UNIVERSITY OF NAIROBI
COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES
FACULTY OF VETRINARY MEDICINE

PROJECT REPORT

ON

PREVALENCE AND ECONOMIC LOSSES ASSOCIATED WITH FACIOLOSIS INFECTION OF CATTLE IN RACHUONYO SOUTH SUBCOUNTY

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THIS REPORT WAS SUBMITTED FOR PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR OF VETERINARY MEDICINE, UNIVERSITY OF NAIROBI.

DECLARATION

I hereby declare that this project report entitled **"Prevalence and economic losses associated with fasciolosis infection of cattle in Rachuonyo south sub county"** submitted by me, Peter Otieno Oduor, to the University of Nairobi for partial fulfillment of the requirement for the award of the degree of Bachelor of Veterinary Medicine in the Department of Public Health Pharmacology and Toxicology is my bonafide project work carried out under the guidance of Professor Jackson Nyarongi Ombui, and that the findings reported in this project have not been submitted either in part or full for the award of any other degree or diploma in this or any other university.

DEDICATION

This work is dedicated to my mother, Priscilla Oduor for her love and moral support without which this work would have not been possible, thank you mother. My uncle, David Oloo and his wife Jenifer for their financial and moral support since I embarked on the journey to accomplish my studies. Further dedication goes to my caring sister, Mary Oduor.

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ABSTRACT

This study was aimed at investigating the prevalence and associated economic losses due to fasciolosis in indigenous animals in Rachuonyo South Sub County. The following techniqueswereused in data collection included meat inspection, identification of Fasciola, administration of questionnaires and a five year retrospective study using postmortem meat inspection records available at the sub county veterinary office for the period 2010-2014. . Fasciolosis was a major cause of liver condemnation during the study period as depicted by the pathological lesions seen during three weeks of meat inspection in December 2014. *Fasciola gigantic* was found to be the main cause of fasciolosis. Slaughter figures and condemned liver figures were documented from various slaughter houses in Rachuonyo south sub county and used to determine the prevalence.

The prevalence of Fasciola cases was found to be 17.43% for the area of study and caused a total loss of Ksh 4,826,250.00within a period of five years. On average the region lost Ksh 965,250.00 per year. Fasciolosis is wide spread in this region due to extensive grazing recorded by about seventy three percent (72.5%) of participants, failure to practice proper deworming regime with 20% of the participants not deworming their livestock. Availability of favorable climatic and local conditions for multiplication of snails vectors such as marshy lands near rivers also aid fasciolosis occurrence.

Regular treatment of all animals with effective flukicide, control of snails using molluscicides, draining and fencing of swampy areas and proper education of farmers were suggested as fasciola management options.In conclusion, fasciolosis was found to be a major threat to livestock production in Rachuonyo south sub county and that the main species identified was *Fasciola gigantic*. Fasciolosis is common in this place due to failure to control liver flukes by some farmers which lead to contamination of grazing fields, hence the observed prevalence

CHAPTER 1: INTRODUCTION

Fasciolosis is an important parasitic disease in the tropics limiting production of ungulates and rabbits (Hansen and Perry 1994, Keyyu *et al*., 2005). It is also a zoonotic disease and cause severe illness in humans (Mas-Coma *et al*., 2005) It is estimated that more than 180 million people are at risk of infection and infection rates are high enough to make fasciolosis a serious public health concern. It is caused by two species of Fasciola, *Fasciola gigantic* and *Fasciola hepatica.* The distribution of the two species depends on prevailing climatic conditions, *Fasciola hepatica* is common in mild cold climates and the temperate regions (Mas-Coma and Bargues 1997*) Fasciola gigantica* is common within the tropics including Western, Sub Sahara and Eastern Africa (Wamae *et al*., 1998).Today fasciolosis is widespread throughout the world unlike in the past when it was limited in certain geographical areas. The intermediate host is Lymnoid snails. In Eastern and Southern Africa the common snails are *Galba truncatula* and *Pseudosuccionea columella (*Brown 1994).

Cattle, mostly the indigenous develop acquired immunity that leads to elimination or chronic Fasciolosis (Spithil *et al*., 1999). On the other hand, acquired immunity develop poorly in sheep, hence they develop pathological lesions (Mas-Coma and Bargues 1997)' Fasciolosis lead to huge economic losses in terms of milk production, poor feed utilization, poor meat quality and decreased weight gain, secondary infections, public health and control expenses (Kithuka *et al* ., 2002;Mungube *et al.,* 2006). Liver is the main organ targeted by liver flukes and this leads to excessive trimming and total liver condemnation in severe cases. Diagnosis is mainly made based on clinical signs and postmortem findings in slaughter houses due to the chronic nature of this disease in bovine(Spithil 1999). At postmortem, the liver is swollen, congested, with fibrosis and hyperplasia of epithelium due to cholangitis and cholecystitis (Sadjjadi et al 1997).

