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Prevalence and associated risk factors of Bovine Fasciolosis in smallholder dairy Cattle in and around Dire Dawa, Eastern Ethiopia

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Abstract

What proportion of smallholder dairy cattle in tropical lowland regions harbor *Fasciola* infections, and which host-level and management-level variables elevate that risk? A cross-sectional investigation was conducted from October 2022 to September 2023 in and around Dire Dawa, eastern Ethiopia, to determine the prevalence and associated risk factors of bovine fasciolosis in smallholder dairy production systems. A total of 384 cattle were sampled using systematic random selection from 96 smallholder dairy farms across four sub-districts. Faecal samples were examined using the standard sedimentation technique, and positive samples were further processed by the Flukefinder method to differentiate *Fasciola* species based on egg morphometry. The overall prevalence of bovine fasciolosis was 30.5% (117/384; 95% CI: 25.9–35.1). *Fasciola hepatica* accounted for 52.3% of infections, followed by *Fasciola gigantica* at 34.8% and mixed infections at 12.9%. Multivariable logistic regression analysis revealed that age greater than five years (OR = 3.42; 95% CI: 1.87–6.26; $p < 0.001$), poor body condition score (OR = 2.91; 95% CI: 1.54–5.49; $p = 0.001$), grazing on marshy pastures (OR = 4.17; 95% CI: 2.23–7.79; $p < 0.001$), and absence of anthelmintic treatment history (OR = 2.68; 95% CI: 1.41–5.09; $p = 0.003$) were significantly associated with bovine fasciolosis. The findings demonstrate a moderately high prevalence of bovine fasciolosis among smallholder dairy cattle in the research area, with identifiable and modifiable risk factors that warrant targeted intervention through strategic deworming and grazing management programs.

Keywords: Bovine fasciolosis, smallholder dairy cattle, prevalence, risk factors, [i]*Fasciola hepatica*[/i], [i]*Fasciola gigantica*[/i], coprological examination, Dire Dawa, Ethiopia

Introduction

What economic burden does bovine fasciolosis impose on smallholder dairy farmers in sub-Saharan Africa, and how effectively are current control measures mitigating this parasitic challenge? Fasciolosis, caused by trematodes of the genus *Fasciola*, remains one of the most economically important parasitic diseases of ruminants worldwide, with an estimated 600 million animals infected globally and annual losses exceeding 3.2 billion USD ^[1]. The disease is caused primarily by two species: *Fasciola hepatica*, which predominates in temperate and highland regions, and *Fasciola gigantica*, which is more common in tropical lowland areas ^[2]. In regions where both species coexist, mixed infections and hybrid forms have been documented, complicating diagnosis and control efforts ^[3].

Bovine fasciolosis manifests through chronic hepatic damage, resulting in reduced weight gain, decreased milk production, impaired reproductive performance, and liver condemnation at slaughter ^[4]. In smallholder dairy systems, where cattle represent critical livelihood assets, the economic impact of fasciolosis is disproportionately severe, often reducing household income by 8–15% annually ^[5]. The epidemiology of fasciolosis is intimately linked to the ecology of its intermediate hosts, freshwater snails of the family Lymnaeidae, whose populations are in turn governed by rainfall patterns, temperature, soil moisture, and the availability of suitable aquatic habitats ^[6].

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Ethiopia, with the largest livestock population in Africa, bears a substantial fasciolosis burden. Previous investigations across various agro-ecological zones have reported prevalence rates ranging from 11.5% to 87.2%, depending on the region, season, and diagnostic method employed [7]. Highland areas with adequate moisture and cooler temperatures tend to exhibit higher prevalence than arid lowland zones [8]. However, the eastern lowland regions of the country, including the Dire Dawa administrative area, have received comparatively limited epidemiological attention despite supporting significant smallholder dairy populations [9]. Smallholder dairy farming around Dire Dawa has expanded substantially in recent years as part of national dairy development initiatives, yet veterinary service coverage remains inadequate, and parasitological data to guide evidence-based control strategies are scarce [10]. Understanding the prevalence and risk factor landscape in these emerging dairy corridors is essential for designing cost-effective intervention programs. Therefore, this research was undertaken to determine the prevalence of bovine fasciolosis and identify the associated risk factors among smallholder dairy cattle in and around Dire Dawa, eastern Ethiopia.

