^2 = 68.809$). Additionally, many respondents did not know the specific type of drug used (22/47). However, no statistically significant difference was observed among respondents with respect to age, educational attainment, religion, marital status, meat consumption habits, meat source, or latrine use (p-value = 0.001; $\chi^2 = 17.504$). Regarding information sources, most respondents reported obtaining information from health centers (69.23%) compared with other sources (p-value = 0.001; $\chi^2 = 22.096$). Concerning knowledge of transmission, most respondents knew that raw meat transmits *T. saginata* (52.7%) (p-value = 0.002; $\chi^2 = 9.195$).

Pharmaceutical Inventories

A survey of medical supply stores was conducted in the Lemi-kura sub-city of Addis Ababa. Estimates of the annual dosages and associated costs of taenecidal (anthelmintic) drugs for adults were obtained through face-to-face interviews with pharmacy managers and by reviewing their 2022–2023 records. The survey indicated that a total of 89,428 adult taeniasis treatment doses equivalent to 2,310,965 ETB were marketed in the town for the treatment of human *Taenia saginata* taeniasis. Albendazole accounted for the largest proportion of doses (53.7%), followed by praziquantel (25.2%) and mebendazole (Vermox) (21.1%) (Table 3).

Table 3
Taenecidal drugs supplied at Lemi-Kura sub-city and their annual cost.

Name of the drug used	Total number of adult doses supplied (during 2022–2023*)	Total worth in ETB**
Praziquantel	22,530	675,900
Albendazole (tab)	38,120	648,040
Mebendazole (tab)	18,443	461,075
Albendazole (Syrup)	9,875	493,750
Mebendazole (Syrup)	460	32200
Total	89,428	2,310,965

Discussion

The prevalence of *Taenia saginata* taeniasis varies considerably among countries and between regions within the same country, depending on several factors, including the consumption of raw or inadequately cooked beef, public awareness of the disease, environmental and personal hygiene practices, and other socioeconomic and epidemiological conditions (Dorny et al., 2007; World health Organization, 2023). While the larval stage, *Cysticercus bovis*, causes bovine cysticercosis and associated economic losses to

the livestock and meat industries, the adult *T. saginata* parasite remains an important public health and economic concern (Dorny et al., 2007).

The prevalence of *Cysticercus bovis* (*C. bovis*) in the current study at Addis Ababa Abattoir Enterprise was 0.83%, which was relatively low compared with reports from several other parts of Ethiopia. Higher prevalence rates have been reported in Batu (2.6%) by Teklemariam and Debash (2015), Gondar ELFORA (2.0%) by Adem and Alemneh (2016), Nekemte (2.08%) by Bijiga and Temesgen (2019), West Shoa Zone (2.5%) by Work et al. (2021), Nekemte (2.68%) by Shuramo et al. (2022), and Assela (1.2%) by Dima (2023). The relatively lower prevalence observed in the present study may be attributed to differences in study design, cattle management practices, geographical location, sample size, duration of the study, and the effectiveness of meat inspection procedures. Compared with findings from other countries, the prevalence recorded in the present study (0.83%) was higher than that reported in Northwest Mexico (0.21%) by Cueto González et al. (2015), but lower than the prevalence reported in Northwest Iran (1.71%) by Mirzaei et al. (2016) and Kenya (2.67%) by Anyango et al. (2023). These variations in prevalence among different countries and regions may reflect differences in cattle husbandry systems, sanitation, human dietary practices, access to veterinary services, meat inspection practices, and the epidemiological conditions prevailing in the respective study areas.

A 10-year retrospective analysis revealed a marked decline in the number of carcasses detained at Addis Ababa Abattoir Enterprise due to *Cysticercus bovis* (*C. bovis*), from 125 carcasses in 2013–2014 to none in 2022–2023. This declining trend may be associated with several factors, including routine deworming of cattle, increased use of intensive production systems in which cattle are housed indoors in feedlots or kept without access to grazing, improved availability of veterinary services, increased involvement of veterinarians and human health extension workers, and greater public awareness and use of sanitary latrines. These interventions may have contributed to reducing environmental contamination with *Taenia saginata* eggs and subsequently decreasing the risk of *C. bovis* infection in cattle. Nearly half (42.73%) of the respondents reported that they have experienced at least one episode of tapeworm infection during their lifetime. The presence of proglottids in their feces and/or on their underwear was considered an indication of infection. In the study areas, as in many other parts of Ethiopia, pork is generally not consumed because of religious and cultural practices. Therefore, the proglottids observed by the respondents were most likely those of *Taenia saginata*. This interpretation is supported by the World Health Organization (1983) guidelines, which indicate that *T. saginata* can be distinguished from *T. solium* by the more frequent spontaneous passage of its proglottids through the anus.

