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Prevalence and Risk Factors of Bovine Fasciolosis in Cattle Slaughtered in Khartoum State, Sudan

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Abstract:

Fasciolosis is caused by trematodes of the genus *Fasciola*. *Fasciola* is commonly recognized as liver flukes that are responsible for wide spread of morbidity and mortality in cattle characterized by weight loss, anemia and hypoproteinemia. The two most important species, *Fasciola hepatica* found in temperate area and in cooler areas of high altitude in the tropics and subtropics and *Fasciola gigantica*, which predominates in tropical area.

A cross-sectional study was conducted on 302 cattle slaughtered at Elkadaro slaughterhouse in Khartoum State, Sudan, during the period extended from April to June 2018 to estimate the prevalence of fasciolosis in slaughtered cattle and to investigate the potential risk factors associated with the disease.

Routine meat inspection procedure was employed to detect the presence of fasciola in liver. The study showed that the overall prevalence was 5% the prevalence of bovinefascilosis at post-mortem was found to be 3.3% and the prevalence by fecal examination was 1.7%. A univariate analysis was performed using the Chi-square as a test of significance for the association between the infection and the investigated potential risk factors. Significant association was detected between bovine fasciolosis infection and each of age (p-value = 0.00), breed (p-value = 0.00) and animal source (p-value = 0.00). In multivariate analysis four risk factors were found to be significantly associated (p-value$\leq$ 0.05) with fasciolosis. These risk factors included age (p-value = 0.00), breed (p-value = 0.00), animal source (p-value = 0.00) and grazing type (p-value = 0.005).

In view of our findings, fasciolosis is prevalent at Elkadaro abattoir in Khartoum State. Our study further confirmed that fasciolosis diagnosed through postmortem examination is more prevalent than by fecal sedimentation. We recommended More elaborate studies on bovine

fasciolosis to reveal the prevalence in other states, Economic importance of the disease should be evaluated, Awareness of animal owner's about the disease, treatment and the control strategy.

Keywords: fasciolosis, risk factors**,** bovine**,** prevalence, abattoir**.**

Introduction

Fasciolosis is an economically important parasitic disease which is caused by trematodes of the genus *Fasciola*. *Fasciola* is commonly recognized as liver flukes that are responsible for wide spread of morbidity and mortality in cattle characterized by weight loss, anemia and hypo proteinemia. The two most important species, *Fasciola hepatica* found in temperate area and in cooler areas of high altitude in the tropics and subtropics and *Fasciola gigantica,* which predominates in tropical area **(**Mugugeta *et al*., 2011).

Fascioliosis caused by *Fasciola hepatica* and *Fasciola gigantica*is are regarded as one of the most important parasitic diseases in the world. Fasciolosis is an important parasitic food borne disease, responsible for significant public health problems and substantial economic losses to the livestock industry (Odigie *et al*., 2013).

Both *F.hepatica* and *F.gigantica* are transmitted by the snails of the family lymnae Infestation with fasciolosis is usually associated with grazing wet land and drinking from the snail infested watering places**.** (Dechasa *et al*., 2012). *Fasciola gigantica* is a parasite of cattle, sheep and wild animal in the tropic and sub -tropics, and is more pathogenic than *Fasciola hepatica*. *F.gigantica* found more commonly in tropical regions of the world. Areas affected include Africa, Asia, many pacific island including Hawaii, the Middle East, Southern Europe, and south of USA. *Fasciola hepatica* has become increasing wide spread in New Zeland in recent years following the colonization of a large area of the country y by the exotic snail (Elhaj., 2001).

The development of fasciolosis involves the presence of an intermediate host (*Lymnaea sp.*), suitable habitats for mollusks and environmental factors such as high humidity, adequate temperature and rainfall. Furthermore, when infecting the definitive host, mature flukes lay eggs that spread in the environment and cause pasture recontamination (Silva *et al*., 2007).

Fascioliosis or liver fluke is worldwide distributed In the Sudan the disease is highly endemic and reported in many areas of the country such as Upper Nile, Blue Nile, White Nile, as well as Northern states **(**Koko *et al*., 2003).

