The Internet Journal of Veterinary Medicine
Volume 8 Number 2

Prevalence Of Bovine Fasciolosis And Economic Importance Due To Liver Condemnation At Kombolcha Industrial Abattoir, Ethiopia

N Ibrahim, P Wasihun, T Tolosa

Citation

N Ibrahim, P Wasihun, T Tolosa. *Prevalence Of Bovine Fasciolosis And Economic Importance Due To Liver Condemnation At Kombolcha Industrial Abattoir, Ethiopia*. The Internet Journal of Veterinary Medicine. 2009 Volume 8 Number 2.

Abstract

The aim of this study was to establish the prevalence and economic significance offasciolosis due to liver condemnation in indigenous adult cattle slaughtered atKombolcha industrial abattoir and to compare diagnostic efficiency of faecal andpostmortem examination. A 5-year database (2004-2009) from the abattoir was retrievedand analysed. A retrospective abattoir survey results showed a total of 24,874 cattle were slaughtered from August 2005 to Sep. 2009. During that period, 9843 livers were positive for fasciolosis and condemned. Based on the current local price of liver, an average annual monetary loss due to liver condemnation was about 1833USD. A retrospective abattoir survey revealed that the prevalence of fasciolosis was 39.6%. From the total number of cattle slaughtered (n=500) during study period, coproscopic and postmortem examination was performed for bovine fasciolosis. Of the 500 livers and faecal samples examined, 140 (28%) and 62 (12.4%) were positive for fasciolosis. 63.6% of total livers found to be positive for bovine fasciolosis were infected with F.hepatica where as F.giantica, mixed infection and immature or unidentified form of fasciola species recovered was 24.3%, 7.14% and 5%, respectively. These results indicate that F.
hepatica was the most common liver fluke species that leads to high liver condemnation rates in cattle slaughtered, resulting into financial loss in the study area. There was moderateagreement between faecal examination and postmortem findings of liver lesion (k=0.53)but postmortem examination was considered a better diagnostic tool for fasciolosis in the study area. Losses due to liver condemnation at Kombolcha industrial abattoir, its economic implications should not be overlooked. Since fasciolosis constitute a major intestinal problem and liver condemnation in cattle, the grazing of cattle should be highly restricted to areas of lesser snail infected site.

INTRODUCTION

Fasciolosis is among important parasitic diseases in tropical and subtropical countries which limit productivity of ruminants in particular cattle. Fasciola hepatica and F. gigantica are the two liver flukes commonly reported to cause fasciolosis in ruminants (Keyyu et al 2005). The presence of Fasciolosis due to F.hepatica and F.gigantica in Ethiopia has long been known and its prevalence and economic significance have been reported by several workers (Fufa et al 2009; Tadelle and Worku 2007; Yilma and Malone 1998; Daniel 1995 and Dagne 1994).

In general the distribution of Fasciolosis is worldwide. However, the distribution of F.hapatica is limited to temperate areas and high lands of tropical and subtropical regions (Soulsby 1986). The definitive hosts for F. hepatica are most mammals, among which sheep and cattle are the most important once. The geographical distribution of trematodes species is depending on the distribution of suitable species of snails. The genus Lymnea in general and L. Truncatula in particular are the most common intermediate host for F. hepatica. This species of snail was reported to have a worldwide distribution (Urquhart et al 1996). F. gigantica is found in most continents, primarily in tropical regions (Dalton 1998).

The economic losses due to fasciolosis are caused by mortality, morbidity, and reduced growth rate, condemnation of liver, increased susceptibility

to secondary infections and
the expense of control measures (Malone et al 1998). The annual loss due to endoparasites in Ethiopia is estimated at 700 million Ethiopian birr/annum (Mulugeta et al 1989). According to the study conducted by Tadelle and Worku (2007) and Fufa et al (2009) fasciolosis caused an average loss of 6300USD and 4000USD per annum at Jimma and Soddo municipal abattoirs, respectively. Kithuka et al (2002) reported up to 0.26 million USD annual loss attributable to fasciolosis-associated liver condemnations in cattle slaughtered in Kenya. Apart from its veterinary and economic importance throughout the world, fasciolosis has recently been shown to be a re-emerging and widespread zoonosis affecting a number of human populations (Mas-Coma and Bargues 1997; Esteban et al 2003).

