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Prevalence, Infectivity Rate and Prospective Determinants of Ovine Fasciolosis in Wadla District, Northeast Ethiopia

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Abstract: A cross sectional study was conducted in Wadla Woreda, in three different sites, from September 2010 to January 2011 with the objectives of determining infection rate and identifying potential risk factors of fasciolosis. A total of 384 fecal samples were collected from sheep in which 192 (50%) animals were positive for fasciolosis. Out of 192 infected sheep, 52 (27.08%) are highly affected, 85 (44.27%) moderately affected and 55 (28.65%) with low infection. A total of 50 sheep were examined at post mortem from which 25 (50%) animals were positive for fasciolosis. There were statistical significant differences ($p<0.05$) between different age groups, water sources, body conditions and sexes. Animals with age group between 0.5-2 years were highly infected (85%), animals drinking from River water source were highly infected (60%) and animals from free grazing were highly infected (53.86%). There were, however, no statistical significant ($p>0.05$) difference among feeding systems, breeds, epidemiological sites and flock sizes. Therefore, good management practice including provision of properly dried hay for those zero grazing sheep, fluke elimination by regular treatment, an alternate use of lands of pasture and chemical measure for control of inter mediate snail host are recommended.

Key words: Ovine · Fasciolosis · Risk Factor · Prevalence · Wadla Woreda

INTRODUCTION

The prevalence and distribution of fasciolosis vary from 11% in the rift valley to 100% in the central high lands of Ethiopia [1]. Fasciolosis was wide spread particularly in the North and West of the Great Rift Valley, which divides the country in to two parts of unequal sizes [2]. Definitive host includes sheep, cattle and many other ruminants [3]. The encysted metacercariae are swallowed with plants on which they are encysted by the final host as sheep that walk in to water to drink [4].

The symptoms are related to the two stages of infection [5]. In acute fasciolosis, death occurs with out definitive signs and disorders suggest entero- toxaemia. In chronic fasciolosis, series of different symptoms can be observed particularly anemia, loss of appetite, yellowish eye and progressive emaciation, then appearance of diarrhea, finally, at advanced stage, development of Oedema (bottle Jaw). In death from acute fluke's infestation, tracks where flukes have migrated may be seen and it is some times possible to find juvenile flukes in the liver parenchyma [3]. In chronic stage, mature flukes are seen in the bile duct [6].

Fasciolosis is disease of economic importance [7]. Economic losses are direct and indirect. Direct losses in domestic animals result from chronic and acute fluke's infestation. Losses due to chronic infestation are mostly in the form of reduced production of meat and milk. In Ethiopia, Amhara region, North Wollo Zone, Wadla Woreda, especially in Enchike River and its surroundings (swampy area) are favorable environments for fasciolosis [8].

Fasciolosis is the most important disease of sheep in the area. The main reason is that the Enchike River and its surroundings create a favorable environment for growth and multiplication of snails as intermediate host by providing moisture, from flooding rainy season and from swampy during dry season [8]. Unfortunately, the data

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regarding the prevalence and distribution of fasciolosis in sheep in different areas of the country are few [9-11]. However, there is lack of information on prevalence, intensity of infection and potential risk factors of fasciolosis in North Wollo Zone particularly in Wadla Woreda. Therefore the objectives of the present study were to determine the prevalence of fasciolosis and to assess the potential risk factors in North Wollo Zone, Wadla Woreda.

MATERIALS AND METHODS

Study Area: The study was conducted from September 2010 to January 2011 in North Wollo Zone, Wadla Woreda in three different sites which comprise Bet-Yohanis, Yeneja and Gashena which is located 120 km from Woldia, 305km North-East from Gondar. This woreda is situated at an altitudinal range of 2000-2800 masl. It receives an annual rain fall of 800-1200 mm with annual mean temperature of 17°C (minimum) and 22°C (maximum) [12].

Animals Population: The total population of sheep in three sites of Wadla Woreda is 101,000 [12].

Study Design: The study was involved a cross-sectional observation in a multi-stage sampling technique for the estimation of fasciolosis prevalence from September 2010 to January 2011.

