Prevalence of Zoonotic Fasciolosis in and around Kemissie Amhara, Ethiopia

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Abstract

Fasciolosis is a disease caused by Fasciola hepatica and Fasciola giganticawhichis a zoonotic helminth infestation of ruminants and human beings. A cross-sectional study was conducted from October, 2015to April, 2016 to determine the case based prevalence of human and cattle fasciolosis and its zoonotic importance in and around Kemissie, Ethiopia.A total of 200 cattle fecesand 100 human stool sample were examined in the clinic coprologicallyusing sedimentation and 27% (N=54) cattle and 2% (N=2) human were found positive for fasciolosis. The prevalence of bovine fasciolosis in the study area in relation to sex of the animal was51.9% and 48.1% in male and female cattle respectively (P->0.05), similarly the prevalence of fasciolosis in young, adult and old cattle was 20.4%, 68.5% and 11.1% respectively, while that of local and cross breed cattle was 27.7% and 0%, respectively.On the other hand in relation to body condition it was 70.4%, 16.7% and 13% in poor, good and medium body condition of cattle respectively with statically significant difference (p-<0.05). In general this study reveals that fasciolosis is one of the important neglectedzoonotic disease in the study area which requires more attention and development of strategies for effective control and prevention.

Keywords: Cattle, Ethiopia, Fasciolosis, Kemisse, Prevalence, Zoonoses

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Introduction

Fasciolosis has long been considered an important veterinary problem, particularly in regions with extensive sheep or cattle production, leading to high economic losses. It is now also recognized as a human disease of large public health importance, including high pathogenicity and presenting from hypo- to hyper endemic areas. Fasciolosisis an emerging or re-emerging disease in several parts of the world (Estebanet al., 2003). Fasciolosis, is an infection caused by the liver fluke Fasciola Spp. have traditionally been considered to be an important veterinary disease. In contrast, human fasciolosis has always been viewed as a secondary disease (Borayet al., 1982). The current trend towards food sufficiency is through the use of irrigation as the means to increase food productions to cope up the rapidly increasing of the country(FAO, 1994).Thus, one of the problem associated with irrigation is its potential facilitate transmission of water born human and animal diseases. Aquatic and amphibian intermediate host transmit disease such as malaria, fasciolosis and schistosomiasis. In fact the shift from a rain fed to an irrigation agriculture system favors the development and propagation of water born infection to both human and livestock (ESTS, 1997).

Human fasciolosis is currently classified as a plant/food-borne trematode infection, commonly acquired by eating metacercaria encysted on leaves that are eaten as vegetablesTransmission in humans is linked to their dietary habits since individuals, particularly children, supplement their diet with aquatic plants during daily animal husbandry. The main types of aquatic plants are 'berro berro' (watercress), algae, kjosco and totora. Drinking untreated water may be a source of infection due to the presence of free-floating metacercarial cysts (Mas-Comaet al., 2014)..Vegetables washed in contaminated water may also become a source of infection. The incidence of infection is almost inevitably aggregated within familial groups that share contaminated food anddrink from a common water source.The prevalence of animal and human fasciolosis corresponds to snail distribution (Mas-Comaet al., 2005). After ingestion, fasciola cysts open in the small intestine. The acute stage of the disease occurs as the worms migrate through the lining of the small intestine into the liver and bile duct. While often asymptomatic, the onset of this stage can produce gastrointestinal bleeding, inflammation, abdominal pain, and diarrhea. The chronic phase of the disease occurs when the worms reach the bile duct. The long-term presence of the worms

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causes progressive inflammation from scar tissue and debris that can lead to fibrosis and obstruction of the ducts (Khandewal et al.,2008). There is a high prevalence of fasciolosis among herding communities in low income countries because of their constant close association with livestock that they keep.The prevalence of fasciolosis in humans is usually measured based on data from hospital diagnosis. However, it may be very difficult to clinically differentiate fasciolainfection from other hepatic diseases in humans since it is neglected tropical and subtropical disease.Diagnostic techniques, including direct parasitological, indirect immunological and other non-invasive methods, as well as response to antiparasitic treatment may help confirming clinical diagnosis (Marcoset al.,2008).

