Peertechz

LIFE SCIENCES GROUP

INTERNATIONAL JOURNAL OF
Veterinary Science and Research
OPEN ACCESS JOURNAL

ISSN: 2640-7604 DOI: https://dx.doi.org/10.17352/ijvsr

Research Article

Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia

Diriba Tigire Nuqus[1], Dereje Abera Wako[2] and Jiregna Dugassa Kitessa[3]*

[1]Director of Veterinary Services, Livestock, and Fisheries Resource Development Office, Gidda Ayana District, Oromia, Ethiopia

[2]Department of Veterinary Medicine, School of Veterinary Medicine, Wollega University, Nekemte, PO, Box 395, Ethiopia

[3]Department of Clinical Studies, College of Veterinary Medicine And Agriculture, Addis Ababa University, Bishoftu, PO Box 34, Ethiopia

Received: 13 April, 2022
Accepted: 01 June, 2022
Published: 02 June, 2022

***Corresponding author:** Jiregna Dugassa Kitessa, DVM, MVSc, Assistant Professor, Department of Clinical Studies, College of Veterinary Medicine And Agriculture, Addis Ababa University, Bishoftu, PO Box 34, Ethiopia, Tel: +251921180037; E-mail: Jiregnadu@gmail.com/ Jiregna.dugassa@aau.edu.et

ORCID: https://orchid.org/0000-0002-6756-6434

Keywords: Bedele; Fasciolosis; Ovine; Prevalence; Risk Factor

Abstract

Background: Ethiopia is rich in sheep and goats, accounting for 63% of the income from financial production and 23% of the cost of food. However, this immense wealth potential has not been well exploited for the support of farmers and their contribution to the economy as a whole due to various factors such as diseases. Among these, fascioliasis is one of the most economically important parasitic diseases of farm animals, especially in sheep.

Objectives: To determine the prevalence and risk factors associated with ovine fasciolosis in the study area.

Methods: A cross-sectional study design was conducted to determine the prevalence and risk factors associated with ovine fasciolosis in four randomly selected peasant associations in and around Bedele town by using standard fecal sedimentation techniques.

Results: Out of a total of 384 sheep faecal samples processed and examined, 85 (22.1%) were positive for fasciolosis. Risk factors such as origin, age, sex, and body condition were also assessed for the occurrence of the disease. Accordingly; Shebe (26.4%) had a higher sheep fasciolosis, followed by Yabella (22.5%), Dabena Daru (20.8%), and Bedele 02 (17.5%) with no significant differences in peasant associations ($p > 0.05$). The prevalence rate under different body condition scores was recorded as poor (38.6%) compared to medium (22.3%), followed by good (16.3%). Similarly, infection was found to be among female (23%) and male (21%) sex groups; but had a statistically significant association ($p < 0.05$).

Conclusion and Recommendations: Current research suggests that fasciolosis affecting sheep was a common parasitic disease in the study area, so control strategies should be developed to reduce the spread of infection.

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117

Abbreviations

Pas: Peasant Associations

Introduction

Ethiopia has the highest livestock potential in Africa, with approximately 53.99 million cattle, 25.5 million sheep, 24.06 million goats, 1.91 million horses, 6.75 million donkeys, 0.35 million mules, 0.92 million camels, and about 50.38 million poultry are estimated to be found in the country [1]. Among livestock, small ruminants play an important role in the socio-economic life of the people of Ethiopian people. Owing to their high fertility, short generation interval, and adaptation even in harsh environments, sheep, and goats are considered investments and insurance to provide income to purchase food during seasons of crop failure and to meet seasonal purchases such as improved seed, fertilizer, and medicine for rural households [2].

Ethiopia is rich in sheep and goats, which provide up to 63% of income from financial production and 23% of the cost of food. However, this immense potential of wealth has not been utilized for the livelihood of rural farmers and their contribution to the overall national economy is low. This is due to the spread of parasitic and infectious diseases, lack of traditional secular management system, genetic selection for good performance with nutrition and nutrition and lack of infrastructure of a well-developed market. Parasitic disease is a serious health condition and associated diseases and deaths limit the productivity of livestock [3].