Mechanical obstruction of bile ducts may be seen, (Heinz Mehlhorn 1988). Fasciolosis an acute disease in sheep and goats where it causes sudden death without visible signs of ill health (Bargues 1997).

The Fasciola trematodes are favored by presence of fresh water snails, swampy areas, short vegetations, shaded areas with temperatures above ten degrees celsius and presence of suitable final hosts (Soulsby 1982,). The aim of this study was to establish the prevalence and economic significance of fasciolosis in cattle, sheep and goats in Rachunyo Subcounty.

GENERAL OBJECTIVE

To determine the prevalence of fasciolosis in Rachuonyo south sub county and methods of control and estimate the economic losses resulting from condemnation of livers at slaughter.

SPECIFIC OBJECTIVES

1 To determine the prevalence of fasciolosis in Rachuonyo south sub county

2 To identify factors that determines the current level of fasciolosis prevalence in the study area

3. Identify and evaluate the methods of control used by farmers.

4 To determine the economic losses due to the disease

5. Recommend strategies that can achieve appropriate control of fasciolosis in the study area.

CHAPTER 2: LITERATURE REVIEW

EPIZOOTIOLOGY

Fasciola belong to the family fasciolidae and has genera *Fasciola gigantica* and *Fasciola hepatica* as the main ones (Keyyu *et al* 2005). They are large diastomes with broad flat muscular bodies and most organs complicated by branching. Fasciolosis is a cosmopolitan disease in wet areas. *Fasciola hepatica* is common in Europe while *Fasciola gigantica* is common within the tropics but the two overlap in many parts of Africa. In Africa it is common along lake borders, flood prone areas, low lying marshy areas and drainage ditches Mas-Comas and Bargues 1997). Main final hosts are cattle, sheep and goats. Intermediate host are fresh water snails (Urquhart *et al* 1996).

LIFE CYCLE

Mature flukes lay eggs in bile ducts which are passed out in feces and washed by rain water, within fourteen days at temperatures above ten degrees Celsius, a ciliated miracidium is formed in eggs which hatches and swim to attach on true aquatic snails *Lymnaea nataliensis* (Camilla Graham2001), the intermediate host. This occurs within hours or it dies. Once in the snails after twenty four hours they become sporocysts which then develop daughter cercariae which leave snail and swim for some time and encyst on water weeds and become metacercaria (Vreni Jean 2011), it takes thirty to fifty days for miracidium to develop to cercaria and might be longer depending on climatic conditions and other factors. (Mas-comas *et al*.,2005). Miracidium are free living while metacercariae encyst on vegetation (Camilla Graham 2001). The metacercariae are swallowed by the host from weeds or water when drinking. Once in duodenum, the cyst is dissolved and young flukes penetrate intestinal wall and fall into peritoneal cavity, migrate to the liver and wander for ten weeks before entering bile ducts. They mature and produce eggs after twelve weeks of ingestion (Soulsby 1982).

MODE OF INFECTION

This depends on biology of vector, biology of parasite and flock management.

VECTOR

The snails have season dependent life cycle and therefore the parasite. They increase with progressing rainy season and decrease in dry season. For example, the vectors population is high in November-March in Sahel Region (Ralph et al 2008).

PARASITE

The eggs survive for 2-3 months in humid feces, desiccation kill them unless washed into water. The larvae (sporocysts, radiae and cercariae) take 10-18 months in aquatic snails from one rainy season to the next. This ensures survival and ensuing infection. Metacercariae live for 3-6 months in shady and humid environment. Hot and sunny environment kill them. Adult flukes last for 1-3 years in the liver and produce 500,000 eggs that result to hundred million Metacercariae, which enhances infection (Soulsby 1986,).

FLOCK AND HERD MANAGEMENT

Animals should be kept away from water courses and permanent water pools and to avoid overcrowding. The flock should be driven from water pools and home watering practice. This reduces infection (Mugumbe et al 2009).

PATHOGENESIS

INCUBATION PHASE

Duration for the signs to appear is three months and can vary depending on state of immunity and number of metacercariae ingested and the stage of ingestion of metacercariae (Wikipedia 2014).