The incidence of fasciolosis in the Sudan has probably increased during recent years as result of agricultural extension and introduction of canalization and pump. Also fascioliosis in Sudan have economic losses a result of livestock mortality and more often due to loss in production and condemnation of infected tissue in the slaughter house ,besides, large amount of money is spent annually on treating infected cases (Altahir.,1975).

Liver fluke infections caused by *Fasciola hepatica*, *Fasciola gigantica*, are major public health problems in East Asia, East Europe, Africa and Latin America. Currently, more than 780 million people are at risk of infection with fasciolosis. (Marcos *et al*., 2008)

Among many parasitic problems of farm animals, fasciolosis is a major disease, which imposes direct and indirect economic impact on livestock production, particularly sheep and cattle**,** through mortality, liver condemnation, reduced production of meat, milk, wool and cost of anthelmintics. Through the world fasciolosis has recently been shown to be an emerging and widespread zoonosis affecting many people **(**Belay *et al.*, 2012**)**

Considering the worldwide spread, occurrence and zoonotic nature, fasciolosis has emerged as a major global and regional concern affecting all domestic animals and infection is most prevalent in regions with intensive sheep and cattle production (WHO, 2007)

Surveys in some Asian countries have shown that among domestic animals, cattle are the most suffering animals (Kuchai., 2011).

Several reports exist on how variable climatic factors and patterns determine period and level of fasciolosis transmission in the divergent agro-ecologic zone in the world. Apart from climatic factors, other factors including the sex of the animals have been suggested as a variable that could influence the prevalence of fasciolosis in cattle (Adodokum *et al*., 2008).

Severe out- break with heavy mortalities were encountered in the White Nile .Province among cattle, sheep and goat. In 1959 an outbreak occured in Bahr El ghazal province in which 60 cows perished (Saeed,1992). In 1973 a high number of sheep near Kosti died from acute fascioliasis. *Fasciola gigantica* was first mentioned in 1914 in the annual report of the Sudan veterinary service (S.V.S). In 1938 fascioliasis was again reported in Malakal.The report of 1953-1954 stated that the incidence of fascioliosis increased in Kosti and Eldueim. Annual reports since 1955 indicate that highest percentages of liver condemnation due fasciolosis are as follows: Upper Nile province (27-58%), Baher El gazal province (16-18%), Equatorial province (13-40%).in all area in Sudan fascioliasis has been reported in several place with high prevalence (Saeed., 1992).

The objectives of the study were: to Estimate the prevalence of bovine fasciolosis in Khartoum state and to investigate the potential risk factors which could be associated with bovine fasciolosis.

2. Material and methods:

2.1 Study area:

The study was conducted from April to June 2017 in Khartoum State, which is located in North Eastern part of the centre of Sudan. The state is located between 21 o, 25-24 o, 45 East and 15 o, 9-16 o, 45 North. The Khartoum State is bounded by North Kordofan in the west and in the north by Nile River State and in the North West by the Northern State and by the White Nile State in the South and Gazeera State in the east.

Figure 1: Map of Khartoum State.

2.2 Study Population:

The study population consists of cattle at different ages, sex, origins and breeds categories in the study area.

2.3 Sampling methods:

Cluster random sampling techniques were used. The prevalence was calculated using formula described by (Martin et al., 1987) as follow:

$$\textbf{Prevalence rate} = \frac{\text{No. of Cattle with fasciolosis}}{\text{Total no. of cattle at a particular point in time}} \times 100$$

Sample size determination:-

The sample size was calculated by the formula:-

$$\mathbf{N} = 4\frac{\mathbf{xPxQ}}{\boldsymbol{L2}}$$

N= sample size

P= expected prevalence

L= desired absolute precision

Q= (1-P). (Martin *et al*.,1987)

The expected prevalence was estimated according to the study prevalence of bovine fasciolosis and related risk factors in Dessie Municipal abattoir , south Wollo Zone, Ethiopia (Belay et al ., 2012) .The sample size was calculated as follows:

$$\mathbf{N} = \frac{\mathbf{4X(,252)X(0.748)}}{\boldsymbol{(0.0025)}} = 302 \text{ animals}$$

2.4 The study design:-

The study design was a cross sectional study which provides snapshot information on occurrence of a disease (Martin et al , 1987). A Cross-sectional study was conducted at Elkadaro slaughterhouse on three randomly selected days, the animals in these days selected by cluster random sampling method.