Sample Size Determination: Since there is no previous studies conducted on prevalence of fasciolosis in Wadla Woreda, the number of animal (sample size) needed in the current study was calculated to be 384, using 50% expected prevalence and 5% absolute precision at 95% confidence interval, according to Thrusfield [13].

Sampling Technique: Fecal samples for parasitological examination were collected directly from the rectum of each animal using disposable plastic gloves and placed in clean screw capped universal sampling bottle containing 10% formalin solution. After labeling with animal identification, place of collection, sex, age, body condition, grazing system, watering system and breeding, laboratory coprological examination was performed to detect the presence of fecal eggs using the standard sedimentation technique [14]. Then the prevalence of fasciolosis was calculated and expressed as the percentage of the number of infected sheep related to the total number of examined sheep [13]. For prevalence determination, sedimentation technique described by Kassai [15] was used, which is the method of choice for routine fecal egg counting when fluke infections are suspected,

Infection Rate Determination: The microscopic slide was counted as procedure indicated by Kassai [15], then the result was compared with standards used to classify it as low, moderate and heavy infection as indicated by Urquhart *et al.* [16]; egg counts more than1000 are generally considered indicative of heavy infection, those over 500 of moderate infections.

Potential Risk Factors: Data on hypothesized risk factors like epidemiological area (in three sites), breed, sex, age, body condition, watering system, feeding system and flock size of sheep source were collected. These data were collected by asking owners on feeding system, water source, flock size and age of the animal and its physical condition. The age was categorized in to < 0.5 year, 0.5-2yrs, 2-4 years and > 4yrs based on information from owners, dentations and observation according to Stamm [17] and Dabas *et al.* [18]. By visual examination the breed and sex of animal were registered as being local and cross breed; male and female. According to Kelly [19] and Smyth [20], the physical condition of the animal were classified and registered as normal, thin or emaciation.

Data Analysis: The epidemiological data and faecal samples were collected by taking in to account different risk factors for the occurrence of fasciolosis. The data and result were first coded and managed in to Microsoft Excel and analyzed using statistical package for social sciences (SPSS) soft ware version 17. The chi-square (x^2) test (fisher test) was used to assess the association between prevalence and risk factors. In all analysis, confidence level was at 95% and $P<0.05$ was set for significance. Descriptive epidemiological measures were also used to determine infection rate.

Post Mortem Examination: Post mortem examination was conducted on 50 sheep slaughtered during the period of September 2010 to January 2011. All slaughtered sheep were local breed. Sheep for slaughter purposes were usually brought mainly from three sites (Bete-yohanis, Gashena and Yeneja) in Wadla Woreda. The livers of all the slaughtered sheep were examined by inspection, palpation and systemic incision to detect *Fasciola* species adult worms if present. Detection of adult parasite and species identification were recorded. The identification of the fluke species was carried out using size parameters given by Kassai [15].

RESULTS

Over All Prevalence and Approximate Infection Rates: From the total of 384 examined sheep's fecal samples, 192 (50%) sheep were found positive for fasciolosis in which 52 (27.08%) were highly infected, 85 (44.27) were moderately infected and 55 (28.65%) were showed low infection rate (Table 1).

Potential Risk Factors: The prevalence was high in Bete-yohanis 95 (52.78%), medium in Gashena 42 (47.73%) and low in Yeneja 55 (47.41) as shown in Table 2. However, There was no statistical significant difference (P>0.05) among the three different sites.

Table 3 showed the prevalence of fasciolosis among different breeds. There was no statistical significant difference (P>0.05) between local (72.65%) and cross breed (44%).

Table 4 showed that there was statistical significant difference (P<0.05) in prevalence between females (51.28%) and males (48%).

Statistical significant difference (P<0.05) was recorded in prevalence between age groups 0.5 - 2 years (85%), 2-4 years (54.03%), <0.5 years (53%) and >4 years (36.67%) as shown in Table 5.

There was statistical significant difference (P< 0.05) in prevalence among different body conditions and there was no statistical significant difference (P>0.05) in feeding systems of the study animals. Higher prevalence was recorded in thin 72.73%, normal 41.38% and the lowest was in emaciated 40% (Table 6). Similarly, 53.68%, 50%, 37% prevalences were recorded in free grazing, Zero grazing and Tethering, respectively (Table 7). However, there was statistical significant difference (P<0.05) in prevalence among different water sources for study animals in which Enchike River water used animals were highly affected (60%) and piped water used animals were the lowest affected (29%) as shown in table 8.