INVASIVE/ACUTE PHASE

When the metacercariae are migrating through the peritoneum and into the liver parenchyma and finally into bile ducts they cause serious damage and toxic allergic reactions resulting into pyrexia of 40 -42 degrees celsius. Other signs are abdominal pain, gastrointestinal disturbances- loss of appetite, flatulence, nausea, diarrhoea and urticaria. Respiratory system signs such as- coughs, dyspnoea, chest pains, hemoptysis, may occur. Other signs include hepatomegaly, splenomegaly, ascites, anaemia and jaundice (Wikipedia 2014,)

LATENT PHASE

This is the period when animals are infected with fasciolosis but fasciola eggs cannot be detected while liver damage occurs (Rokni et al 2003)

CHRONIC/OBSTRUCTIVE PHASE

Take months to years after infection. Flukes cause inflammation and hyperplasia of epithelium of bile ducts and thus cholangitis, while large flukes cause mechanical obstruction of ducts (Spithil 1999)

MANIFESTATIONS OF FASCIOLOSIS

ACUTE FASCIOLOSIS

Type one occurs when sheep ingest five thousand metacercariae. Sheep dies without prior signs. Liver flukes damage liver causing acute hepatitis with loss of blood into peritoneum. Sheep dies without signs of struggle (Wikipedia 2014, Wamae 1998). At postmortem, ascites, abdominal hemorrhages, icterus, pallor and weakness may be seen. Sheep in both good and poor body condition are equally attacked in days to few weeks after ingesting large number of metacercariae. Type two occurs when sheep ingest between one thousand and five thousand metacercaries. Slow pallor, loss of condition and ascites are possible signs seen. At postmortem, liver is swollen, congested with fibrosis and tags on the surface. Blood is seen in the peritoneal

cavity .The liver has numerous burrows, hemorrhages and fibrotic. When liver is cut open, liver flukes are squeezed out of the bile ducts (Nebyou Moje 2014).

SUBACUTE FASCIOLOSIS

This occurs when eight hundred to one thousand metacercariae are ingested by sheep. Lethargy, anemia, weight loss and death may occur (Leticia et al 2013).

CHRONIC FASCIOLOSIS

Ingestion of two hundred to eight hundred metacercariae by ruminants. It is asymptomatic or gradual in nature. Signs include bottle jaw, ventral abdomen edema, emaciation, weight loss, anaemia, lack of stamina, pica, eat soil, wool is pulled out easily. Blood picture show anaemia, hypoalbuminaemia, eosnophilia(Mushin Kaya 2011).

There are elevated liver enzymes such as glutamate dehydrogenase, gamma glutamyl transferase and lactate dehydrogenase from week twelve to fifteen of ingestion of metacercariae. Flukes suck blood and damage bile ducts by their spines leading to thickening and fibrosis (pipey liver) the ducts with time form cysts and become calcified. Huge economic losses occur due to liver condemnation. Mature cattle developed acquired resistance against *Fasciola hepatica* (Maria Adrien, 2013).

CLINICAL SIGNS

Anaemiais the earliest sign. There is migratory liver damage with loss of blood leading to: palor, sub icteric eyes, increased apathy, weakness, sluggish, rapid loss of breath and loss of appetite (George Mitchell 2002).

Anemia is followed by diarrhea which occurs due to poor billiary antisepsis and is pronounced in cattle. Change of diet or natural resistance help reduce diarrhea in lighter cases of infection,

where most flukes are eliminated and Cattle recover (Junquera 2015). Oedema may also be observed on limbs, dew lap (bottle jaw) and ventral abdomen (pot belly). Cachexia occur gradually due to lack of appetite, edema get generalized resulting to hydramia/watery cachexia. Thirst and decubitus occur. Animal die due to exhaustion with no signs of pain as it dies, in less than 3-5 months (Junquera 2015).

COMPLICATIONS

1) Endotoxaemia due to lack of billiary antisepsis (Mark Robinson et al 2011).
2) Gastrointestinal strongylosis (Showcat Ahmed 2012)

DIAGNOSIS

Clinical diagnosis is difficult and is mostly diagnosed at meat inspection, based on presence of adult flukes and pathological findings (Mushin Kaya et al 2011). Fecal floatation is done using samples collected from live animals. The fluke eggs are heavy and thus settle at the bottom after centrifugation while the light, round worm eggs float (Hadleigh Marsh).

Microscopy reveal eliptiform eggs with large thin eggs shell and containing morula mass formed of cells surrounding the zygote. The eggs are operculate at one pole and yellowish. The eggs measure 175-190 micrometers by 90-100 micrometers. Then the number of eggs per gram of feces calculated, that hint severity of infection.