2.4.1. Ante-mortem and postmortem inspection:-

Regular visits were made by the investigator to conduct ante-mortem examination of slaughter animals. The cattle were selected by cluster random method. Total of 302 cattle were examined in Elkadaro abattoir, during the survey period which extended from April 2017 to June 2017 which questionnaire was designed. The information include: animal grazing (indoor/outdoor), source of animal and using drug. During the ante-mortem inspection the ages, sex, breed and body condition of each individual animal were assessed and recorded. The age was divided into two categories: ≤ 3 years, and >3years; sex to male and female; the cattle breed into three categories: local, cross and breed.

Postmortem examinations of liver and associated bile duct were carefully performed by visualization and palpation of entire organ followed by transverse incision of the organ across the thin left lobe.

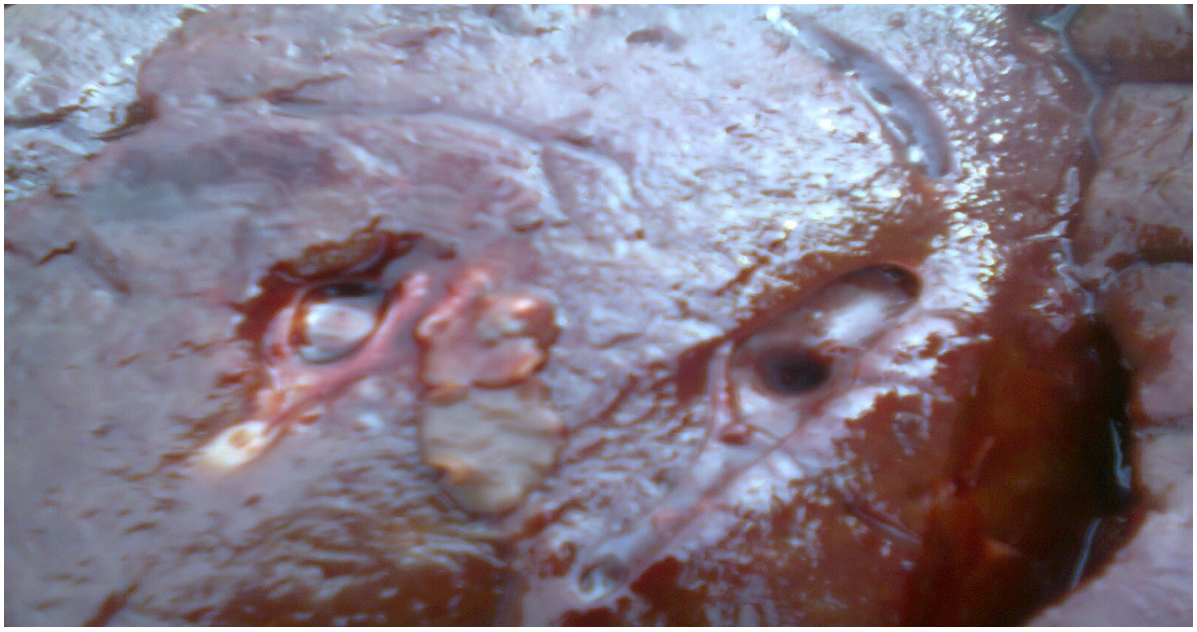

Figure3: The adult parasite in the liver surface.