There was no statistical significant difference (P>0.05) in prevalence among the flock sizes but the prevalence were higher in flock size of 21-30 (57.78%), followed by the flock size 11-20 (49.02%) and lower prevalence was recorded in flock size of 1-10 (46.88%) as illustrated in Table 9.

Post Mortem Examination: Out of total 50 slaughtered and inspected sheep in the three local abattoirs, 25 were infected with either of the two species of *Fasciola* or both presenting an overall prevalence of 50% (95% confidence interval).

Table 1: Infection rate of fasciolosis in Wadla Woreda.

Infection rate	Number of positive animals (%)
Heavy infection	52 (27.08%)
Moderate infection	85 (44.27%)
Low infection	55 (28.65%)
Total	192 (50%)

Table 2: Prevalence of ovine fasciolosis in Wadla Woreda in different sites

Site	No of examined animals	No of positive animals	Prevalence (%)	x^2	P-value
Bete-yohanis	180	95	52.78	1.05	0.592
Gashena	88	42	47.73		
Yeneja	116	55	47.41		
Total	384	192	50		

Table 3: Prevalence of ovine fasciolosis according to breed.

Breed	No of examined animals	No of positive animals	Prevalence (%)	x^2	P. value
Local	234	170	72.65	0.83	0.363
Cross	50	22	44		
Total	384	192	50		

Table 4: Prevalence of ovine fasciolosis according to sex.

Sex	No of examined animals	No of positive animals	Prevalence (%)	x^2	P-value
Male	150	72	48	192.00	0.00
Female	234	120	51.28		
Total	384	192	50		

Table 5: Prevalence of ovine fasciolosis according to age.

Age (years)	No of examined	No of Positive	Prevalence (%)	x^2	P-value
< 0.5	75	40	53.33	29.66	0.00
0.5. - 2	35	30	85.71		
2-4	124	67	54.03		
> 4	150	55	36.67		
Total	384	192	50		

Table 6: Prevalence of ovine fasciolosis on body condition basis

		No of examined	No of positive	Prevalence (%)	x^2	p-value
Body condition	Emaciated	100	40	40	31.9	0.00
	Thin	110	80	72.73		
	Normal	174	72	41.38		
	Total	384	192	50		

Table 7: Prevalence of ovine fasciolosis on feeding system basis

Feeding system	No examined	No positive	Prevalence	x^2	p-value
Grazing	190	102	53.68%	4.66	0.097
Zero grazing	140	70	50%		
Teathering	54	20	37%		
Total	384	192	50%		

Table 8: Prevalence of ovine fasciolosis on water source basis.

	No examines	No positive	Prevalence	x^2	p-value
River	250	150	60%	28.73	0.00
Pond	100	32	32%		
Pipe	34	10	29%		
Total	384	192	50%		

Table 9: Prevalence of ovine on flock size basis

		No examined	No positive	Prevalence	x^2	P-value
Flock size	1-10	192	90	46.88%	2.97	0.227
	11-20	102	50	49.02%		
	21-30	90	52	57.78%		
	Total	384	192	50%		

Table 10: Detection of *Fasciola* in slaughtered sheep in local abattoirs of the three sites.

Site	No of examined sheep	No of positive sheep	Prevalence (%)
Bete-yohanes	25	14	56
Gashena	15	7	46.6
Yeneja	10	4	40
Total	50	25	50

Table 11: The relative abundance of *Fasciola* species detected in slaughtered sheep in three site abattoirs.

	Fasciola species				
Site	*Fasciola hepatica*	*Fasciola gigantica*	Mixed	Total	Prevalence (%)
Bete-yohanes	8	4	2	14	56
Gashena	4	2	1	7	46.6 (28%)
Yeneja	2	1	1	4	40 (16%)
Total	14 (56%)	7 (28%)	4(16%)	25	50

The result was assessed for the relative abundance of *Fasciola* species. As shown in table 11, *Fasciola hepatica* is more abundant 14 (56%) than *Fasciola gigantica* 7 (28%) and mixed infections with both species 4 (16%).