Challenges: 1 Eggs are shed 15 weeks after infection; this means no egg is found before that duration (Rokni et al 2003). 2 Intermittent egg expulsions due to evacuation of gallbladder and Fasciola biology(Ibrahim et al 2009). 3 Eggs are similar to those of Paramphistomes except for colour difference, Fasciola eggs are yellowish while those of paramphistomes are grayish (Bonita 1996).

DIFFERENTIAL DIAGNOSIS

The acute form may be confused with necrotic infectious hepatitis due to nutritional disorders or intrahepatic migration of *Cysticercus tenuicolis* (*Taenia hydatigena*) (Nonga et al 2010). The chronic form may be confused with cestode infestation, strongylosis and other helminthes (Kanyari 2009).

TREATMENT

Many drugs can be used including hexachlorophene, bithional, closantel, nitroxynil, brotianide, clorsulon and triclabendazole (Junquera 2007).

PREVENTION

1 Use of drugs to eliminate Fasciola parasites (Junquera 2007, Mugumbe 2009).

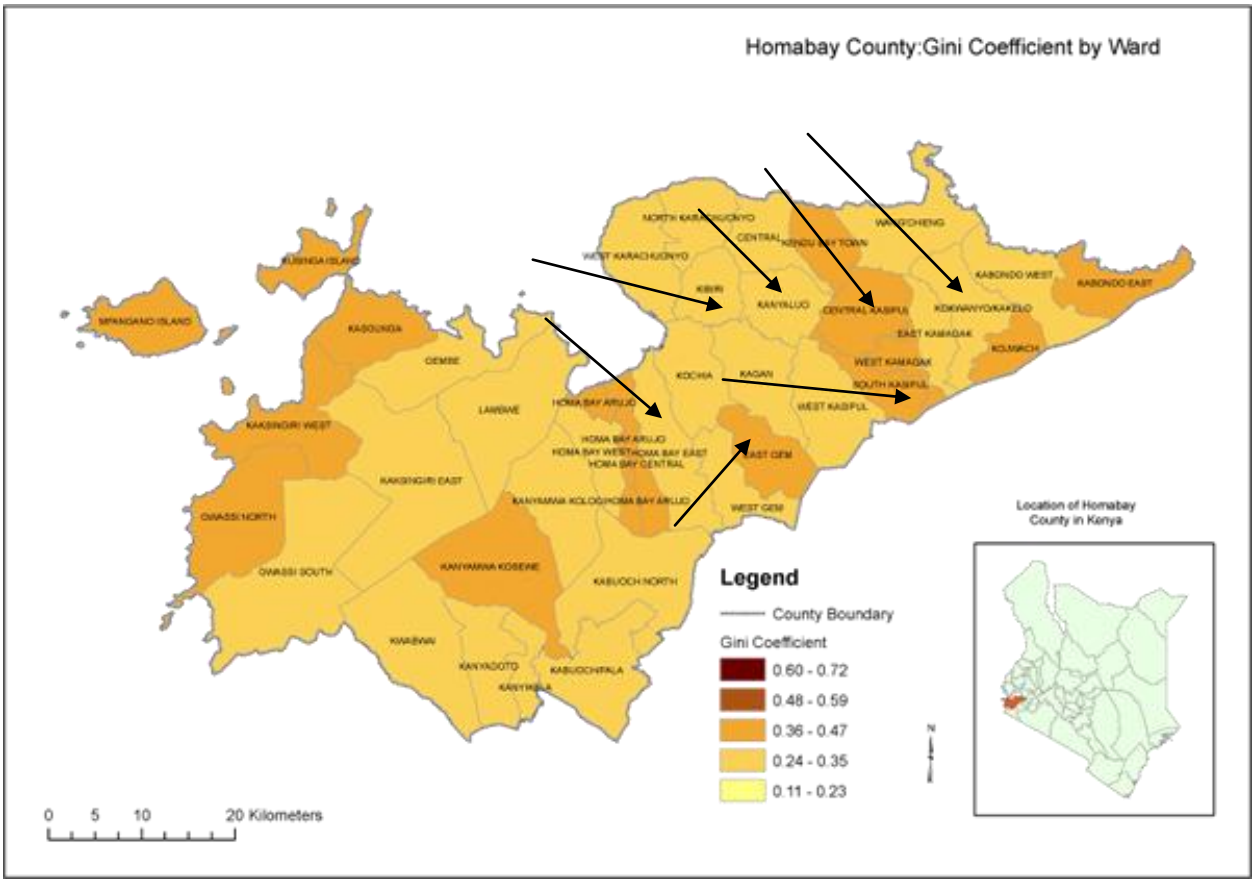
2 Proper distribution and management of waterholes i.e. avoid overcrowding at waterholes and practicing proper animal husbandry (Mugumbe2009)