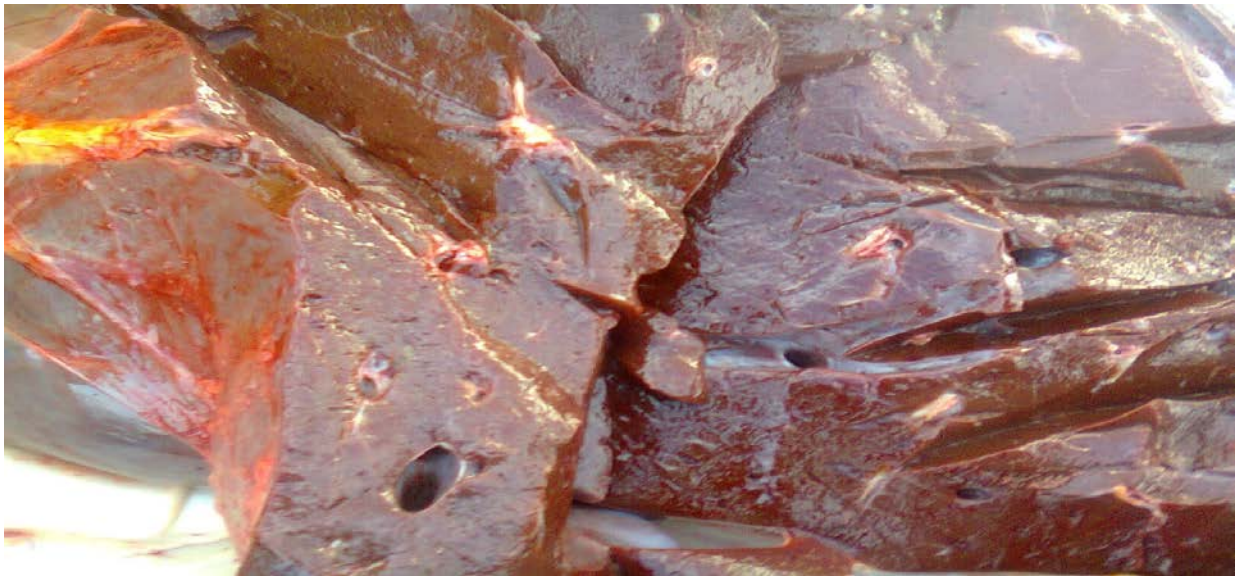

Figure 4: Infected liver of Fasciolosis.

2.4.2 Fecal samples collection and examination

Fecal sample examination was carried out at the laboratory of the Sudan University of Science and Technology, Khartoum State. Fecal samples were collected directly from the rectum during ante-mortem examination using plastic gloves. Specimens were carried in a plastic container and transported to the laboratory for microscopic examination using sedimentation technique to detect the presence of fasciola *spp*. Eggs. The identification of eggs was done on the basis of morphology. Water was added to feces into a container, mixed thoroughly then filtered through a tea strainer, the filtered material was poured into 15 ml centrifuge tube and centrifuged at 3000 rpm for 3minuts and then the supernatant was discarded. Mixing of water and centrifuging is continued until clear supernatant was

obtained. A small drop of the sediment was transferred to slide microscope, covered with cover slip and examined under the microscope at 10x10 magnifications.

2.5 statistical analyses

Results of the study were analyzed using statistical package of social science (SPSS) version 22. At first, descriptive statistical analysis was displayed in frequency distribution and cross tabulation tables. Then, univariate analysis using the Chi-square for qualitative data was carried out. P-value of 0.25 was considered as significant association and the risk factor was then selected to enter the multivariate analysis. Logistic regression was used to analyze the data and to investigate association between potential risk factors and the occurrence of fasciolosis. A p-value of 0.05 indicated significant association between fasciolosis and risk factors.

3. Results

3.1. Descriptive statistical analysis frequency tables, cross tabulation and association tables between the disease and risk factors: Out of 302 cattle inspected, only 10 (3.3%) animals were positive, for bovine fasciolosis (table 1).

Table 1: Prevalence of fasciolosis in 302 cattle examined through postmortem examination in Khartoum State.