DISCUSSION

The coprological examination carried out in the present study revealed an overall infestation rate of 50%. This finding is comparable to the other findings in different regions of the country such as Kombolcha [9] and Debrezeit [10] with the prevalence of 51%. However, it was relatively lower compared with the result of other workers in other parts of country such as 86% in Kaffa, 70% in Ilubabor administrative regions [21] and 82.5% in Western Shoa [11]. The prevalence was high in local breed (72.65%) than cross breed (44%). This might be due to the management system with longer exposure of local breed than cross. However, the difference was not statistically significant (P>0.05) which might be due to an access of metacercaria to both breeds equally in either free grazing or zero gathering with hay having sufficient moisture for the survival of metacercaria.

There was statistical significant difference (P<0.05) in prevalence between females (51.28%) and males (48%). This might be due to the fact that farmers are mostly used male sheep for fattening purposes and hence they mostly treat them with anti-helmentics unlike females which were free to graze and reared for production purposes. The present finding was not similar to that of Ahmed [9] where both sexes were equally susceptible explaining that both sexes were grazing in metacercaria contaminated pasture land.

The present study showed that there was statistical significant difference (P<0.05) among different age groups. High prevalence was recorded in the age of 0.5 – 2 years (85%). This might be due to the lack of pre-immunization to the disease in their first grazing time on *Fasciola* contaminated pasture [3]. On the other hand, low prevalence is reported on sheeps's >4 years old (36.67%). This might be also due to the resistance development by adults as a result of exposure to the parasites. The low prevalence in sheep's less than 0.5 years (53.33%) compared to 0.5- 2 years (85%) might be due to the fact that they do not usually left to graze in free pasture which is prone to contamination.

There was statistical significant difference (P<0.05) among body condition groups where, high prevalence was recorded in thin, (72%) followed by normal (41.38%) and emaciated (40%) sheep. This might be due to the use of flukecidal drug by owner's sheep against the disease before animal reach to examination. Cachexia (extreme emaciation) develops gradually, especially as animal loses its appetite completely [5].

There was no statistical significant difference (P>0.05) in prevalence among free grazing (53%), zero grazing (50%) and tethering (37%) animals. This might be due to availability of metacercaria in both free grazing and zero grazing systems. Most parasitic diseases can affect animals at pasture but animals indoors can be affected if management is inadequate [22]. There was statistical significant difference (P<0.05) in prevalence among different watering sources for study animals in which river (60%), pond (32%) and pipe (29%) were recorded. The prevalence is high in sheep drink in river. This might be due to grazing on the boarder of the river in addition to getting metacercaria from drinking water of river.

Slightly high results were obtained in 21-30 herd size and 11-20 herd size with prevalences of 57.78%, 49.02%, respectively and it was slightly low in a herd of 1-10 (46.88%). This might be due to concentration or high herd (flock size) which is conducive to heavy contamination while distribution of flock (low flock size) over a large area, decreased probability of infection, especially in flock grazing around a water hole [23-25]. However, there was no statistical significant difference among the herd size ($P>0.05$) in the current study.

The prevalence of fasciolosis in Bete-Yohanes was 52.78%, in Gashena 47.73% and in Yeneja 47.41%. There was no statically significant difference in prevalence among the three sites of Wadla Woreda. This may be due to the access of metacercaria to sheep of all three sites with hay harvested from boarder of Enchike River and Marsh area or by grazing. A general decrement was observed between overall occurrence of ovine fasciolosis recorded previously and the current prevalence which may be due to the better expansion and coverage of the veterinary services in the country as well as the improvement of the people's awareness in the prevention and utilization of anti-helmenthic drugs.

CONCLUSIONS

Coprological study of fasciolosis revealed a prevalence rate of 50% in Wadla woreda. Fecal egg count revealed that most of *Fasciola* positive animals (sheep) showed high infection (27.08%), low infection (28.65%) and moderate infection (44.27%). It was also found that sheep in Wadla Woreda were affected with fasciolosis regardless their three sites (Bete-yohanis, Gashena and Yeneja), feeding system, herd size and breed with no statistically significant difference ($P>0.05$). However, it was found that there were statistical significant differences ($P<0.05$) among age, sex, body condition and water sources of study animals.

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