3 Controlling snails by the use of molluscicides (Pfukenyi2006, Brunsdon1976).

CHAPTER 3. MATERIALS AND METHODS

Description of study area

Study was carried out in Rachuonyo south sub county whose headquarter is Kosele in Homabay County in former Nyanza province western Kenya. This region has a population of 225055. The main commercial centre is Oyugis town, which located 20 kilometers north of Kisii town along major A1 highway. The geographical coordinates are 05000 degrees south, 34.7167 degrees east. Rachuonyo has four divisions and an area of 930 square kilometers. This region is 1400 to 1600 meters above sea level with rainfall amount of 1200 millimeters per year. This region has average daily temperatures range of 17 to 27 degrees Celsius and the people are mainly Luo community who practice crop farming and livestock rearing for subsistence. Crops are mainly maize, millet, beans, cassava and potatoes while animals are mainly cattle, sheep and goats. Luo community is known for fish consumption and this has an influence on meat consumption.



Study design

The study encompassed two study designs which included a cross sectional study and a retrospective study. .A cross sectional study was carried out during a-three week period in December 2014 with the aim to determine prevalence and economic losses due to fasciolosis in Rachuonyo South Sub County. This was done by filling questionnaires, focus group discussions and doing postmortem meat inspection.

A retrospective study/historic cohort study was done by analyzing postmortem records dating 2010 to 2014 including bovine, caprine and ovine carcasses slaughtered in this place**.**

Sample size

The study targeted one hundred farmers within Rachuonyo South Sub County, who contributed to the filling of questionnaires. They were selected on the basis of gender, location and nature of grazing lands including highlands and swampy lowlands.

Data collection.

I collected data using four methods:

1 **Meat inspection**

Daily visits were made by myself to various slaughter houses in Rachuonyo south subcounty for a period of three weeks in December and did examination of two hundred and ninety nine slaughtered ruminants, paying attention to their livers for presence of liver flukes, pathology caused and findings were recorded. The methods used during meat inspection included visualization, palpation, and incision of organs to identify any pathology. Presence of liver flukes was noted. The results obtained constituted part of table 1.

2. **Questionnaires.**

I obtained data by filling questionnaires by visiting sampled farmers and meat inspectors in Rachuonyo South sub County. Farmers were chosen based on location and climatic conditions Sampling was done in both highlands and low lands, near swampy areas and areas far from the rivers as well as in both wet and dry areas. It was also gender based with no gender bias. The results obtained constituted table 3 and summarized in table 4

3 Analysis of postmortem records

Data on fasciolosis spanning the period from the year 2010 to 2014 was retrieved from Rachuonyo South Sub County Vterinary Office. The postmortem records were analyzed and prevalence calculated. The results obtained, including December 2014 were captured in table 1.

4 Focus group discussion

This was done on field days when farmers gathered together with veterinary officials with the aim of finding lasting solutions to the fasciola menace. Farmers discussed their methods of control and their efficacies. The discussions were spearheaded by the District Veterinary Officer. After the discussions, farmers were trained on methods of controlling fasciolosis including water hole management, antelmintic treatment, avoiding swampy areas and use of molluscicides. Details are captured in figure 4.

Data storage and analysis:

Data was stored in computer excel sheet and analyzed using excel and presented in tables.

RESULTS

During the period 2010 to 2014 under study, an average of 4107 animals was slaughtered out of which an average of 715 livers was condemned as a result of fasciolosis per year. These figures gave an annual prevalence of fasciolosis of 17.43 percent for Rachuonyo south sub county (postmortem data). Taking average weight of liver to be 3 kilogram and price of Kenya shillings 450.00 per kilogram, the total loss was calculated to be Kenya shillings 965,250.00 per year**.**

Table 1 : Prevalence of fasciolosis and related economic losses in Rachuonyo south sub county between 2010 to 2014

YEAR	Total number of animals slaughtered	Total number of liver condemned due to fasciolosis	Prevalence of fasciolosis (%)
2010	3877	734	18.93
2011	4002	681	17.01
2012	4182	725	17.33
2013	4552	764	16.78
2014	3922	671	17.10
TOTAL	20535	3575	17.41
AVERAGE	4107	715	17.43