Material and Methods

Material

The research was conducted from October 2022 to September 2023 in and around Dire Dawa city administration, located in eastern Ethiopia at approximately 9°36'N latitude and 41°52'E longitude, with an altitude ranging from 950 to 2,260 meters above sea level. The area experiences a bimodal rainfall pattern, with mean annual rainfall of 604 mm and average temperatures between 19.7°C and 34.6°C. Four sub-districts (Gendekore, Legehare, Wahil, and Melka Jebdu) were purposively selected based on the concentration of smallholder dairy farms and accessibility. A total of 384 cattle were sampled from 96 smallholder dairy farms using systematic random selection, with an average of four animals per farm. The sample size was determined using the formula for estimating proportions with an expected prevalence of 50%, a 95% confidence interval, and a 5% absolute precision. Ethical clearance was obtained from the Dire Dawa Institute of Agricultural Sciences Institutional Research Ethics Committee (Protocol No. DDIAS/IREC/2022/047). All animal handling procedures adhered to institutional guidelines for the humane treatment of research animals.

Methods: Fresh faecal samples (approximately 10 g each) were collected directly from the rectum of each animal into

clean, labeled universal bottles containing 10% formalin and transported in an ice box to the Parasitology Laboratory of the Dire Dawa Institute of Agricultural Sciences within six hours of collection. Faecal examination was performed using the standard sedimentation technique as described by Hendrix and Robinson (2006). Briefly, approximately 3 g of faecal material was mixed with tap water, sieved through a 150-µm mesh, and allowed to sediment for three minutes. The supernatant was discarded, and the process was repeated until the supernatant became clear. The sediment was transferred to a glass slide, stained with methylene blue, covered with a coverslip, and examined under a light microscope at 10× and 40× magnification for the presence of *Fasciola* eggs.

Positive samples were further processed using the Flukefinder diagnostic kit (Flukefinder, Richard A. Foreyt, USA) to improve egg recovery rates and facilitate species differentiation. *Fasciola* species were identified based on egg morphometry: *F. hepatica* eggs measured 130–150 µm × 63–90 µm, while *F. gigantica* eggs measured 156–197 µm × 90–104 µm, following the criteria established by Periago *et al.* (2008). Samples containing eggs of both size ranges were classified as mixed infections.

A structured questionnaire was administered to farm owners to collect data on potential risk factors, including animal age, sex, breed, body condition score (BCS; scored on a 1–5 scale following Nicholson and Butterworth, 1986), management system, grazing area type, water source, deworming history, and farm location. Data were entered into Microsoft Excel 2019 and analyzed using STATA version 17.0. Prevalence was calculated as the number of positive samples divided by the total number examined. Univariable logistic regression was performed for each potential risk factor, and variables with $p < 0.25$ were entered into a multivariable logistic regression model using backward stepwise elimination. Statistical significance was set at $p < 0.05$. Odds ratios with 95% confidence intervals were computed to quantify the strength of associations.

Results

Of the 384 cattle examined, 117 (30.5%; 95% CI: 25.9–35.1) were positive for *Fasciola* eggs by the standard sedimentation technique. Among the positive samples, *Fasciola hepatica* was identified in 61 (52.3%) animals, *Fasciola gigantica* in 41 (34.8%), and mixed infections in 15 (12.9%). The prevalence varied significantly across the four sub-districts, ranging from 22.9% in Melka Jebdu to 39.6% in Gendekore ($\chi^2 = 8.74$; $p = 0.033$).