Diagnosis is based primarily on clinical signs and seasonal occurrence in endemic areas
but previous history of fasciolosis on the farm or identification of snail habitats;
postmortem examinations, haematological tests and examination of faeces for fluke eggs are useful. Coprological analysis is still commonly employed to diagnose bovine fasciolosis, despite the fact that eggs cannot be detected until the latent period of infections, when much of liver damage has already occurred (Rokni et al 2003). Even though, it is impossible to detect fasciola in live animals, liver examination at slaughter or Necropsy was found to be the most direct, reliable, and cost effective technique for diagnosis of fasciolosis (Urquhart et al 1996).

Therefore, the objectives of this study were to determine prevalence and most prevalent species of liver flukes in indigenous adult cattle, to compare diagnostic efficiency of faecal and postmortem examination and to assess the economic importance of bovine fasciolosis due to liver condemnation in the abattoir.

MATERIALS AND METHODS

DESCRIPTION OF THE STUDY AREA

Kombolcha is a town and a district in north-central Ethiopia. Located in the south Wollo
zone of the Amhara region, it has a latitude and longitude of 11°4′N 39°44′E,11.067°N
39.733°E, 11.067; 39.733 with an elevation between 1842 and 1915 meters above sea
level. Kombolcha industrial abattoir is located 375km North East of Addis Ababa.

Kombolcha experiences bimodal rainfall; the short rains with 36.9mm and 1000mm,
respectively. The short rainy season in and around Kombolcha occurs usually from
March to May. The long rainy season extends from June to September. The minimum
and maximum mean annual rainfall ranges from 750 to 900mm. Annual temperature
ranges from 11.8oc to 26oc and the relative humidity of the region varies from 23.9% to
79%. In abattoir up to 90 cattle are slaughtered per day.

STUDY POPULATION AND STUDY DESIGN

In cross sectional type of study, a total of 500 adult male indigenous cattle provided to the abattoir from different part of north western Ethiopia were included in this study.

COPROLOGICAL EXAMINATION

Prior to sampling; an identification number was given to each animals presented to the abattoir for the routine meat inspection. Fecal sample were collected directly from rectum of animals. The feces are collected by hands protected by rubber gloves, using two fingers i.e. (middle and index fingers). The samples were taken to the laboratory in tightly closed universal bottles and examined for fasciola species of eggs by method described by Antonia et al (2002).

POSTMORTEM EXAMINATION

During meat inspection, the previously identified animals and their livers were carefully
supervised and examined, so as to avoid mixing up of the organs to be inspected and the
faecal samples. The fluke recovery and count was conducted following the approach of
Hammond and Sewell (1974), as follows: the gall bladder was removed and washed to
screen out mature flukes. The liver was cut into slices of about 1cm thick and put in a
metal trough of warm water to allow mature flukes lodged in smaller bile ducts to escape
and then the heads of the flukes were counted. Identification of the species involved was
carried out using the size parameters described by Soulsby (1986).

DATA MANAGEMENT AND ANALYSIS

The data were recorded on specially designed forms and preliminary analysis was done in

Microsoft® Excel (2003). The outcome variables were the cases of fasciolosis detected during routine postmortem inspection and fecal examination of Fasciola spp. eggs. In all cases, the SPSS version 16 was used. Prevalence of fasciolosis was calculated as the number of cattle found to be infected with fasciola, expressed as a percentage of the total number of cattle slaughtered (Thrusfield, 2005). The monetary significance of the problem was analysed based on the information obtained during interview and calculated on daily and annual basis using both present and retrospective data obtained from the abattoir. Appropriate date were collected by using postmortem examination of the organ, so far claimed to be infected by fasciolosis and secondary data analysis.

RESULTS

A total of 500 adult indigenous cattle were slaughtered at kombolcha industrial abattoir and examined for fasciolosis. Of the total cattle slaughtered and examined (N=500), 28% (N=140) of them were found to be positive for lesions of fasciolosis. A total of 500 adult indigenous cattle were examined by taking faecal samples to laboratory in tightly closed universal bottles and examined for fasciola eggs. From 500 cattle, 62 (12.4%) were positives for fasciolosis (Table 1).

Figure 1

Table 1. Prevalence of bovine fasciolosis based on faecal sample

Table 1. Prevalence of bovine fasciolosis based on faecal sample

Month	Oct.	Nov.	Dec.	Jan.	Feb.	Total
No. of faecal sample examined	60	110	120	110	100	500
No. of positives for fasciolosis	7	13	16	12	14	62
Prevalence (%)	11.7	11.8	13	11	14	12.4

From a total of 140 livers found positive for fluke infection during post-mortem meat inspection of slaughtered animals, 89 livers(63.6%) harbour F. hepatica, 34 livers (24.3%) harbours F. gigantica, 10 livers (7.14%) harbour mixed infection and 7 livers (5%) infected with unidentified species due to immature flukes(Table 2).