The distribution of fasciolosis is worldwide. F. hepatica is distributed in all continents, whereas F. gigantica appears restricted to Africa and Asia. Both fasciolids follow a similar two-host life cycle, in which freshwater snails of the family Lymnaeidae act as intermediate or vector hosts and a broad spectrum of mammals, mainly herbivorous large size species, act as definitive hosts, including humans (Bernardand Darwin, 2007). However, ecologically the distribution ofF.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. Until recently, human fasciolosis cases occurred occasionally but are now increasingly reported from Europe, the Americas and Oceania (where only F. hepatica is transmitted) and from Africa and Asia (where the two species overlap). WHO estimates that at least 2.4 million people are infected in more than 70 countries worldwide, with several million at risk. No continent is free from fasciolosis, and it is likely that where animal cases are reported, human cases also exist (WHO, 2012). Being Ethiopia is one of the developing countries with large number of livestock and nearly 75% of the population is linked with livestock, zoonotic importance of the disease is not negligible. Therefore, the objectives of this study are to determine clinical case prevalence of human and cattle fasciolosis and to see the possible risk factors and their associations in and around Kemissie.

Materials and methods

Study area

The study was conducted from October 2015 to April 2016on purposively selected health centers and veterinary clinics in and around Kemissie town, Oromia zone in Amhara region which is located North east part of Ethiopia 325kmfrom Addis Ababa.Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), Kemissie has a total population of 457,278 of whom 227,328 are men and 229,950 women.The majorities of the inhabitants are Muslim, with 76.29% reporting that as their religion, while 21.24% of the population practiced Orthodox Christianity.The townhas a latitude and longitude of 10°43'N 39°52'E, 10.717°N 39.867°E with an elevation of 1424 meters above sea level and annual temperature range from 18-25c0. About 78% of the land falls within the lowland zone. Crop cultivation and livestock grazing are the major land use activities. Other land uses include forest and bush land. Mixed farming is the main livelihood activity, with sorghum as the dominant crop. Vegetables, fruits, maize, nug, bean, groundnut, chat and sesame are emerging as important cash crops. Livestock production equally is important in the district, accounting for as much as 50% of household incomes. The major livestock owned include cattle, goats and sheep (Kemissie zone agricultural office).

Study population

The study populations were cattle and human beings in the study area. Cattle kept mainly for drought purpose and are kept under extensive management system with a little bit intensive production system.

Cattle are a common source of food, drought and source of cash income for the people. In other case the study was conduct on those people who have a habit of eating raw vegetables and meat mainly liver and practicing irrigation system.

Sample size determinations and sampling methodology

A cased based cross-sectional study design was conducted to investigate the prevalence of fasciolosis in cattle and human parasite in systematically selected study animals and tries to link predisposing risk factors of zoonotic fasciolosis. In addition to the direct physical examination each randomly selected study cattle and people, there were stool examination for human beings and fecal examination for cattle using sedimentation technique. In case of stool examination, sedimentation technique was done in the laboratory class of health center using automatic centrifuge at a rate of 1500rpm for three minutes for each stool sample after filing the ¾ th the test tube in volume. This was done after weighting 3grams of stool and mixed with 42ml of tape water. Then, discard the supernatant following sedmentation and agitate the remained sample and pour over the slide, examined using 10x magnification power after adding cover slip.At the same time in case of faecal samples, some samples were processed in Kombolcha regional laboratory after taking samples using universal bottles in 4% formalin by automatic centrifuge mashin. But other samples were processed in Kemissie veterinary clinic without automatic centrifuge rather using manual centrifuge methodology. Here under faecal examination the same procedure were done like stool examination but additionally 1% methylene blue was added in case of faecal examination which differentiate Paraphistomum eggs from fasciola eggs.

Sample size determination for cattle

From the veterinary clinicat which cattle were selected through systematic sampling (every second owner) after completion of purposively selected clinic. The sample size for the current study was determined according to Thrusfield (2005) using expected prevalence of 12.4% provided by Ibrahim et al., 2009.

Where: n = required sample size;

Pexp = expected prevalence (P=12.4%)

d = desired absolute precision. The calculated sample size is 167, but so as to increase the accuracy of the study sample size collected were increased to 200.

Sample size determination for human

Like bovine fasciolosis, the samples/patients/ weretakensystematically from health centers on thebasis of purposively selected health centers. This was carried on, by listing all working days from Monday to Friday then, randomly selected the days using the lottery system.Then the days were Monday and Thursday which were chosen, by doing these, sampleswere taking every third patient(systematic sampling) in both health centers. The sample size for the current study was determined according to Thrusfield (2005) by considering the expected prevalence 3.3% as per the reportofFantieet al., 2013.

$$n = \frac{1.96^2 * \text{Pexp} (1-\text{Pexp})}{d^2}$$

Where: n = required sample size

Pexp = expected prevalence (P=3.3%)

d = desired absolute precision.