A statistically significant association was observed between the sex of respondents and the prevalence of *Taenia saginata* taeniasis ($p = 0.001$; $\chi^2 = 12.649$), with a higher proportion of male respondents (53.95%) reporting taeniasis compared with female respondents (17.65%) (Table 3). This finding is consistent with reports by Akalu and Amuamuta (2015) in Farta Woreda, Leilt et al. (2015) in Bishoftu, and Nestanet et al. (2020) in Dessie Town. However, it differs from the findings of Kifle and Shiret (2015) in Debre Berhan, Bekele et al. (2016) in and around Halaba Kulito Town, and Tegegne et al. (2018) in Kombolcha. The higher prevalence of *T. saginata* taeniasis among males may be associated with

cultural, behavioral, and socioeconomic factors. In the study area, men may be more likely than women to consume meals outside the home, particularly at restaurants and butcher shops, where raw or inadequately cooked beef may be consumed. In addition, men may have a greater tendency to consume raw beef together with locally produced alcoholic beverages, such as *tella* and *tej*, which may further increase their exposure to *T. saginata* infection. A statistically significant, although marginal, association was also observed between respondents' occupation and *T. saginata* taeniasis ($p = 0.049$; $\chi^2 = 11.106$). The prevalence of *T. saginata* taeniasis was highest among butchers and abattoir workers (66.67%), followed by civil servants (55.32%), food-related merchants (41.67%), farmers (25.00%), and non-food-related merchants (22.22%). The relatively higher prevalence among butchers and abattoir workers may be attributed to their frequent occupational contact with cattle, raw meat, and meat by-products, which may increase their exposure to *T. saginata* infection, particularly when appropriate personal hygiene and food-safety practices are not consistently followed.

An inventory of 23 pharmacies in Lemi Kura Sub-City, Addis Ababa, during the 2022/23 fiscal year revealed that 89,428 adult doses of taeniocidal medications were dispensed, with an estimated total cost of 2,310,965 Ethiopian Birr (ETB), equivalent to approximately USD 41,597.37. The estimated expenditure on medications used for the treatment of *Taenia saginata* taeniasis in the present study differs from those reported by Teklemariam and Debash (2015), Tolossa et al. (2015), Bekele et al. (2016), Tegegne et al. (2018), and Tsegaye (2023) in different parts of Ethiopia. The substantial expenditure on taeniocidal medications suggests that *T. saginata* taeniasis may impose a considerable financial burden on households. However, the disease is largely preventable through the consumption of adequately cooked beef and the proper use of sanitary latrines. The observed differences between the present study and previous reports may be attributable to variations in population size among study areas, differences in the prevalence of *T. saginata* infection across the country, the frequency of raw or inadequately cooked beef consumption, differences in the prices of medications among pharmacies, and variations in the use of traditional herbal remedies for the treatment of taeniasis.

Conclusion

Despite the relatively low prevalence of *Cysticercus bovis* (0.83%) observed in the present study, human taeniasis remains an important public health concern among the study population, as evidenced by the high proportion of respondents reporting at least one lifetime episode (42.73%). The occurrence of taeniasis was significantly associated with sex and occupation, with higher reported occurrence among males, butchers, and abattoir workers, highlighting the need for targeted health education and preventive interventions among high-risk occupational groups. The marked decline in carcasses detained due to *C. bovis* over the past decade suggests improvements in cattle management, sanitation, veterinary services, and meat inspection practices. The sale of 89,428 adult taeniocidal treatment doses, costing an estimated ETB 2,310,965, indicates a substantial economic burden associated with human *T. saginata* infection. Hence, strengthened surveillance and multi-sectoral stakeholder collaboration, together with larger-scale studies using highly sensitive diagnostic methods, are recommended to further evaluate the epidemiological and economic burden of *T. saginata* infection.