Percentage losses per year were calculated as a fraction of the total slaughter figures and the figure below gives the nature of the losses.**Table2 Economic losses due to fasciolosis between 2010 – 2014.**

YEAR 2010	No. of condemned livers	Total weight of condemned livers(kg)*	Economic losses (Ksh)
2010	734	2202	990,900.00
2011	681	2043	919,350.00
2012	725	2175	978,750.00
2013	764	2292	1,031,400.00
2014	671	2013	905,850.00
Total	3575	10,725	4,826,250.00
Average	**715**	**2145**	**965,250.00**

Knowledge, attitudes and practices of farmers

The knowledge, attitudes and practices of farmers in the study area were determined from the Questionnaires and interviews that were done during data collection. The results of the study indicated that 25% of participants had attained post secondary education and own on average 8 animals with better control of fasciolosis, while 75% of the participant had attained either secondary or primary, or had never gone to school. This category on average owned 11 animals but gave minimum attention to fassiolosis problem. Sixty percent (60%) of the participants had been rearing animals for more than 10 years while 40% had reared animals for less than 10 years.

This might have a relationship with knowledge of control. 95% bought livestock for production purposes from within the local markets in the sub county and only 5% bought from outside. Extensive grazing is practiced by 72.5% of participants mainly along rivers, roads, school grounds, hilly grounds that cannot support crop farming, croplands after harvesting while 27.5% practiced zero and own pasture grazing. Rivers were the main source of water for livestock at 97.5%, while boreholes accounted for 2.5%. Of those who used river water 92.5% took their livestock to the river and 60% of them watered their animals between 2 to 4 pm and met with more than five flocks at the same watering point, while 40% watered their animals between 12noon to 2pm.and met 2 to 4 herds/flocks gathering at water point.

Worm control is an important aspect to limiting fasciolosis menace. While 80% of the participants dewormed their livestock, 20% did not. Ninety (90.6%) percent of the farmers used Levamisole (nilzan®) and Albendazoles, while 9.4% used a concoction of natural herbs orally after boiling and cooling.

Of those that dewormed animals, about twelve percent (12.5%) dewormed animals at intervals of 3 months, 32.5% dewormed every 4 to 5 months and 35% in dewormed after 5 or more months.

Figure 3: Deworming regimes practiced by participants

Deworming interval in months	Response percent (%)
Did not deworm	20
Dewormed after 3 months	12.5
Dewormed after 4 to 5 months	32.5
Dewormed after more than 5 months	35

Source of antihelmintics

About ninety three percent (92.5%) of the participants said that Kenya Tsetse and Trypanosomiasis Eradication Council (KENTTEC) assist them with antelmintic drugs to deworm the animals during the long rains of May- June every year and Veterinary Officials are involved in the deworming exercise. Seventeen point five percent (17.5) of participants experienced sudden death of sheep and goats but only two point five percent (2.5%) involved Veterinary Doctors who attributed the cause of death to fasciolosis. About seven point five percent of the participants were butcher men and they reported that on average fourteen percent (14%) of all livers with fasciola were condemned while eighty six percent (86%) of livers underwent trimming per day.

Table 4 : Characteristics of the study participants

Characteristic	Category	Number (n=120)	%
Level of Education	Post secondary	4	3
	Secondary	26	22
	Primary	55	46
	Never been to school	34	29
Duration in livestock Keeping	Less than one year	0	0
	1 -5 years	3	2.5
	5 -10 years	45	37.5
	More than 10 years	72	60
Sources of animals for production purposes	Within the district	114	95
	Outside the district	6	5
Sources of feed for the animals	Zero grazing	6	5
	Own pasture grazing	27	22.5
	Extensive grazing	87	72.5
Source of water for the animals	Borehole	3	2.5
	River	117	97.5
	Dam	0	0
	Pond	0	0
Time of watering and number of flocks met at water point	12:00-2:00pm(2-4flocks)	48	40
	2:00-3:30(>5flocks)	72	60
Deworming regime	Deworm	96	80
	Do not deworm	24	20
Antelmintics used by farmers	Levamisole(nilzan)	22	19
	Albendazole	86	71.6
	Natural herbs	11	9.4
Source of antelmintics drugs	Self	69	57.5
	KENTTEC	51	42.5
Manifestations of fasciolosis in sheep and goats	Sudden death seen	21	17.5
	No death seen	99	82.5
Involvement of veterinary officer in diagnosing cause of death	Involved	3	2.5
	Not involved	117	97.5
Butcher ownership	Own	9	7.5
	Do not own	11	97.5

DISCUSSION

The results obtained in this study indicate that Fasciolosis exist in Rachuonyo South Sub County and this concurs with findings in other parts of Kenya reported by Kithuka *et al.,* (2002). Other reports specifically, from Taveta Division in which the prevalence of Fasciolosis was found to be 25.9% (Mugumbe *et al*., 2009). Elsewhere in the world, a study at Kambolcha industrial abattoir in Ethiopia found that fasciolosis prevalence of 12.4% (Brheet *et al.*, 2009), while another study in Switzerland found the prevalence of *Fasciola hepatica* to be 16% and caused a total loss of 52 million Euros (Schweizer G.*et al*., 2005). A study in South East Asia found fasciolosis to cause huge economic losses (Saleha, 1991).