Based on the above formula the sample size to be collected for the study was 49 but due to convenience of collecting the sample and so as to increase the accuracy of the study we have increased the total sample size to 100.

Coprological examination

For coprological examination samples collected aseptically were submitted to the Kombolcha Regional Veterinary Laboratory and Kemissie veterinary clinic for examination of animal fecal sample whereas to Kemisse and Dulecha health centers in the case of human. In both cases, sedimentation technique was used to detect the presence or absence of fluke eggs in the sample collected following the procedures described by (Antonia et al., 2002). In case of animal's sample to differentiate eggs of Paramphistomum with that of Fasciola species, a drop of methylene blue solution was added to the sediment as a result of which eggs of Fasciola species show yellowish color while eggs of Paramphistomum species stain by methylene blue (Hansen and Perry, 1994). During sampling information on sex, breed, and approximate age of individual animals were recorded. Age was classified as young, adult and old.

Data analysis

The raw data collected from both laboratory result of human and animal's fasciolosis entered into Microsoft Excel spread sheet. Data was coded and filtered for any invalid entry then transferred to SPSSsoftware version 16 used for statistical analysis. The prevalence of fasciolosis in cattle and the prevalence of human fasciolosis were calculated and other descriptive analysis was made. Chi-square test was used to analyze the relationship between associated risk factors to the occurrence of zoonotic fasciolosis and determine whether there are significant associations between the parameters measured at 95% Confidence interval and a significance level of $P<0.05$ using SPSS version 16.0 statistical packages for windows.

Results

Human fasciolosis

Out of 100 examined human patients 44 were men and 56 were women with age variations of 48%, 39% and 13% for 10-25 years, 26-45 years and 46-70 years old respectively.

Out of the total patients 2(2%) were positive for fasciola eggs. Prevalence of fasciola was 0% in 10-25 years and 26-45 years old but 15.4% in 46-70 years age group with statically significant p- value 0.001 and Chi square of 13.658. The prevalence rate of fasciola infection was 2.3% and 1.8% in male and female respectively which has statically insignificant ($P>0.05$) (Table: 1)

Possible risk factors		Results		Statistical Value (X^2)	P-Value
		Positive	Negative	13.658	0.001
Age	10-25 years	0 (0%)	48 (100%		
	26-45 years	0 (0%)	39 (39%)		
	46-70 years	2 (15.4%)	11 (84.6)		
Sex	Male	1 (2.3%)	43 (97.7%)	0.30	0.863
	Female	1 (1.8%)	55 (98.2%)		

Table 1: prevalence of human fasciolosis in different risk factors in Kemissie.

Bovine fasciolosis

Out of the 200 examined animals feces in the Veterinary clinic, 54 (27%) were positive for fasciola eggs. The prevalence among various age groups was 68.5% (N=37) in adult, 20.4% (N=11) in young and 11.1% (N=6) in old aged group of animals while 51.9% in male and 48.1% in female (p>0.05). The prevalence of fasciola was significantly higher (p<0.05) in poor (70.4%) than that of good (16.7%) and fair (13%) body conditions. From perspective of watering area, animals watered only in Dolo and Borkena river were more frequently affected (50%) than those watered in both Worke and Borkena river (29.6%) and Borkena River (20.4%) though the difference were not statically significant (Table 2).

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Risk factors	Category	Number of examined	Positive	Prevalence (%)	Chi square	p- value
Age	Young	42	11	20.4	0.996	0.608
	Adult	128	37	68.5		
	Old	30	6	11.1		
	Total	200	54	27		
Sex	Male	112	28	51.9	0.517	0.472
	Female	88	26	48.1		
	Total	200	54			
Body condition	Poor	92	38	70.4	17.919	0.00
	medium	40	7	22.6		
	Good	68	9	40.4		
	Total	200	54			
Watering point	borkena	34	11	20.4	0.72	0.696
	Borkena and Dolo	108	27	50		
	Borkena and Worke	58	16	29.6		
	Total	200	54			
Breed	Local	195	54	100	1.897	0.168
	Cross	5	0	0		
	Total	200	54	27		

Table 2: Prevalence of bovine fasciolosis with different risk factors and their respective stastical value

Discussions

Based on result obtained in this study is an indication that fasciolosis is prevalent in the study area both in human and bovine. The public health importance of fasciolosis was reported among clinically illed person in the health centers, north east Amhara, Ethiopia. The finding of an overall prevalence of human fasciolosis is 2% in the present study which agree with previous reports of 3.3%(Fantieet al., 2013) in the northwest Ethiopia.This may be the due to low prevalence of fasciolosis in Kemissie and low distribution of intermediate host due to the occurrence of ELININO. The relatively low prevalence can be attributable to the better health services and sanitary conditions in urban areas.In this study gender was not associated with fasciolosis. Moreover, gender differences are not usually observed in fasciolosis transmitted through food, especially Ethiopia, where traditionally all household members share the same food.