Abbreviations

ETB
Ethiopian Birr

Declarations

Ethics approval and consent to participate

The study was reviewed and approved by the relevant ethical committee of Addis Ababa University under reference number VM/ERC/02/08/16/2024. The study involving human participants was conducted in accordance with relevant ethical guidelines and regulations and the principles of the Declaration of Helsinki. Before administration of the questionnaire, the purpose and procedures of the study were explained to the participants through a brief group discussion, and informed consent was obtained from all participants. Confidentiality and anonymity of all information collected from the participants were maintained throughout the study. Each participant was adequately briefed on the objectives of the study to facilitate informed participation and the provision of accurate and comprehensive information.

Consent for publication

Not applicable.

Competing interests

The authors have no competing interests to declare.

Funding

No funding was received for this study.

Author Contribution

YB performed original draft writing and editing; UG analyzed and interpreted the research data. AG, DD, DD, AM helped in the research data collection and laboratory examination of tissue sample. All authors read and approved the final manuscript.

Acknowledgements

Not applicable.

Data Availability

Publicly available in a repository: at <https://etd.aau.edu.et/server/api/core/bitstreams/00688a57-8c8f-431b-9396-4b0b75ae05de/content>

References

1. Abdela M, Ame MM. Prevalence and public health importance of bovine cysticercosis in Haramaya Municipal Abattoir, East Hararghe Zone of Oromia Regional State, Eastern Ethiopia. *Vet Med Open J*. 2022;7(1):5–11.
2. Adem E, Alemneh T. Epidemiological studies on *Cysticercus bovis* at Gondar ELFORA Abattoir, Northwest Ethiopia. *J Vet Sci Technol*. 2016;7(5):364. 10.4172/2157-7579.1000364.
3. Akalu B, Amuamuta A. Prevalence and risk factors associated with *Taenia saginata* infection in the rural community of Farta Woreda, Northwest Ethiopia. *J Harmoniz Res Med Health Sci*. 2015;2(4):145–55.
4. Anwar FAS, Negm EA, Abdelhaseib M, Abdel-Maksoud FM, Mohammed AA, Mohamed SA-A, et al. High prevalence of bovine cardiac cysticercosis in Upper Egypt: an epidemiological and histopathological study. *Anim (Basel)*. 2024;14(1):158. 10.3390/ani14010158.
5. Anyango RM, Wachira TM, Muchemi GM. Seroprevalence of *Taenia saginata* cysts in cattle, human hospital cases, and risk factors for human taeniasis in Kajiado County, Kenya. *Vet Med Int*. 2023;2023:7385643. 10.1155/2023/7385643.
6. Arsham H. Questionnaire design and surveys sampling. *The Online Survey*. USA; 2002.
7. Hirpha A, Bekele T, Melaku M. Study on bovine cysticercosis with special attention to its prevalence, economic losses and public health significance in and around Halaba Kulito Town, South Ethiopia. *World J Agric Sci*. 2016;12(4):299–307.
8. Bijiga ED, Temesgen E. A cross-sectional study of bovine cysticercosis in Nekemte Municipal Abattoir, East Wellega Zone, Oromia Regional State, Western Ethiopia. *J Anim Vet Adv*. 2019;18(4):92–7.
9. Biruk WA. Prevalence of bovine cysticercosis at Jijiga Municipal Abattoir, Ethiopia. *J Vet Sci Technol*. 2017;8(3):442. 10.4172/2157-7579.1000442.
10. Dorny P, Praet N. *Taenia saginata* in Europe. *Vet Parasitol*. 2007;149(1–2):22–4. 10.1016/j.vetpar.2007.07.004.
11. Blate ME, Kalacho ND, Erango TB. Bovine cysticercosis: prevalence and viability in cattle slaughtered at Shone Municipal Abattoir, Southern Ethiopia. *J Innov Med Res*. 2023;2(5):1–7.
12. Cueto González SA, Rodríguez Castillo JL, López Valencia G, Bermúdez Hurtado RM, Hernández Robles ES, Monge Navarro FJ. Prevalence of *Taenia saginata* larvae (*Cysticercus bovis*) in feedlot cattle slaughtered in a federal inspection type abattoir in northwest México. *Foodborne Pathog Dis*. 2015;12(5):462–5.