The prevalence of 17.43% reported in this study is of great economic importance and may indicate a problem in a wider area than the study area due to pilferage of animals meant for slaughter from regions such as Homabay, Migori, Nyakach and Kisii into this place. The most important factor influencing occurrence of *Fasciola gigantica* in this place is availability of suitable habitat within the tropics (Soulsby *et al*., 1986). Swampy areas such as Owade in Kokal and Awach in Kodera largely may contribute to the observed prevalence. Such areas were found to have high fasciola cases of about 5 to 6 in 10 animals slaughtered (i.e 50-60% prevalence), while drier areas of Kotieno, Konuon'ga, Kasimba and Kanyango have few cases of about 1 out of 10 animals. Fasciolosis incidences vary with changes in rainfall pattern and seasonality with high cases occurring during in the long rain season from April to June and few cases in drier months from October to January (Kithuka et al. 2002). The rains lead to seasonal stagnation of water that creates grounds for snail survival and thus fasciolosis (Kithuka *et al.*, 2002). Generally there is a reduction in fasciola prevalence per year as seen in figure 1 and this is reflected on the economic losses per year as indicated in figure 2. This might be due to control measures instituted by farmers facilitated by resources committed by KENTTEC.

Other contributing factor is level of education. Seventy five percent of farmers had attained secondary education and below and keep larger flocks with poor management. It was alarming that 20% of participants did not deworm their livestock. Strategic antehelmintic treatment is a major control method (Hansen and Perry 1994). Some farmers even use natural herbs that are not flukicidal. The prevalence obtained is slightly higher than that obtained for Nyanza province of 8% reported by Kithuka, et al. (2002). There was fluctuation in fasciolosis incidence in this place with 2013 recording the least figure of 16.78% while 2010 recording the highest.

Extensive grazing is a factor that perpetuates and exacerbates effects of fasciolosis in this region. The study indicated that 72.5% of participants practice extensive and interactive grazing and this probably leads to the spread of fasciolosis in this area. This concurs with findings of other studies as reported by Bauni *et al., (*2009).

CONCLUSION

In conclusion, Fasciolosis is a major threat to livestock industry in the study area and efforts should be made to combine all possible methods of control to ensure that the current high prevalence is curbed. The prevalence of Fasciolosis in Rachuonyo south sub county is mainly due to *Fasciola gigantica* that induce pathology and economic losses due to liver condemnation. Its occurrence is linked to the suitable climatic conditions, presence of snails that are the intermediate host and reluctance by some farmers to control this disease due to its chronic nature.

RECOMMENDATION

In order to reduce losses attributable to this disease, strategic antelmintic treatment should be done, control of snails using molluscicides, practice drainage, fencing off swampy areas and to ensure that all farmers are educated and participate in control of fasciolosis to avoid shading of eggs in grazing lands. This will ensure proper control of the disease in the long run.

REFFERENCES

Atnafe,Melaku (2012): Bovine fasciolosis in Ginnir District:Prevalence and Susceptability to commonly used Antelmintics, **J.Vet.Adv.;2(11):539-543**.

Bonita and Taira 1996.: Fecal examination of fasciola eggs fixed with formalin solution using Beads technique**:** ***Veterinary Parasitology***:**67(3):1996,269-271**

Brunsdon (1976).:Liver fluke Fasciola hepatica in sheep and cattle in New Zealand and its control**:** ***New Zealand Veterinary Journal***, **volume 15,issue 1-2,pp 9-23**.

Camilla Graham (2011): ***Oxford Journals: Medicine and Health***: Clinical infectious diseases 33(1).p15

George Mitchell (2002): Update on fasciolosis in cattle and sheep: Journal of the British Veterinary Association:***Farm Animal Practice***.In practice **2002;24(7):378-385**.

Hansen and Perry (1994). Epidermiology and control of helminth parasites in ruminants, second edition. A publication for the international Laboratory for Research on Animal Diseases (ILRAD),Nairobi,Kenya.p43.