Among the animal diseases that affect animal health, fascioliasis is one of the most economically important parasitic diseases of farm animals, particularly in sheep and cattle. In addition, fascioliasis is now recognized as a newly emerging human disease. The World Health Organization (WHO) estimates that 2.4 million people were infected with fasciola in 1995 and that 180 million were at risk of infection. The disease is caused by native trematodes of the genus Fasciola, commonly known as fluke liver. The two species that are most likely to cause fascioliasis are Fasciola hepatica and Fasciola gigantica [4].

The prevalence of fasciolosis is highly dependent on the ecology of snails acting as intermediate hosts, and snails of the Lymnaae genus are primarily involved in the life cycle of the metacercariae-mediated miracidium development. The favorable factors in the production of metacercariae essential for the development of fasciolosis are temperature (≥0 °C), snail habitat availability, and moisture [5]. The onset of fasciolosis infection in the critical host is divided into two stages: the parenchymal (migration) stage and the biliary phase [6]. There are three clinical manifestations of fasciolosis in infected sheep: acute, subacute, and chronic [7].

Diagnosis is primarily based on the standard fluke egg sedimentation technique, clinical signs, seasonal events, and history of form fasciolosis, or coprological examination of faces using snail habitat identification, postmortem examination, and hematological examination [8]. The most common way to control fasciolosis is to treat hosts with anthelmintics. Triclabendazole is the most commonly used drug because it is effective against mature and immature forms of the parasite [9].

Ovine fascioliasis in Ethiopia is very common and causes significant economic loss of production, decreased productivity, and loss of body condition annual losses have been estimated at 48.4 million Ethiopian Birr (ETB) per year, of the which, 46.5%, 48.8%, and 4.7% were due to mortality, productivity (weight loss and reproductive waste) and condemnation of the liver for slaughter, respectively [10]. These losses can be significantly reduced by fascioliasis control programs that may include the use of anthelmintics, grazing management, and nutritional supplements [11].

Although many studies have been conducted on the prevalence and economic significance of sheep fasciolosis in Ethiopia, there is no information about the prevalence and associated risk factors of sheep fasciolosis in these study areas, where local farmers consider sheep to be an important asset. Therefore, the objectives of this study were to:

- ✓ Determine the prevalence and risk factors associated with ovine fasciolosis in the study area.

Materials and methods

Study area

The study was conducted between November 2017 and April 2018 in and around the town of Bedele, Oromia. The town of Bedele has located 483 km from Addis Ababa on the main road to Gambella. Geographically, the city of Bedele is located at 8° 27′N latitude and 36° 21′E longitude. The height of the district is between 1400 and 2010 m.a.s. According to the District Agriculture Office (2018 Annual Report), the average minimum and maximum annual temperatures are 15 °C and 25°C respectively [12],

The area receives an average annual rainfall of more than 1800 mm. It is a bimodal type with a tropical, sub-humid climate and evergreen forest vegetation (i.e. November to March and May to September). Mixed agriculture is the livelihood of the Bunno Bedele zone, where about 87% of the total population is engaged in agriculture. Livestock plays an important role in the agricultural economy. The livestock herd of the district is estimated at about 172, 272 cattle, 27, 931, sheep, 29,734, goats, 14,948, horses, and 71,763, poultry. Teff, millet, corn, sorghum, wheat, and sesame are some of the major crops [12].

Study design and study animals

A cross-sectional study design was used to determine the prevalence of bovine fasciolosis and to identify associated risk factors in the study area. This study was carried out on sheep of different age groups, sex, and body condition. Age was estimated and categorized as described in [13]. The sheep were divided into groups under 1 year and 3 months and the adults are over 1 year and 3 months. The rating of the body

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117

condition of each animal was determined based on the criteria established by [14] using the 5-point scale (1 = very thin to 5 = obese). It can be evaluated by palpating the lumbar vertebrae between the back of the ribs and the front of the pelvic bones.

However; for this study, animals were classified as poor, medium, and in good physical condition. The study was conducted on 384 sheep selected by 38 farmer associations such as Bedele 02, Dabena Daru, Shebe, and Yabela, taking into account the number of the road or transport access and area sheep. Among these animals were 80 Bedele 02, 96 Dabena Daru, 102 Yabela and 106 Shebe. Individual animals were selected by simple random sampling. Accordingly, the sample size of study animals from each farmer's association is determined based on a proportional basis.