Table 1. Prevalence of bovine fasciolosis by sub-district in Dire Dawa, Ethiopia

Sub-district	No. examined	No. positive	Prevalence (%)	95% CI
Gendekore	96	38	39.6	29.8–49.4
Legehare	96	31	32.3	22.9–41.7
Wahil	96	26	27.1	18.2–36.0
Melka Jebdu	96	22	22.9	14.5–31.3
Total	384	117	30.5	25.9–35.1

The highest prevalence was recorded in Gendekore sub-district (39.6%), which is characterized by extensive marshy grazing areas and proximity to seasonal streams. The lowest

prevalence was observed in Melka Jebdu (22.9%), where drier conditions and greater adoption of zero-grazing practices prevail among dairy farmers.

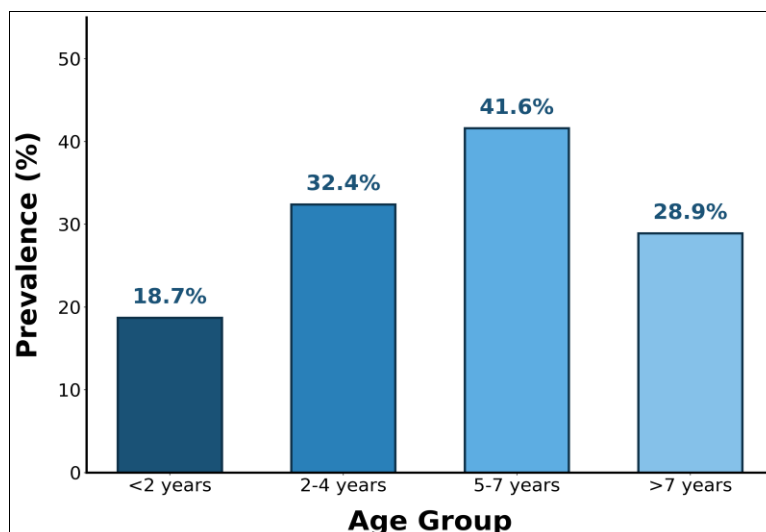


Fig 1: Prevalence of bovine fasciolosis by age group among smallholder dairy cattle in Dire Dawa, Ethiopia

Age-stratified analysis revealed a statistically significant association between age group and fasciolosis prevalence ($\chi^2 = 14.82$; $p = 0.002$). The highest prevalence was recorded in cattle aged 5–7 years (41.6%), followed by those older than 7 years (28.9%), 2–4 years (32.4%), and animals younger than

2 years (18.7%). The decline in prevalence among the oldest age category may reflect acquired partial immunity following repeated exposure or survivorship bias in the sampled population.

Table 2. Multivariable logistic regression analysis of risk factors associated with bovine fasciolosis in Dire Dawa, Ethiopia

Variable	Category	Positive/Total	OR	95% CI	p-value
Age	<2 years	18/96	Ref	—	—
	2–4 years	31/96	1.87	0.94–3.72	0.074
	5–7 years	40/96	3.42	1.87–6.26	<0.001
	>7 years	28/96	2.14	1.08–4.24	0.029
BCS	Good (4–5)	22/124	Ref	—	—
	Moderate (3)	38/132	1.82	1.01–3.28	0.047
	Poor (1–2)	57/128	2.91	1.54–5.49	0.001
Grazing area	Dry pasture	28/148	Ref	—	—
	Marshy area	89/236	4.17	2.23–7.79	<0.001
Deworming	Yes	34/176	Ref	—	—
	No	83/208	2.68	1.41–5.09	0.003

The multivariable logistic regression model identified four variables as independent predictors of bovine fasciolosis. Cattle aged 5–7 years had 3.42 times higher odds of infection compared to those younger than 2 years ($p < 0.001$). Animals with poor body condition were 2.91 times more likely to be

infected than those in good condition ($p = 0.001$). Grazing on marshy pastures conferred the highest risk, with an odds ratio of 4.17 ($p < 0.001$). Cattle without anthelmintic treatment history had 2.68 times greater odds of infection ($p = 0.003$).