Figure 2

Table 2. The prevalence of Fasciola spp encountered in postmortem examination of slaughtered animals

Table 2. The prevalence of *Fasciola spp* encountered in postmortem examination of slaughtered animals

Species of fasciola	Number of livers	Percentage
F.hepatica	89	63.6
F.gigantica	34	24.3
mixed infection	10	7.1
unidentified species or immature flukes	7	5
Total	140	100

Taking postmortem examination as a gold standard technique for diagnosing Fasciola species infection, the sensitivity and specificity of faecal examination was found to be 44 % and 100%, respectively. The agreements of the two tests were done by calculating kappa and shows k=0.53. A 5-year database (2004-2009) from the abattoir was retrieved and analysed. Retrospective results showed a total of 22,026 cattle were slaughtered from August 2005 to Sep. 2009. During that period, 9167 livers were positive for fasciolosis and condemned. Based on the current price an average annual monetary loss was about 1833 USD. A retrospective abattoir survey revealed that the prevalence of fasciolosis was 41.6% (Table 3).

Figure 3

Table 3. Prevalence of bovine liver fasciolosis between 2004/5- 2009/10

Table 3. Prevalence of bovine liver fasciolosis between 2004/5- 2009/10

Year	No. Of cattle slaughtered	Distomatosis	Prevalence (%)
2004/05	4,634	1,996	43.1
2005/06	2,248	9,07	40.3
2006/07	5,755	2,928	50.9
2007/08	4,816	1,941	40.3
2008/09	4,573	1,395	30.5
Total	22,026	9167	41.6

DISCUSSION

The result obtained in this study is an indication that fasciolosis exists in the study area. In the current study the prevalence (12.4%) indicated by faecal examination was relatively higher than 4.9% recorded in Soddo (Fufa et al 2009) and much lower than 80% recorded for Debre Berhan (Dagne 1994) which is the high land of Ethiopia. Similarly, the autopsy study revealed a higher prevalence of bovine fasciolosis (28%) compared to the (14%) and (14.4%) at Soddo (Fufa et al 2009) and Dire Dawa municipality abattoir (Dagne, 1994) and lower prevalence compared to the 46.58% recorded for Jimma municipal abattoir (Tadelle and Worku 2007), respectively. These differences are probably due to the agro-ecological and climatic differences between the localities, although differences in the management systems may also resulted in such variation. The 28% prevalence of fasciolosis found by autopsy, in this study, was comparable with 31.5%, 30.43%, and 33.4% of bovine fasciolosis recorded at Bedele (Wakuma 2009), Awassa (Hailu 1995) and Gonder municipal abattoir (Roman 1987), respectively. One of the most important factors that influence the occurrence of fasciolosis in an area is the availability of a suitable habitat for the vectors (Urquhart et al 1996). The animals brought to the abattoir for slaughter were mostly from midland and highland areas, where there are few suitable environments for the multiplication of the snails. In addition, optimal base temperatures of 10°C and 16°C are necessary for the vectors of F. hepatica and F. gigantica, respectively, and for the development of Fasciola spp. within the snails. Optimal moisture for snail breeding and development of larval stages within the snails is provided when rainfall exceeds transpiration and saturation is attained. Such conditions are also essential for the development of fluke eggs, miracidiae searching for snails and dispersal of cercariae (Urquhart et al 1996). The study was conducted in the same season, and therefore the prevalence of fasciolosis was not statistically significant on a monthly basis. During the month of February the prevalence is high because during this month grazing pastures are scarce and cattle go far away along the banks of streams and ponds. Of the total livers 63.6% of them were found to be positive for bovine fasciolosis infected by Fasciola hepatica where as Fasciola gigantica, mixed infection and unidentified or immature form of fasciola spp. were recorded to be 24.3%; 7.14%; and 5% diagnosed as positive for fasciolosis. Similar study conducted at Bedele and Jimma municipal abattoir reported 64.5%, 60.3%; of liver harbored F.hepatica, 24.8%, 23.85%; of liver harbored F. gigantica; and 10.7%, 11.93% harbour immature or unidentified form of fasciola species were recorded by Wakuma (2009) and Tadelle and Worku (2007), respectively.