Ibrahim et al :(2009) Prevalence and economic importance due to liver condemnation at Kambolcha industrial abattoir, Ethiopia: ***The Internet Journal of Veterinary Medicine*.:8(2)**

Junquera (2007): Liver fluke, *Fasciola hepatica*, Parasites of cattle sheep goats and other livestock,Dogs and Cats .Biology,prevention and control:***PARASITIPEDIA.net*** :

Kanyari P. (2009): Prevalence and Intensity of endoparasites in small Ruminants kept by farmers in Kisumu Municipality,Kenya*:* ***Livestock Research for Rural Development*21(11)**.

Keyyu J. D, Monrad J, Kyvsgaard N.C and Kassuku A.A (2005). Epidemiology of *Fasciola gigantica* and Amphistomes in cattle on traditional, small scale and large scale dairy farms in the southern highlands of Tanzania. ***Tropical Animal Health Production***,**37**: 303-314.

Kithuka J.M, Maingi N, Njeru F.M, Ombui J.N (2002): The prevalence and economic importance of bovine fasciolosis in Kenya:An analysis of abattoir data, ***Onderstepoot J vet Res***,., **69(4):** 255-61.

Leticia (2013): Sub acute and Acute fasciolosis in sheep in southern Brazil: ***Parasitology Research*****: 112(2) pp883-887.**

Maria Adrien et al (2013): Acute fasciolosis in cattle in Southern Brazil: Psesq.Vet.Bras.**vol.33 no. 6 Rio de Janairo.**

Mark Robinson (2011):Afamily of Helminth Molecules that modulate innate cell rtesponses via molecular mimicry of host Antimicrobial Peptides: ***PLoS Pathog.2011 May 7(5):e1002042***

Mas-Coma S. and Bargues M. D (1997). Human liver fluke. A review. ***Res Rev Parasit;*** **57: 145-218**

Mugumbe E. O *et al.*, (2009). A cross sectional survey on fasciolosis in Taveta Division: A Report by KARI –Katumaini Research Centre, PO.Box 340-90100 Machakos, Kenya.

Mulugeta H.S *et al.*(1989). -the significance of helmintic parasite in livestock production ;In: the proceedings of the third livestock improvement conference held in May 26-24, Addis Ababa,Ethiopia**. p34**.

Mushin Kaya (2011): Clinical Presentation and management of Fasciola hepatica infection:single-centre experience.***World Gastroenterol*****: 17(44)4899-49045**

NebyouMoje (2014):Cross-sectional study on bovinefasciolosis:prevalence,coprological,abattoir survey and financial loss due to liver condemnation at Areka Municipal Abattoir,southern Ethiopia: ***Journal of veterinary Medicine and Animal Health*:7(1) pp 33-38**

Nonga :(2010): A slaughterhouse survey of liver lesions in slaughtered cattle, sheep and goats, at Arusha, Tanzania, ***Research Journal of Veterinary Sciences*,3;179-188**.

Pfukenyi: (2006): Epidermiological study Fasciola gigantic infections in cattle in the Highveld and lowveld communal grazing areas of Zimbabwe.***Onderstepoort J Vet Res***

Ralph et al (2008); Economic effects of fasciolosis on animal traction technology in Adamawa state Nigeria. ***Journal of applied sciences* 2008**;**8(7).** p1305

Sadjjadi et al (1997): Quantitative histopathology of liver and portal lymphnode in chronic,bovine fasciolosis: ***The Indian Journal of Animal Sciences*:67(4) pp**

Schweizer G.*et al*., (2005): Estimating financial losses due to bovine fasciola in Switzerland: ***Vet Rec*,157(7):** 188-93.

Seleha A.A, (1991). Liver fluke disease, epidemiology, economic importance and public Health importance:South Eastern Asian J.Trop Med Public Health, **22**:361-4.

Showcat Ahmed (2012):Prevalence of Gastrointestinal parasitic infections in sheep of Kashmir Village of India:***Veterinary world*.5(11)667-671**

Soulsby E.J.L (1986)-Helminthes, Arthropods, Protozoa of domesticated animals; seventh edition, Balliere, Tindal, London, UK,pp40-52

Vreni Jean Richard (2011);Prevalence of Fasciola gigantic infection in slaughtered animals in South Eastern Lake Chad area in relation to husbandry practices and seasonal water levels;*doi*;**10.1186/1746-6148-10-81**

Wikipedia (2014):*Journal of clinical microbiology* 45(2) p648-650