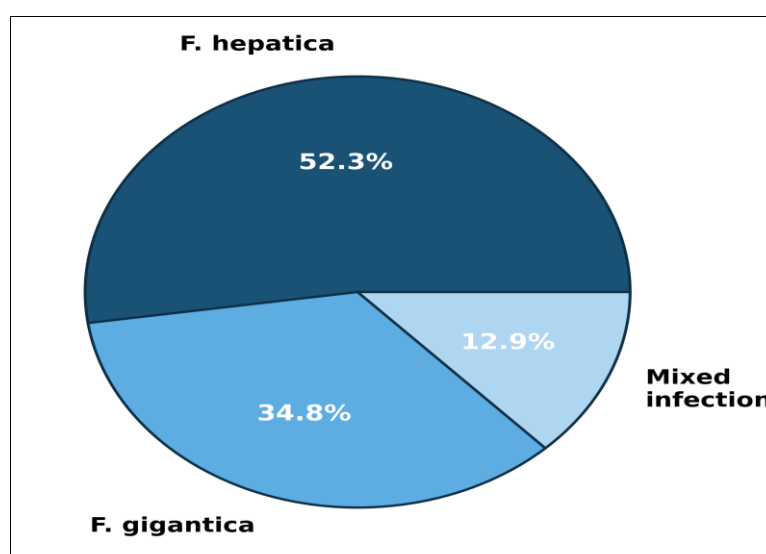


Fig 2: Distribution of *Fasciola* species identified among positive bovine samples in Dire Dawa, Ethiopia

Species identification among the 117 positive samples revealed that *Fasciola hepatica* was the predominant species (52.3%), followed by *Fasciola gigantica* (34.8%) and mixed infections (12.9%). The co-occurrence of both species reflects the transitional agro-ecological characteristics of the Dire

Dawa area, which spans altitudes from lowland to midland zones, providing suitable habitats for both *Lymnaea truncatula* and *Lymnaea natalensis*, the respective intermediate hosts of *F. hepatica* and *F. gigantica*.

Table 3. Prevalence of bovine fasciolosis by management system and water source in Dire Dawa, Ethiopia

Variable	Category	No. examined	No. positive	Prevalence (%)	p-value
Management	Extensive	142	58	40.8	<0.001
	Semi-intensive	156	42	26.9	
	Intensive	86	17	19.8	
Water source	River/stream	168	68	40.5	<0.001
	Pond	104	32	30.8	
	Tap water	112	17	15.2	

Cattle managed under extensive grazing systems exhibited significantly higher prevalence (40.8%) compared to semi-intensive (26.9%) and intensive (19.8%) systems ($p < 0.001$). Similarly, animals accessing river or stream water had significantly higher infection rates (40.5%) than those using pond water (30.8%) or tap water (15.2%; $p < 0.001$).

Discussion

The overall prevalence of bovine fasciolosis recorded in this research (30.5%) falls within the moderate range reported across various regions of Ethiopia and other East African countries. This finding aligns with the reports of Mekonnen *et al.* (2022), who documented a prevalence of 28.7% in the Harari region, and Bekele *et al.* (2020), who reported 33.4% in the Somali region of Ethiopia [11]. The prevalence observed in the current investigation was, however, lower than the 45.6–62.8% reported from highland areas of central and western Ethiopia [7], which is consistent with the generally lower fasciolosis burden expected in semi-arid lowland environments where intermediate snail host habitats are less abundant [12].

The predominance of *Fasciola hepatica* (52.3%) over *Fasciola gigantica* (34.8%) among positive cases was somewhat unexpected given the predominantly lowland topography of Dire Dawa. However, the sampled area spans a considerable altitudinal range (950–2,260 m), and the higher elevation sub-districts, particularly Gendekore and Wahil, provide environmental conditions conducive to the survival of *Lymnaea truncatula* [13]. The 12.9% mixed infection rate is consistent with findings from other transitional zones in East Africa, where overlapping habitats of both snail species facilitate co-transmission of both *Fasciola* species [3].