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	292	96.7	96.7	96.7
Positive	10	3.3	3.3	100.0
Total	302	100.0	100.0	

Table 2: Prevalence of fasciolosis in 302 cattle examined through fecal examination.

	Frequency	Percent	Valid Percent	Cumulative Percent
Negative	297	98.3	98.3	98.3
Positive	5	1.7	1.7	100.0
Total	302	100.0	100.0	

3.2. Result of Univariate analysis:

3.2.1. Postmortem results

Table 3: Univariate analysis for the association between fasciolosis diagnosed through postmortem examination and potential risk factors in 302 cattle examined in khartoum State using the Chi-square test

Risk factor	Total No	No. positive	Percent (%)	df	X^2	p-value
Age				1	81.5	0.000
Young (≤3years)	268	0	0%			
Old (>3years)	34	10	29.4%			
Sex				1	1.8	0.184
Female	9	1	11.1%			
Male	293	9	3.0%			
Breed				2	88.6	0.000
Local	289	10	3.6%			
Cross	10	0	0%			
Foreign	3	3	100%			
Body condition				1	0.069	0.793
Poor	2	0	0.0%			
Good	300	10	3.3%			
Grazing				1	0.139	0.709
open	298	10	3.6%			
close	4	0	0.0%			
Origin				4	107.9	0.000
Nyala	198	1	0.5%			
Elfashir	7	0	0.0%			
Ethiopia	3	3	100%			
White Nile	46	6	13.0%			
Eldien	48	0	0.0%			

Age of animals:

The presence of liver fasciolosis in three hundred and two cattle of various age was investigated according to the age distribution of cattle 268 of the cattle were less than or equal 3 years (young) and 34 of cattle were more than 3 years (old). Among young animals, no animal was found infected. However among adults 10 animals were found infected. Rate of infection within adults was 29.4 % (10/34).

The Chi- square test showed significant association between fasciolosis infection and age of animal (p-value = 0.000), (table 3).

Sex of animals:

The results of this study showed the distribution of 302 cattle examined for fasciolosis according to sex. Total number of male examined was 293 animals, while the total number of female examined was 9. Among males, 9 animals were found infected. Rate of infection within males was 3.0% (9/293). While among females, one animal was found infected. The rate of infection within females was 11.1% (1/9).

The Chi-square test showed no significant association between fasciolosis infection and sex of animal (p-value = 0.184), (table 3).

Breed:

The results of study showed distribution of fasciolosis infection in Elkadaro slaughterhouse according to breed. Total number of local breed was 289 animal. Among these 289 animals, 7 were found infected. The rate of infection was 2.4% (7/289). Total number of cross breed examined was 10. Among these, there was no infection. Total number of foreign breed examined was 3. Among these, 3 were found infected .The rate of infection was 100% (3/3).

The chi- square test showed there was significant association between the infection and breed (p-value = 0.000), (table 3).

Body condition:

The body condition of animals and the presence of infection were investigated. Three hundred of cattle were found to be in good condition, while 2 of cattle were found to be in poor condition. Among good healthy animals, 10 were found infected. The rate of infection within good healthy condition animals was 3.3% (10/300). However no animal was found infected among poor animals. The rate of infection within poor animals was 0.0%.

The chi- square test showed no significant association between the infection and body condition (p-value = 0.793), (table 3).

Source of animals (Origin):

Of the total 302 cattle inspected, 198 animals were from nyala, 7 animals were from Elfashir, 3 animals from Ethiopia, 46 animals were from White Nile and 48 animals were from Eddien . All infected animals found in this study (10 animals) were from nyala, Ethiopia and White Nile. The rate of infection in nyala , Ethiopia and White Nile was 0.5% (1/198) ,100% (3/3) ,13.0 % (6/46) respectively.

The chi- square test showed there was significant association between the infection and source of animal (p-value = 0.000), (table 3).

Grazing type:

The grazing type of animals and the presence of fasciolosis infection were investigated. Two hundred ninety eight of cattle were found to be in open grazing type, while 4 of cattle were found to be in close grazing type. Among open grazing type animals, 10 were found infected. The rate of infection within open grazing type animals was 3.4% (10/298). However no animal was found infected among close grazing type animals.