Sample size determination

To determine the sample size, a prevalence rate of 50% was taken into consideration since there was no published research work on ovine fasciolosis done in the study area. The desired sample size for the study was calculated by using the formula given by [15] with a 95% Confidence interval and 5% absolute precision.

Where N = require sample size

$$N=\frac{1.962*Pexp\ (1-Pexp)}{d^2}$$

Pexp=expected prevalence

CI=confidential Interval (95%)

d=desired absolute precision (5%)

$$N=\frac{1.962*0.5\ (1-0.5)}{(0.05)^2}$$

Accordingly, the estimated sample size was 384 animals

Sample collection, transportation and examination

A total of 384 fecal samples were collected and all samples were taken directly from the rectum of the vulva using a glove and placed in a clean universal bottle with a screw cap each sample was clearly labeled with the identification of the animal species, sex was labeled with age, body condition score and sample collection site followed by recording on the data collection sheet. Samples collected in nearby locations, such as Dabena Daru, Shebe, and Yabela, which are far from the Bedele Regional Veterinary Laboratory, were protected by a formal solution for the development and escape of eggs before being tested. Fasciolosis eggs were examined using different equipment and laboratory equipment such as beakers, strainers, measuring cylinders, mortars, and pestles, test tubes, test tube racks, microscope slides, coverslips, microscopes, centrifuges, and coolers. The examination procedure for examining Fasciola eggs was as follows: approximately 10 grams of feces were collected from the rectum of each selected sheep using gloved fingers and placed in a universal bottle.

The fecal sample was crushed with mortar and pestle and 40-50 ml of tap water was added and mixed with a fork and filtered the fecal suspension through a tea strainer into a beaker, the filtered material should be poured into a centrifuge tube. After balancing the centrifuge tubes, centrifuged the sample at about 1500 rpm for three minutes the supernatant fluid was discarded carefully using a pipette and bulb, transferred a small amount of the top of the layer of the sediment to a microscope slide, and covered with a coverslip, Then examined under 10x's magnification power. To differentiate between eggs of *paramphistomum* species and *fasciola* species a drop of methylene blue solution was added to the sediment. Eggs of *fasciola species* show yellowish color while eggs of *paramphistomum* species stain by methylene blue and examined under 40 x magnification powers [16].

Data management and analysis

The collected data were entered and stored into a Microsoft Excel spreadsheet in 2007. The data were thoroughly screened for errors and properly coded before subjecting to statistical analysis. The data were imported from Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 20.0. Descriptive statistics were used to quantify the prevalence of fasciolosis. The prevalence of fasciolosis was expressed as a percentage with a 95% confidence interval by dividing the total number of sheep positive for fasciolosis by the total number of animals examined in the study period. The prevalence rate of fasciolosis was calculated for different risk factors as the number of fasciolosis positive animals examined divided by the total number of animals investigated at the particular time. The significant difference in fasciolosis prevalence was determined using descriptive statistics; the Chi-Square test where P – value was found less than 0.05.

Result

Coproscopic examination conducted from November 2017 to April 2018 shows that out of a total of 384 local sheep placed under a traditional extensive management system tested by using the sedimentation technique of feces, 85 sheep were found to be infected by *Fasciola Fasciola* with an overall prevalence of 22.1%. The variation of prevalence among peasant associations (PAs) shows the highest was recorded in Shebe (26.4%), followed by Yabela (22.5%), Dabena Daru (20.8 %), Bedele 02 (17.5%), however, there was no statistically significant difference ($P > 0.05$), as described below in (Table 1).

In the present study area, the prevalence of fasciolosis is found to be higher in sheep with poor body conditions. The prevalence is 38.6 %, 22.3 %, and 16.3 % in poor, medium, and good body condition respectively with statistically significant differences ($P < 0.05$). The prevalence of fasciolosis was also assessed between female and male sheep. Accordingly, the prevalence is found to be 23.0% and 21.0%, respectively without statistically significant ($p > 0.05$) as described in (Table 2).