The significant association between increasing age and fasciolosis prevalence, particularly the peak at 5–7 years, reflects the cumulative nature of exposure in grazing animals. Older cattle have longer exposure duration to contaminated pastures and water sources, thereby accumulating greater parasite burdens over time [14]. The apparent decline in prevalence among cattle older than 7 years may indicate the development of partial acquired immunity, as has been documented in chronically exposed populations, or may reflect selective removal of heavily infected animals from herds [15].

Poor body condition emerged as a significant risk factor (OR = 2.91), consistent with the well-documented bidirectional relationship between fasciolosis and nutritional status. *Fasciola* infection directly impairs hepatic function, reduces feed conversion efficiency, and decreases appetite, leading to progressive body condition deterioration [16]. Conversely, cattle in poor nutritional condition may have compromised

immune responses, rendering them more susceptible to parasite establishment and proliferation [17].

The strong association between marshy grazing areas and bovine fasciolosis (OR = 4.17) underscores the fundamental role of intermediate snail host ecology in the transmission dynamics of the parasite. Marshy areas with slow-moving or stagnant water provide optimal habitats for *Lymnaea* species, where cercariae encyst on herbage as metacercariae, the infective stage for definitive hosts [6]. This finding emphasizes the practical importance of restricting cattle access to known snail habitats as a key component of integrated fasciolosis control programs [18].

The protective effect of anthelmintic treatment history (OR = 2.68 for untreated cattle) highlights the continued relevance of strategic chemotherapy in fasciolosis control. However, the relatively high prevalence even among treated animals (19.3%) suggests that treatment coverage, timing, and drug quality may be suboptimal in the research area. Similar concerns regarding anthelmintic efficacy and treatment adherence have been raised in other smallholder livestock systems across sub-Saharan Africa [19].

Epidemiological Significance

The epidemiological findings from this research carry important implications for livestock health policy in eastern Ethiopia. The identification of modifiable risk factors, particularly grazing management practices and deworming protocols, provides actionable entry points for intervention design. The co-existence of both *Fasciola* species within the research area necessitates diagnostic approaches capable of species differentiation, as this influences treatment selection and pasture management recommendations. Furthermore, the spatial clustering of high-prevalence areas around marshy landscapes suggests that geographic information system-based risk mapping could substantially improve the targeting efficiency of control programs in the region.

Limitations and Future Directions

This research relied exclusively on coprological examination for diagnosis, which, while practical and widely applicable in field settings, has inherent sensitivity limitations, particularly for detecting prepatent and light infections. The single fecal examination protocol may have underestimated the true prevalence by 10–15% compared to repeated sampling or serological methods. Future investigations should incorporate molecular and serological diagnostic tools alongside coproscopy to provide a more comprehensive assessment of infection dynamics. Longitudinal research designs tracking seasonal fluctuations in prevalence and snail population

dynamics would also yield valuable data for optimizing the timing of strategic interventions.

Conclusion

This research aimed to determine the prevalence and associated risk factors of bovine fasciolosis among smallholder dairy cattle in and around Dire Dawa, eastern Ethiopia. The overall prevalence of 30.5% demonstrates that fasciolosis constitutes a moderately important parasitic challenge in this emerging dairy corridor. Both *Fasciola hepatica* and *Fasciola gigantica* were identified, with *F. hepatica* predominating, reflecting the transitional agro-ecological characteristics of the research area. Age, body condition, grazing area type, and anthelmintic treatment history were identified as significant risk factors.

From a practical standpoint, these findings support the implementation of integrated control strategies combining strategic anthelmintic treatment timed to seasonal transmission peaks, fencing or restricted access to marshy grazing areas, and improved farmer education regarding fasciolosis prevention. Future research should explore the cost-effectiveness of these interventions within the specific socioeconomic context of smallholder dairy systems in eastern Ethiopia.