13. DeLahunta A, Habel RE. Applied veterinary anatomy. Philadelphia: WB Saunders; 1986.
14. Deressa FB, Dima FG, Edao A. Prevalence of bovine cysticercosis and status of human taeniasis in and around Asella Town, Tiyo Woreda, Southeast Ethiopia. Glob J Med Res G Vet Sci Vet Med. 2016;16(G3):19–26.
15. Edao A, Korso L. Prevalence of *Cysticercus bovis* in Eastern Shoa of Oromia, Ethiopia. J Biol Agric Healthc. 2019;9:7.
16. El-Sayad MH, Farag H, El-Taweel H, Fadly R, Salama N, Ahmed AAE, et al. *Cysticercus bovis* in cattle slaughtered in North Egypt: overestimation by the visual inspection method. Vet World. 2021;14(1):155–60. 10.14202/vetworld.2021.155-160.
17. Gracey JF, Collins DS, Huey RJ. Meat hygiene. 10th ed. New Delhi: Elsevier; 1999.
18. Kifle W, Shiret B. Prevalence and public health significance of *Cysticercus bovis* in and around Debre Berhan City. Eur J Appl Sci. 2015;7(5):199–208.
19. Leilt E, Desalew T, Tsegabirhan K, Teshale S, Yohannes H. Prevalence and public health significance of bovine cysticercosis at Elfora Abattoir, Bishoftu, Ethiopia. J Public Health Epidemiol. 2015;7(2):34–40. 10.5897/JPHE2014.0681.
20. Mirzaei M, Nematolahi A, Ashrafihelan J, Rezaei H. Prevalence of infection with the larval form of the cestode parasite *Taenia saginata* in cattle in Northwest Iran and its zoonotic importance. Turkiye Parazit Derg. 2016;40(4):190–3. 10.5152/tpd.2016.4776.
21. Mohammed A, Abebe M, Birhanu W, Abdirahman M, Wali MA. Prevalence of *Taenia saginata* cysticerci in Addis Ababa Abattoir Enterprise, Ethiopia. Food Waterborne Parasitol. 2021;25:e00135. 10.1016/j.fawpar.2021.e00135.
22. Muhammed S, Birhanu T. Major bovine parasitic zoonosis at selected municipal abattoirs, North Shewa Zone, Oromia, Central Ethiopia. Int J Vet Sci Res. 2020;6(2):148–53. 10.17352/ijvsr.000066.
23. Neary M, Yager A. Body condition scoring in farm animals. West Lafayette (IN): Purdue Extension Service; 2002. AS-550-W.
24. Netsanet BG, Yesuf YA, Abrha BH, Lewtnesh BD. Prevalence and public health importance of bovine cysticercosis in and around Dessie, Amhara Region, Northeast Ethiopia. Niger J Anim Sci. 2020;22(2):173–85.
25. Shuramo MY, Gutama KP, Bulcha MR, Pal M. Prevalence, related risk factors and distribution of cyst of *Cysticercus bovis* in cattle subjected to slaughter at Nekemte Municipal Abattoir, Western Ethiopia. Int J Livest Res. 2022;12(1):27–32. 10.5455/ijlr.2022013.
26. Space Science and Geospatial Institute (SSGI). Ethiopia-Addis Ababa subcities and woredas. Humanitarian Data Exchange. (2025). Available at: <https://data.humdata.org/dataset/8d82flca-5ald-4e73-9fea-8e53c190869d>
27. Tegegne A, Hiko A, Elemo KK. Bovine cysticercosis and human taeniasis: animal-human health and economic approach with treatment trends in Kombolcha Town, Wollo, Ethiopia. Int J One Health. 2018;4:15–21. 10.14202/IJOH.2018.15-21.