Our result was not in agreement with the finding of Fufa et al (2009) with the highest prevalence of F.gigantica in Soddo municipal abattoir. The prevalence of fasciolosis and the Fasciola spp. found vary with locality. In Ethiopia F. hepatica and F. gigantica infections occur in areas above 1800m.a.s.l. and below 1200m.a.s.l., respectively which has been attributed to variations in the climatic and ecological conditions such as altitude, rainfall, temperature and livestock management system (Yilma and Malone 1998). The high prevalence rate of F. hepatica may be associated with the existence of favourable ecological biotops for L. truncatula.

Relatively small proportion of cattle were found infected with F. gigantica alone or mixed infection with both species. This might be explained by cattle coming to abattoir from highlands and flood prone areas and therefore drainage ditches are favorable habitat to natalensis (Urquhart et al 1996).

The lower prevalence of fasciolosis reported using coproscopy indicates that the lower sensitivity of this procedure in detecting the disease due to the intermittent nature of the expulsion of the eggs through the faeces. A period of 8–15weeks after infection is needed for the appearance of Fasciola spp. eggs in the faeces, by which time most pathological lesions have already occurred (Hillyer 1999; Sanchez-Andrade et al 2002).

Furthermore, detection of Fasciola spp. eggs can be unreliable even during the patent period because the eggs are expelled intermittently, depending on the evacuation of the gall bladder (Briskey 1998). Finally, 1833USD monetary loss per annum incurred due to condemnation of cattle livers infected with Fasciola spp. was in agreement with finding of Mwabonimana et al (2009) at Arusha abattoir, Tanzania and lower than 4000 and 6300USD per annum losses reported for Soddo municipal abattoir (Fufa et al 2009) and Jimma municipal abattoir (Tadelle and Worku 2007). However, the losses at Kombolcha industrial abattoir, its economic implications should not be overlooked.

CONCLUSION

In present study moderate prevalence of bovine fasciolosis was obtained when compared
with prevalence reported by different researchers at different area. The dominant fasciola
revealed was fasciola hepatica at Kombolcha industrial abattoir (ELFORA) that
induces economic losses due to liver condemnation. In general it can be concluded that
fasciolosis is one of major problem for livestock development in the study area by
inflicting direct economic losses and its occurrence is closely linked to the presence of
biotypes suitable to the development of snail intermediate host. So as to reduce these
losses, strategic anthelementics treatment with appropriate fluckicide drug should be
practiced and a combination of control measures include drainage, fencing and
molluscides have to be used to ensure a satisfactory degree of control in the long run.

ACKNOWLEDGEMENTS

The authors would like to acknowledge all staff members of Veterinary Regional
Laboratory of Kombolcha and to all Kombolcha industrial abattoir workers.