The chi- square test showed no significant association between the infection and grazing type (p-value = 0.709), (table 3).

3.2.2 Fecal examination results:

Table 4: Univariate analysis for the association between fasciolosis diagnosed through fecal examination and potential risk factors in 302 cattle examined in Khartoum State using the Chi-square test.

Risk factor	Total No	No. positive	Percent (%)	Df	X2	p-value
Age				1	40	0.000
Young(≤3years)	268	0	0%			
Old(>3years)	34	5	14.7%			
Sex				1	0.156	0.693
Female	9	0	0.0%			
Male	293	5	1.7%			
Breed				2	78.7	0.000
Local	289	3	1.0%			
Cross	10	0	0.0%			
Foreign	3	2	66.6%			
Grazing				1	0.068	0.794
Open	294	10	3.4%			
close	4	0	0.0%			
Body condition				1	0.034	0.854
Poor	2	0	0.0%			
Good	300	5	1.7%			
Origin				4	88.8	0.000
Nyala	198	0	0.0%			
Elfashir	7	0	0.0%			
Ethiopia	3	2	66.7%			
White Nile	46	3	6.5%			
Eldien	48	0	0.0%			

Age of animals:

Among young animals examined, no animal was found infected. Rate of infection within young animals was 0.0% (0/268). However among adults 5 animals were found infected. Rate of infection within adults was 14.7(5/34).

The Chi- square test showed significant association between fasciolosis infection and age of animal (p-value = 0.000), (table 4).

Sex of animals:

Among examined males, 5 animals were found infected. Rate of infection within males was 1.7% (5/293). While among females, no animal was found infected. The rate of infection within females was 0% (0/9).

The Chi-square test showed no significant association between fasciolosis infection and sex of animal (p-value = 0.693), (table 4).

Breed:

Among local breed, the rate of infection was 1% while it was 66.6% in foreign breed and 0% in cross breed.

The chi- square test showed there was significant association between the infection and breed (p-value = 0.000), (table 4).

Body condition:

Among good animals, 5 animals were found infected. The rate of infection within good healthly condition animals was 1.7% (5/300). However no animal was found infected among poor animals. The rate of infection within poor animals was 0.0%.

The chi- square test showed no significant association between the infection and body condition (p-value = 0.85), (table 4).

Source of animals (Origin):

All animals from Ethiopia and White Nile province were found to be infected with fasciola. The rate of infection in Ethiopia and White Nile were 0.5% 66.7% (2/3), 6.5 % (3/46) respectively.

The chi- square test showed there was significant association between the infection and source of animal (p-value = 0.000), (table 4).

Grazing type:

Among open grazing type animals, 5 animals were found infected. The rate of infection within open grazing type animals was 1.7% (5/298). However no animal was found infected among close grazing type animals.

The chi- square test showed no significant association between the infection and grazing type (p-value = 0.794), (table 4).

3.3. Results of multivariate analysis:

3.3.1. Postmortem examination:

Table 5: Multivariate analysis for the association between fasciolosis diagnosed through postmortem examination and potential risk factors in 302 cattle examined in Khartoum State using logistic regression.

Risk factor	No. positive	No. positive (%)	Exp (B)	p-value	95% CI
Age				0.000	0.000-0.296
Young(≤ 3years)	268	0(0%)	Ref.		
Old(> 6years)	34	10(29.4%)	11.0		

Sex				0.184	0.296-161.6
Male	293	9(3.0%)	Ref		
Female	9	1(11.1)	6.9		
Breed				0.000	0.000
Cross	0	(0%)	Ref.		
Local	7	(2.4%)	0.040		
foreign	3	(100%)	9.0		
Grazing				0.000	0.000-0.005
Open	298	10(3.4)	2.46		
Close	4	0(0.0%)	Ref		
Origin				0.000	
Nyala	198	1(0.5%)			
Elfashir	7	0(0.0%)	Ref.		1.8 -570.1
Ethiopia	3	3(100%)	32.0		
White Nile	46	6(13.0%)	4.0		
Eldien	48	0(0.0%)	.000		

Potential risk factors found to be significantly (p-value< 0.25) associated with fasciolosis in the univariate analysis (table 3) were entered to logistic regression model. Four risk factors were found to be significantly associated (p-value<0.05) with fasciolosis in the multivariate analysis. These risk factors included Age (p-value 0.000), breed (p-value=0 .000), source of animal (p-value =0.000) and grazing (p-value=0 .005) (table 5).