The risk of fasciola infection among the patients who used unsafe drinking water sources, consumed raw vegetables, practiced irrigation activities, and owned sheep and/or cattle was increased several fold. Communities in the study area have developed the habit of consuming vegetables, most of the time uncooked, which may increase the risk of exposure to human fasciolosis. Many of the farmers in the study areas practice irrigation activities for the cultivation of vegetables during the dry season. The irrigation canals create media for the reproduction of vector snails, which may be the cause of the appearance of endemicity of trematode infections in the area. When the fields arewatered from contaminated canals, the metacercariae encyst on vegetable leaves and may be the route by which infection is acquired. High prevalence of human fasciolosis has also been reported in areas where extensive sheep and cattle raising occur. However, there is the possibility of human to human transmission, because outdoor defecation is practiced in rural communities (Soliman, 2008). Fasciolosis is a widespread ruminant health problem and causes significant economic losses to the livestock industry in Ethiopia. The prevalence indicated by coprological examination of the bovine faeces in the present study (27%) is much higher than the 12.4% recorded in Kombolcha(Ibrahim et al., 2009). 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 difference of prevalence of fasciolosis reported using coproscopyindicates 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. 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. 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 (Urquhartet al. 1996). The prevalence of bovine fasciolosis in and around Bah Dar, North West Ethiopia addressed 32.3 % (Abebe et al., 2015)and in Qena/Upper Egypt/ was 30.3% (Abdel et al., 2009). This was a little difference from the current study this may be due to ELININO occurrence in this year which didn't allows survival of intermediate host. According to Biniam et al., 2012 the study in coprological prevalence of bovine fasciolosis

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in and around Woreta they have found that 41.14%. this is due to the difference that there is large number of intermediate host over there and large area of it covers by watering spots. According to (Esteban et al., 2003) in Nile Delta Egypt, have reported prevalence rates of human fasciolosis as high as 12.8 %. As indicated by (Mohamed et al., 2014) on human fasciolosis in Kafr El-Sheikh Governorate in the west of the Nile Delta in Egypt with a prevalence of 6.02%. By comparing these studies with the present study, we can conclude that the rate of infection in humans and animals are diverse in different parts of the world and do not follow the same pattern. This dissimilarity is depend on different factors such as region's climate, biological characteristics of snails intermediate hosts, diversity and distribution of reservoir hosts, dietary habits and vegetable consumption.

Conclution and recommendations

The fact that human fasciolosis reporting in the least developed nations is lacking due to facing difficult challenges such as burdened by different diseases and inadequate resource. Most information on zoonotic fasciolosis in the country is based on hospital records and case reports and only few studies have addressed the epidemiology and risk factors. These risk factors appear to be: the humid tropical environment, the presence of the intermediate snail hosts, in some areas of the rural conditions in Kemissie characterized by maize and teff cultivation, use of fresh animal faeces for fertilizing crop fields and vegetable gardens, the free grazing of animals on river. The high infection rate in livestock may constitute a reservoir for human infection and routine deworming of animals were not as such enough due to their awareness and large amount of cattle population, Poor hygiene and the habit of eating fresh and undercooked irrigated vegetables plants.

Based on the above conclusions the following recommendations are forwarded:

» İmproving quality and construction of abattoir at least in the district and town administration level and they have to improve the feeding style and quality of foods.

» The community should improve prevention and control mechanism of fasciolosis in this area

» To address the control of human fasciolosis, the Ethiopian Ministry of Health has to take some actions including the set-up of a standardized diagnosis protocol and it needs intersectoral co-operation of both health and veterinary fields in the area.

References

1.Abdel-Nasser,A.,Hussein., Rafaat, M., and Khalifa., A. (2009): Fascioliasis prevalences among animals and human in Upper Egypt. Journal of King Saud University Science, 22: 15-19

2.Abebe,T., Mebiratu,G. andYitayal,G. (2015): Prevalence of bovine fasciolosis in and around Bahir Dar, North West Ethiopia. Acadamic journal, 7(4): 74-79.

3.Antonia, M., Conceiçao, P., Rute, M., Isabel, H., Costa, J. and Correia, C. (2002): Evaluation of a simple sedimentation method (modified MacMaster) for diagnosis of bovine fasciolosis. Vet. Parasitol.105: 337–343.