The prevalence of fasciolosis between young and adult animals was compared based on age groups of animals.

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117

Table 1: Prevalence of ovine fasciolosis in different peasant associations.

Peasant associations	No of animals Examined	No of positive animals	Prevalence (%)	x^2	(*P*- value)
Bedele 02	80	14	17.5%		
Yabela	102	23	22.5%		
Dabena daru	96	20	20.8%	2.228	0.526
Shebe	106	28	26.4%		
Total	384	85	22.1%		

Table 2: The prevalence of ovine fasciolosis across risk factors.

Risk factors	No. of animals examined	No. of positive	Prevalence (%)	X^2	P-value
Body condition score					
Poor	70	27	38.6		
Medium	112	25	22.3	14.951	0.001
Good	202	33	16.3		
Total	384	85	22.1		
Age					
Young	152	24	15.8	0.015	5.878
Adult	232	61	26.3		
Total	384	85	22.1		
Sex					
Female	222	51	23%	0.214	0.644
Male	162	34	21%		
Total	384	85	22.1		

Accordingly, the statistical analysis revealed significant differences ($p < 0.0s$) between sheep of different age groups (Table 2).

Discussion

There are various results reported by many authors or researchers in different years regarding the prevalence of fasciolosis in sheep in Ethiopia. The current study found that the overall prevalence of fasciolosis based on a joint coprological test of fasciolosis in sheep was 22.1%. The findings were consistent with other studies in different parts of the country that reported a prevalence of 24.2% in selected areas of Alamata, Ethiopia [17]. The prevalence of fasciolosis in sheep in this study was higher than the 14.6% prevalence reported by [18] in Hirna [19] 13.4% in Nekemte, [20] 13.2% in the central Awash River basin. This can be due to differences in temperature, rainfall, humidity, humidity, soil, and other environmental factors that can affect the life cycle of the parasite. However, the current prevalence was less than 50.8% in Chole Worea and its environs, Ethiopia) [21] and Mainz Lalo Medir District, in northeastern Ethiopia, 70.2%. This may be due to agricultural and environmental differences between local areas, management systems, sample size, sampling period, and deworming status.

Consequently, the prevalence of ovine fasciolosis in the area of the present study in deferent peasant associations (PAs) was higher in Shebe (26.4%) followed by Yabela (22.5%), Dabena Daru (20.8%), and Bedele 02 (17.5%), without significant difference. This significant variation in prevalence from one peasant association to the others may be due to the presence of a large variety of marshy or swampy lands, the irrigation canal, and the management of animals.

The prevalence of fasciolosis was significantly higher in poor body conditioned sheep (38.6%) than in medium (22.3%) and good body conditioned (16.3%) sheep. This finding is consistent with the result of [10,22-25] also found that sheep with poor body conditions had a higher prevalence than their counterparts. This can be explained by the fact that sheep with poor body conditions are less resistant and are more susceptible to infectious diseases, as compared to good body conditions once. In addition to weight loss, lack of appetite, poor diet, and weekly growth rates are associated with an increase in the number of flukes in sheep's bodies [6].

The present study found that the prevalence of fasciolosis was significantly higher in adult sheep (26.3%) than in young (15.8%). This result is corroborated by other reports [10,26,27]. The low prevalence in young sheep may be due to the sheep management system in the study area, where they are not allowed more visits to the pasture with adult sheep, leading to contact with infectious fasciola larvae and adult sheep. The probability decreases. They are often allowed to graze a larger area of pasture than young people, which increases the risk of infection. In addition, the increased risk of exposure in adults may be associated with physical differences such as stress, pregnancy and lamb, inadequate nutrition, and co-infection.

The prevalence of the disease in females and males was 23.0% and 21.0%, respectively. There was a nonsignificant difference ($P > 0.05$) between the two sexes. The lack of significant sex-specific differences was also reported by [28-30]. This could be due to grazing of both sexes on similar pastures contaminated with fasciola. This shows that gender does not affect the prevalence of fascioliasis and that both sexes are equally susceptible and exposed to the disease. In general, the results obtained in this study indicated that there was fascioliasis in the study area.