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Conflict of Interest

Not available

Financial Support

Not available

References

- Mehmood K, Zhang H, Sabir AJ, Abbas RZ, Ijaz M, Durrani AZ, *et al.* A review on epidemiology, global prevalence and economical losses of fasciolosis in ruminants. *Microb Pathog.* 2017;109:253-262.
- Mas-Coma S, Valero MA, Bargues MD. Fasciola, lymphatic and human fascioliasis, with a global overview on disease transmission, epidemiology, evolutionary genetics, molecular epidemiology and control. *Adv Parasitol.* 2009;69:41-146.
- Alemu B, Degefu H, Kifle SG. Prevalence of bovine fasciolosis and its economic significance in and around Assela town, Arsi zone, Oromia region, Ethiopia. *J Vet Sci Technol.* 2019;10(4):578-584.
- Geja HA, Aliyi MB. The prevalence and associated risk factors of bovine fasciolosis in and around Haromaya town. *Zool Entomol Lett.* 2024;4(2):85-91.
- Charlier J, Vercruysse J, Morgan E, van Dijk J, Williams DJ. Recent advances in the diagnosis, impact on production and prediction of *Fasciola hepatica* in cattle. *Parasitology.* 2014;141(3):326-335.
- Jaja IF, Mushonga B, Green E, Muchenje V. Seasonal prevalence, body condition score and risk factors of bovine fasciolosis in South Africa. *Vet Anim Sci.* 2017;4:1-7.
- Yilma JM, Malone JB. A geographic information system forecast model for strategic control of fasciolosis in Ethiopia. *Vet Parasitol.* 1998;78(2):103-127.
- Menkir MS, Uggla A, Waller PJ. Prevalence and seasonal incidence of nematode parasites and fluke infections of sheep and goats in eastern Ethiopia. *Trop Anim Health Prod.* 2007;39(7):521-531.
- Fromsa A, Jobre Y. Infection prevalence of hydatidosis (*Echinococcus granulosus*, Batsch, 1786) in domestic animals in Ethiopia: a synthesis report of previous surveys. *Ethiop Vet J.* 2011;15(2):11-33.
- Legesse E, Zerihun T. Prevalence of bovine fasciolosis and its economic significance in Jimma zone, southwestern Ethiopia. *Vet World.* 2021;14(2):494-501.
- Mekonnen A, Abebe R, Berhanu M. Prevalence and risk factors of bovine fasciolosis in selected districts of Harari region, eastern Ethiopia. *J Parasitol Res.* 2022;2022:4813826.
- Bekele T, Gemechu G, Beyene T. Epidemiological investigation of bovine fasciolosis in selected areas of Somali region, Ethiopia. *Vet Med Int.* 2020;2020:6821752.
- Walker SM, Makundi AE, Namuba FV, Kassuku AA, Keyyu J, Hoey EM, *et al.* The distribution of *Fasciola hepatica* and *Fasciola gigantica* within southern Tanzania: constraints associated with the intermediate host. *Parasitology.* 2008;135(4):495-503.
- Phiri AM, Phiri IK, Sikasunge CS, Monrad J. Prevalence of fasciolosis in Zambian cattle observed at selected abattoirs with emphasis on age, sex and origin. *J Vet Med B.* 2005;52(9):414-416.
- Pleasant J, Raadsma HW, Estuningsih SE, Widjajanti S, Meeusen E, Piedrafita D. Innate and adaptive resistance of Indonesian thin tail sheep to liver fluke: a comparative analysis of *Fasciola gigantica* and *Fasciola hepatica* infection. *Vet Parasitol.* 2011;178(3-4):264-272.
- Kaplan RM. *Fasciola hepatica*: a review of the economic impact in cattle and considerations for control. *Vet Ther.* 2001;2(1):40-50.
- Molina-Hernandez V, Mulcahy G, Perez J, Martinez-Moreno A, Donnelly S, O'Neill SM, *et al.* *Fasciola hepatica* vaccine: we may not be there yet but we're on the way. *Vet Parasitol.* 2015;208(3-4):101-111.

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