3.3.2. Fecal examination:

Table 6: Multivariate analysis for the association between fasciolosis diagnosed through fecal examination and potential risk factors in 302 cattle examined in Khartoum State using logistic regression.

Risk factor	No. positive	No. positive (%)	Exp(B)	p-value	95% CI
Age				0.000	0.000-0.296
Young(≤ 3years)	268	0(0%)	Ref.		
Old(> 6years)	34	5(14.7%)	15.0		
Sex				0.693	0.000-0.000
Male	293	5(1.7%)	26.0		
Female	9	0(0.0%)	Ref.		

Breed				0.000	0.000
Cross	10	0 (0%)	Ref.		
Local	289	7(2.4%)	0.090		
Foreign	3	3(100%)	65.0		
Grazing				0.000	0.000-0.005
Open	298	10(3.4)	2.06		
Close	4	0(0.0%)	Ref.		
Origin				0.000	0.000-0.000
Nyala	198	0(0.0%)			
Elfashir	7	0(0.0%)	Ref.		
Ethiopia	3	2(66.7%)	32.0		
White Nile	46	3(6.5%)	32.0		
Eldien	48	0(0.0%)	1.00		

Potential risk factors found to be significantly associated (p-value ≤ 0.25) with fasciolosis in the univariate analysis (table 4) were entered to logistic regression. In the final model four risk factors were found significantly associated (p-value≤ 0.05) with fasciolosis in the multivariate analysis. These risk factors included age (p-value =0.000), breed (p-value= 0.000) source of animal (p-value= 0.000), grazing (p-value=.000), (table 6).

4. Discussion:

Fasciolosis is a parasitic disease of mammals, especially ungulates. The bodies of trematodes or flukes are dorsoventrally flattened and are unsegmented leaf like. The fluke is cosmopolitan in it's distribution and is the cause of fasciolosis (liver fluke disease, liver rot), especially in sheep and cattle (Soulsby,1986).

Previous studies on animal fasciolosis revealed that the disease is prevalent in the Sudan, in area such as Darfur, Upper Nile, Khartoum, Bahr ElGazal, Equatorial Blue Nile, Kassala as well as North State .(Koko et *al* .,2003). The annual reports since1955 indicate that highest percentages of liver condemnation due fasciolosis are follows:Upper Nile Province (27-58%), Baher El Gazal Province (16-18%),Equatorial Province(13-40%) .In all area in Sudan fasciolosis has been reported in several places with high prevalence.

Our study was carried out in Khartoum State to investigate risk factors and to estimate prevalence of bovine fasciolosis in Khartoum State The prevalence rate was 3.3% by postmortem examination and1.7% by fecal examination using sedimentation techniques.

The prevalence rate of postmortem examination obtained in this study is 3.3% which is higher than prevalence rate by fecal examination (1.7%), because some infected animal might have been misdiagnosed by sedimentation technique which is characteristically poor in detection of fluke (Pfukeny *et al*.,2006).

Also this variation could probably be due to the fact that in abattoir study the liver is usually damaged by immature flukes which cannot be detected through fecal examination. In addition, most cattle that are infected with flukes shed relatively few eggs and only eggs are found from 8 week after infection (Pfukeny *et al*., 2006).

However the prevalence rate in our study (3.3%) was lower than many other studies from different abattoirs in Sudan in Gezira state, Central Sudan (Koko *et al*., 2003) where the prevalence was12.5% or in Africa, such as from Nekemte municipal abattoirs the prevalence rate was 21.9% (Petros et al., 2013) and from Jimma municipality abattoirs in Ethiopia, where the prevalence rate was 48.19% (Fromsa *et al*., 2001).