Conclusion and recommendations

Current studies show that fasciolosis is one of the major obstacles to the development of sheep production and development in the study areas. The prevalence of ovine fasciolosis in the study area was 22.1%. Origin, body condition, sex, and age were important risk factors assessed for ovine fasciolosis. The occurrence of ovine fasciolosis in this study suggested that there is the presence of favorable ecological and climatic conditions for the development and survival of the Fasciola species as well as intermediate hosts. Based on the above conclusion, the following recommendations are forwarded:

- Strategic anthelmintic and basic animal management system improvements need to be practiced.
- It is necessary to implement awareness-raising measures for animal owners in the study area.

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117

- Wetlands should be well-drained in the study area.
- Further research on the epidemiological conditions and seasonal dynamics of parasites in the study area is required to implement the integrated management strategy.

Declarations

Ethics approval and consent to participate: Wollega University Research Ethics Review Committee (WUREC) approved this research before actual data collection. A consent sheet was prepared in English and attached to the tool on a separate page regarding the purpose, description, anticipated benefits, and other relevant aspects of the study, and signed informed consent was taken from all respondents prior to data collection for animal owners of above 18 years of age. **Thus, the authors declare that all methods were performed in accordance with the relevant guidelines and regulations.**

Availability of materials and data

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author contributions

All authors contributed to the manuscript to the final submission. Conceptualization, Data curation, analysis, and writing the original draft were performed by Nuqus TD, Investigation, methodology, validation, and supervision were majorly done by Wako AD while visualization, reviewing, and editing was done by Kitessa DJ. Finally, all authors read and approved the final manuscript submission.

Acknowledgment

All authors warmly extend their deep and heartfelt gratitude to veterinarians, veterinary laboratory technicians of Bedele Regional Veterinary Laboratory, and other corresponding government officers for their kind, cooperation, and processing of samples during the survey besides their dedicated time.