28. Teklemariam AD, Debash W. Prevalence of *Taenia saginata*/cysticercosis and community knowledge about zoonotic cestodes in and around Batu, Ethiopia. J Vet Sci Technol. 2015;6(6):273. 10.4172/2157-7579.1000273.
29. Tesfaye B. Study on the prevalence of *Cysticercus bovis* and hydatidiosis in cattle slaughtered at Addis Ababa Abattoir Enterprise, Addis Ababa [master's thesis]. Debre Zeit: Addis Ababa University, College of Veterinary Medicine and Agriculture; 2018.
30. Thrusfield M. Veterinary epidemiology. 4th ed. Chichester: Wiley; 2018.
31. Tolossa YH, Taha A, Terefe G, Jibat T. Bovine cysticercosis and human taeniosis in Adama Town, Oromia Region, Ethiopia. J Vet Sci Technol. 2015;6(S10):003.
32. Tsegaye AA. Prevalence, financial losses and risk factors of bovine cysticercosis and human taeniosis in selected districts of Northwest Ethiopia. J Clin Med Img Case Rep. 2023;3(1):1342.
33. World Health Organization. Guidelines for surveillance, prevention and control of taeniosis/cysticercosis. Geneva: World Health Organization; 1983. VPH/83.49.
34. World Health Organization. Waterborne zoonoses: identification, causes and control. Geneva: World Health Organization; 2004.
35. World Health Organization. Taeniosis and cysticercosis [Internet]. Geneva: World Health Organization; [accessed 2026 Aug 20]. Available from: <https://www.who.int/health-topics/taeniosis-and-cysticercosis>
36. Work A, Wakjira B, Haile Michael B, Tolossa YH. Epidemiology of *Cysticercus bovis*/*Taenia saginata* and community perception about meat-borne zoonosis in three selected districts of West Shoa Zone of Oromia Region, Ethiopia. Int J Curr Res Biol Med. 2021;6(2):20–31.

Figures

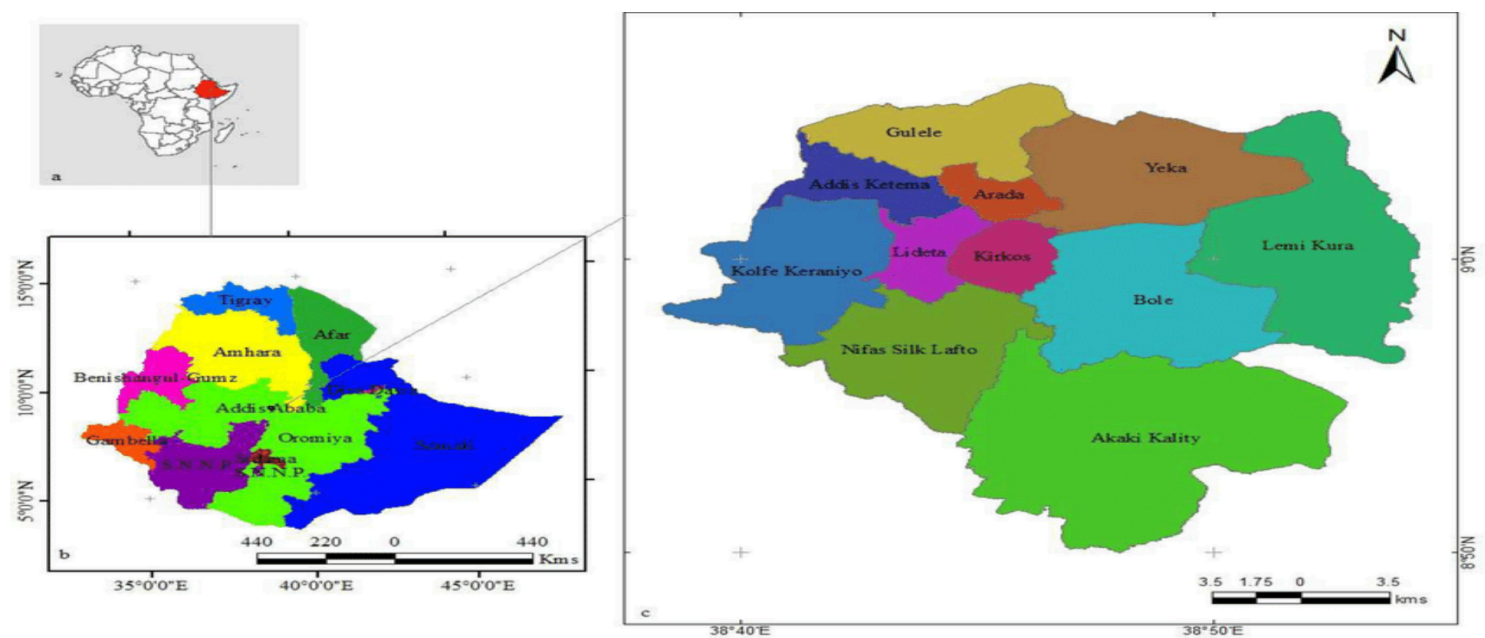


Figure 1

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [File1.docx](#)