4.Bernard, F. and Darwin, K. (2007): World Class Parasites Food- borne Parasitic Zonoosis. America, USA.Pp.314.

5.Biniam, T., Hanna, A. and Sisay, G. (2012): Study on coprological prevalence of bovine fasciolosis. Journal of veterinary medicine and anial health; 4 (7): p.89-92.

6.Boray, J., Hillyer, G. and Hopla, C. (1982): Fascioliasis. In: Handbook series in zoonoses. Parasitic zoonoses. 3 Boca Raton, FL, CRC Press, Pp.71-88.

7.Esteban, J., Gonzalez, C., Curtale, F., Mun˜ oz-Antoli, C., Valero,M., Bargues, M., El-Sayed, M., El Wakeel, A., Andel-Wahab,Y., Montresor, A., Engels, D., Savioli, L. and Mas-Coma, S. (2003): Hyperendemicfascioliasis associated with schistosomiasis in villages in the Nile Delta of Egypt. American journal of Tropical Medicine and Hygiene. 69: 429–437.

8.ESTS, (1997): Integrating the sterile insect technique to eradicate Tsetse from the southern rift valley of Ethiopia, Ethiopia Debrezit: Faculity of veterinary Medicine Addis Ababa University DVM Thesis P.32.

9.Fantie,T., Bitew,B., Sebhat, A., Alemseged,w., Jemal, A., Molla, G. , Assefa, G., Sintayehu,T., Tamiru, D. and Gashaw, Y. (2013): Cases of Humn Fasciolosis in north-west Ethiopia. Ethiopian journal of development; 19(3): 237-240.

10.FAO, (1994): Disease of domestic animals caused by flukes. Organization of the United Nations Rome Italy, 38(4):.423-428.

11.Hansen, J. and Perry, B. (1994): The epidemiology, diagnosis and control of helminth parasites of ruminants. A hand book, Internationallaboratory for research on Animal Disease. Nairobi, Kenya. Pp.31-36.

12.Ibrahim, N., Tolosa, T. and Wasihun, P. (2009): Prevalence of bovine fasciolosis and its economic importance in Kombolcha town, Ethiopia. Journal of veterinary medicine; 8: 5-6.

13.Khandewal, N., Mamta, K., Join and Joanna, Shaw., 2008.Current Treatment Options in Gastroenterology 11(2) P.85-95.

14.Marcos, A.L., Tagle, M., Terashima, A., Bussalleu, A., Ramirez, C., Carrasco, C., Valdez, L., Huerta –Mercado, J., Freedman, O.L., Vinetz, M.J., Gotuzzo, E., 2008. Natural history, clinicoradiologic correlates, and response to Triclabendazole in acute massive fascioliasis. American Journal of Tropical Medicine and Hygine; 78; 222-227.

15.Mas-Coma, S., Bargues, M. D. and Valero, M. A., 2005. Fascioliasis and other plant-borne trematode zoonoses. International Journal of Parasitology; 35: 1255–1278.

16.Mas-Coma.S., Bargues. M. D., and Valero. M. A., 2014. "Diagnosis of human fascioliasis by stool and blood techniques: update for the present global scenario," Parasitology, 141(10, p.1918–1946.

17.Mas-Coma.S.,Valero.M.A., and Bargues. M.D., 2014."Fascioliasis,"in Digenetic Trematodes Advances in Experimental Medicine and Biology; Pp.77–114.

18.Mohamed, EL-Bahy, Abeer, Mahgoub, Eman and Taher., 2014. Contributions on human fascioliasis and its snail intermediate host in Nile Delta, Egypt.International Academic Journals;3 (3): 168.

19.Soliman, MF. 2008. Epidemiological review of humanand animal fasciolasis in Egypt. Journal of Infectious Development; 2: 182–9.

20.Soulsby, E. J L., 1986. Helminthes, Arthropods and protozoa of domesticated Animals, Ed 7th, London, UK; p.40-52.

21.Thrusfield, M., 2005. Veterinary Epidemiology, 3rd ed. Blackwell Science, Oxford, UK, p.183.

22.Urquhart, G. M., Duncan, J., Armour, L., Dunn, J. and Jennings, A. M., 1996. Veterinary parasitology 2nd Ed, Black well science, UK; p.103-113.

23.WHO, 2012. Food born trematode infection, fasciolosis. Available at: http://www.who.int/foodborne_trematode_infections/fascioliasis/en/ [accessed on: 17th May 2016]

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