References

1. Central Statistical Authority. Livestock population of Ethiopia, central statistical authority, Addis Ababa, Ethiopia. 2013.
2. Zelalem A, Flecher I. small ruminant productivity in centeral Ethiopia mixed farming systems.4th national live stock improvement conference. Addis Ababa, Ethiopia. 1993.
3. Ahmed E, Markvichitr K, Jumwasorn S, Koonawothththin S, Achoothesa J. Prevalence of Fasciola species infections of sheep in the middle Awash river basin, Ethiopia. Southeast Asian J Trop Med Publ Health. 2007; 38: 51-52.
4. Andrews S. The life cycle of Fasciola hepatica. In fasciolosis, ed. Dalton, J. CABI Publishing. 1999; 1-29.
5. Uruqhart G, Tarmour J, Duncan J, Dunn A, Jennings F. Veterinary helminthology, in veterinary Parasitology, (2nd ed), Blackwell science, United Kingdom. 1996; 102-120.
6. Behm CA, Sangster NC. Pathology, pathophysiology and clinical aspects. In, Dalton JP (Ed), fasciolosis. CAB Int Pub, Wal, 185-224. 1999.
7. Troncy P. Helminthes of livestock and poultry in tropical Africa. Manual of tropical veterinary parasitology. CAB Inter, UK. 1989; 63-73.
8. Rokni N, Massound J, KIA E. Comparisons of adult somatic and cytosine proteinase antigens of Fasciola gigantic, OIE seminar on Biotechnology proceeding. 2003; 9-13.
9. Gaasenbeek CP, Moll L, Cornelissen JB, Vellema P, Borgsteede FH. An experimental study on triclabendazole resistance of Fasciola hepatica in sheep. Vet Parasitol. 2001 Feb;95(1):37-43. doi: 10.1016/s0304-4017(00)00413-1. PMID: 11163696.
10. Molalegne B, Nuradis I, Nahili A. Study on the prevalence of ovine fasciolosis in and around Dawa- Cheffa Kemissie. Afr J Agr Res. 2010; 5: 2981-2985.
11. Anderson N, Luong TT, Vo NG, Bui KL, Smooker PM, Spithill TW. The sensitivity and specificity of two methods for detecting Fasciola infections in cattle. Vet Parasitol. 1999 Jun 1;83(1):15-24. doi: 10.1016/s0304-4017(99)00026-6. PMID: 10392764.
12. BWLFRB. Bedele Woreda livestock and fisheries resource Bureau, annual report of agricultural productivity. 2010.
13. Gatenby RM. The tropical agriculturalist, sheep (Tropical agriculture series) Macmillan Education, Addis Ababa. 1991.
14. Girma A. A giede to body condition scoring of sheep and goats, Ethiopia sheep and goat productivity improvement program (ESGPIP). Addis Ababa, Ethiopia. 1990.
15. Thrusfield M. Veterinary epidemiology. 3rd ed. Blackwell Scince, Great Britain. 2007; 259-263.
16. Hansen I, Perry B. The epidemiology, diagnosis and control of helrninth parasite of rurninants. 1994.
17. Mathewos T, Tadesse D, Zawdneh. Prevalence and associated risk factors for ovine fasciolosis in selected sub-districts of Alamata district, Ethiopia. Glob Vet. 2014; 13: 738-744.
18. Henok M, Mekonnen A. Study on prevalence and risk factors of fasciolosis in small ruminants in and around Hirna town, Ethiopia. Glob Vet. 2011; 7: 497-501.
19. Wassise M. Prevalence of bovine and ovine fasciolosis a preliminary survey in Nekemte and its surround areas. DVM thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia. 1995; 30.
20. Ahmed E, Markvichitr K, Jumwasorn S, Koonawothththin S, Achoothesa J. Prevalence of Fasciola species infections of sheep in the middle Awash river basin, Ethiopia. Southeast Asian J Trop Med Publ Health. 2007: 38: 51-52.
21. Hubad H, Seifudin K, Sufian A, Kemer K, Mukarim A. Study on Prevalence of Ovine fasciolosis in and around Chole Woreda, Ethiopia. Inter Jou of Res Stud in Bio (IJRSB). 2017; 5(1): 1-5.
22. Eyerusalem G, Yeshitila A, Mihreteab B. Prevalence of ovine fasciolosis in Adigrat, North East Ethiopia. Glob Vet. 2012; 9: 92-96.
23. Bitew M, Ibrahim N, Abdela N. Study on the prevalence of ovine fasciolosis in and around Dawa-Cheffa, Kemissie. Afri Jou of Agri Rese. 2010; 5: 2981-2985.
24. Beyazen C. Preliminary study on epidemiology of fasciolosis in eastern Gojjam region, Ethiopia. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debrezeit, Ethiopia. 1995.
25. Kebede Sh, Wakgari O. The prevalence study of ovine fasciolosis in Jima Rare District, Horo Guduru Wollega Zone, Oromia Regional State, Western Ethiopia. J Vet Sci Techn. 2016.
26. Begashaw S. Assessment of the economic impact and prevalence of ovine fasciolosis in Menz Lalo Midir District, Northeast Ethiopia. Veterinary World. 2012; 5: 261-264.

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117

27. Mamaru A, Nibret M. Prevalence of ovine fasciolosisin Dembecha district, northwest Ethiopia. Acta Para Glob. 2014; 5.

28. Daryani A, Alaei R, Arab R, Sharif M, Dehghan M, Ziaei H. Prevalence of liver fluke infection in slaughter animals in Ardabi Province, Northwestern Iran. J Anim Vet Adv. 2015; 5: 408-411.

29. Mohammed S. Prevalence and economic importance of ovine fasciolias in and around Kombolcha, DVM thesis, Gondar University, Gondar, Ethiopia. 2010.

30. Gebreyohannes M, Demeke Y, Kebede E. Ovine fascioliasis prevalence and associated risk factors in Menz gera midr woreda of north Shoa zone, Ethiopia. J Anim Prod Adv. 2013; 3: 203-207.

Citation: Nuqus DT, Wako DA, Kitessa JD (2022) Prevalence of ovine fasciolosis and its associated risk factors: The case of in and around Bedele Town, Bunno Bedele Zone, Oromia Region, Ethiopia. Int J Vet Sci Res 8(2): 074-079. DOI: https://dx.doi.org/10.17352/ijvsr.000117