This variation could be due to the geographical location and ecological condition such as altitude, rain fall and temperature. *Fasciola spp* prevalence has been reported to vary over the years mainly due to variation in amount pattern of rain fall. Bahr el Ghazal Province of south Sudan was also reported to have a high prevalence of fasciolosis than the more open and dry savannah, Darfur provinces (Pfukeny *et al*., 2006).

In our study, the age was found significantly associated with fasciolosis the p-value is (0.000) in post mortem examination. The prevalence rate is high in old animals than young animals. (29.4%, 0%) respectively. This result is in agreement with previous study in Debre Zait town, Ethiopia by (Abdulhakim *et al*., 2012).

However, our result does not agree with another study in Ladakh in India by (Kuchai *et al*., 2011) who found higher prevalence in young animals.

In our study, the age was found significantly associated with fasciolosis the (p-value is 0.000) in fecal examination. The prevalence rate is high in old animals than young animals. The prevalence rate of fecal examination was14.7% in old animals and 0%in young animals. These results are in agreement with previous study in Zimbabwe by (pfukeny *et al*., 2006) who found high infection rate in old animal ,the(p-value is.<0.001) , The higher infection rate in older animal was reported to be probably due to longer exposure time, or due to management system with longer exposure of old animals outdoor while young animals are kept indoor (Pfukeny *et al*., 2006).

Also our study is in agreement with another study in Kayseri Province, Turkey by (Yildrim *et al*., 2007) who found high infection rate in old animals. However, our results do not agree with another study in Ginnir District by (Fekadu *et al*., 2012), where a significant difference was not observed between age groups (p-value > 0.05).

In our study, sex was found no significantly associated with fasciolosis in postmortem examination (p- value =0.184). This is agrees with a previous study in Nekemte Municipal abattoir by (Petros *et al*., 2013) who did not find significant association of sex with fasciolosis (p-value > 0.05). However, our study does not agree with study in Assela, Ethiopia by (Mugugeta *et al.,*2011) who found significant association of sex with fasciolosis (p-value <0.05).

Also in our study, the sex was not found significantly associated with fasciolosis (p-value=0.693), in fecal examination .This finding is not in agreement with study carried out around Assela by (Mugugeta *et al*., 2011) who found significant association between sex and fasciolosis .

Also in our study, source of animal was found significantly associated with fasciolosis (p-value=0.000), in postmortem examination .This finding is in agreement with study carried out in southern Espirato Santo by (Bernardo *et al*., 2011). However, our study does not agree with a previous study in Sowth Wollo zone, Ethiopia by (Belay *et al*., 2012).

Our study revealed that grazing type was significantly asciated with fasciolosis the p-value =0.005), in postmortem examination. A higher prevalence of fasciolosis was reported in outdoor (1.7%) as compared with animals in indoor (0%). This variation IS in our opinion may be due to the fact that animal grazes outdoor is more exposed to the disease from pasture, dams, ponds than animal kept indoor.

In this study there were four risk factors were found to be significantly associated (p-value <o.o5) with bovine fasciolosis in the multivariate analysis. These four risk factors included: age, source of animal, grazing and breed.

5. Conclusion and recommendations:

In view of our findings, fasciolosis is prevalent at Elkadaro abattoir in Khartoum State. Our study further confirmed that fasciolosis diagnosed through postmortem examination is more prevalent than by fecal sedimentation. The overall prevalence was 5%. Old Animals were more affected compared to young animals. The prevalence of fasciolosis is higher in foreign breed and local breed compared to cross breed. The prevalence of fasciolosis is higher in animals which graze outdoor than animal which graze indoor. We recommended
More elaborate studies on bovine fasciolosis to reveal the prevalence in other states, Economic importance of the disease should be evaluated, Awareness of animal owner's about the disease, treatment and the control strategy.

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