References

1. Antonia M Conceicao P Rute Durao Isabel H costa Jose and Correia dec
2. Evaluation of a sample sedimentation method (modified Mac master) for Diagnosis of bovine Fasciolosis. Veterinary parasitology; 2002; 105, 337-343.
3. Briskey D W Diagnosis of liver fluke infection in cattle, Veterinary Bulletin; 1998; 68, 1-4.
4. Dagne M Survey on prevalence and economic significance of Bovine Fasciolosis in Debre Berhan region, DVM thesis, faculty of Veterinary medicine, Addis Ababa University, Debre Zeit, Ethiopia; 1994.
5. Dalton J P Fasciolosis. School of Biotechnology, Dublin city, Ireland;1998.
6. Daniel F Economic importance of organic condemnation due to fasciolosis and hydatidosis in cattle and sheep. Slaughtered at Dire Dawa. Abattoir, DVM thesis, faculty of Veterinary medicine, Addis Ababa University, Debre Zeit, Ethiopia; 1995.
7. Esteban JG, Gonzalez C, Curtale F, Mun˜oz-Antoli C, Valero MA, Bargues MD, El Sayed M, El Wakeel A, Abdel-Wahab Y, Montresor A, Engels D, Savioli L, and Mas-Coma S. Hyperendemic fascioliasis associated with schistosomaisis in villages in the Nile delta of Egypt. Am Jour of Trop Med Hyg; 2003; 69: 429-437.
8. Fufa A Loma A Bekele M Alemayehu R Bovine fasciolosis: coprological, abattoir survey and its economic impact due to liver condemnation at Soddo municipal abattoir, Southern Ethiopia. Trop Anim Health Prod; 2009.
9. Hailu D Bovine fasciolosis at Awassa municipal slaughter house prevalence and economics loss. DVM thesis, Faculty of veterinary medicine, Addis Ababa University. Debre Zeit, Ethiopia; 1995.
10. Hammond J A and Sewell M M H Flotation onto sellotape (demonstration), Transactions of the Royal Society of Tropical Medicine and Hygiene; 1974; 66, 547.
11. Hillyer G V Immuno diagnosis of human and animal fasciolosis. In: Dalton, J. (eds), Fasciolosis, 13. CAB international; 1999; pp.435–447.
12. Keyyu J D Monrad J Kyvsgaard N C and Kassuku A A Epidemiology of Fasciola gigantica and Amphistomes in cattle on traditional, small-scale dairy and large scale dairy farms in the Southern Highlands of Tanzania. Trop An Health Prod; 2005; 37, 303-314.
13. Kithuka J M, Maingi N, Njeruh F M and Ombui J N. The prevalence and economic importance of bovine fasciolosis in Kenya—an analysis of abattoir data. Ond J Vet Res; 2002; 69: 255–262.
14. Malone J B Gommes R Hansen J Yilma J M Slingenberg J Snijders F Nachet O F and Ataman E A Geographic Information System on the potential distribution and abundance of Fasciola hepatica and F. gigantica inEast Africa based on food and agriculture organization databases, Veterinary Parasitology; 1998; 78, 87–101.
15. Mas-Coma S.and Bargues MD. Human liver flukes: a review. Res Rev Parasit; 1997; 57: 145-218.
16. Mulugeta, H. S., Getachew, T., Taffesse, M., Getachew, W. M., Kinfe, G. and Teshome, Y., The significance of Helmintic parasite in livestock production. In: The 3rd livestock improvement Conference, May 24-26, Addis Ababa, Ethiopia; 1989; Pp: 34.
17. Mwabonimana1 M F Kassuku A A Ngowi H A Mellau L S B Nonga H E and Karimuribo E D Tanzania Veterinary Journal; 2009; Vol. 26, No. 2
18. Rokni M B Massoud J and Kia E B Comparision, Of Adult Somatic and cysteine proteinase antigens of Fasciola gigantica in Enzyme linked Immunosorbent Assay for diagnosis of bovine Fasciolosis. DIE seminar on biotechnology, proceeding November 9-13, Tehran, Iran; 2003.
19. Roman T Study on economic significance of bovine fasciolosis and Hydatidosis at Gondar abattoirs. DVM thesis, Faculty of veterinary medicine, Addis Ababa University. Dabre Zeit, Ethiopia;1987.
20. Soulsby E J L Helminthes, Arthropods and protozoa of domesticated Animals, seventh edition, Balliere. Tindall, London, UK; 1986; pp. 40-52.
21. Sanchez-Andrade R Paz-Silva A Suarez J. Pandero L Pedreira R Lopez J Diez Banos C and Morrondo P Influence of age and breed on natural bovine fasciolosis in an Endemic area (Galicia, NW Spain), Veterinary Research Communication; 2002; 26, 361–370.
22. Tadelle T and Worku T The Prevalence and economic significance of bovine Fasciolosis at Jimma, abattoir, Ethiopia, The internet journal of veterinary medicine; 2007; 3, 15.
23. Thrusfield M V Veterinary Epidemiology second edition, university of Edinburgh, Blackwell science; 2005; pp. 180-188.
24. Urquhart G M Duncan J Armour L Dunn J and Jennings A M Veterinary parasitology second edition, Black well science, UK; 1996; Pp. 103-113.
25. Wakuma M Prevalence and economic significance of Bovine Fasciolosis at Bedele municipal abattoir. DVM thesis, school of Veterinary medicine, Jimma University

collage of Agriculture and Veterinary Medicine, Jimma, Ethiopia; 2009.
26. Yilma J M and Malone J B A Geographic information systems fore cost model for strategic control of Fasciolosis in Ethiopia, Faculty of veterinary medicine, Addis Ababa University, Ethiopia, veterinary parasitology; 1998; 78, 103-123.

Author Information

Nuraddis Ibrahim
School of Veterinary Medicine, Jimma University

Pawlos Wasihun
School of Veterinary Medicine, Jimma University

Tadele Tolosa
School of Veterinary Medicine, Jimma University