

Prevalence of Fasciola Gigantica in Cattle and Sheep Slaughtered at the Eldoret Slaughterhouse, Kenya

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ABSTRACT

Fasciolosis impact livestock production globally, particularly in Sub-Saharan Africa, necessitating studies to develop intervention strategies. The objectives of the current study were The main objective of the study was to determine the prevalence of Fasciola gigantica in cattle and sheep slaughtered at the Eldoret Slaughterhouse in Kenya with a null hypothesis of Ho1: There is no Fasciola gigantica in cattle and sheep slaughtered at the Eldoret Slaughterhouse in Kenya. The livestock traders are not aware of the nutritional depletion associated with fasciola and hydatid cyst. From 3rd May,2024 to 3rd June, 2024, a 30-day study was carried out at the Eldoret Slaughterhouse on cattle and sheep slaughtered. The study was carried out on a total of 479 cattle and 313 sheep which were examined in 30 days. The results at the slaughter house revealed a high Fasciola gigantica prevalence of 64.8% in cattle and 33.2% in sheep. There were higher detection rates in bile compared to faecal samples. In Conclusion there was high prevalence of fasciola gigantica and hydatid cyst in cattle compared to sheep. Recommendations include Implementing a comprehensive parasite control program, including regular deworming of livestock with effective fasciolicides. Improving pasture management to reduce the risk of Fasciola gigantica infection, such as fencing off wet areas and providing clean drinking water sources. Educating farmers on the lifecycle of Fasciola gigantica and preventive measures they can take to reduce infection rates in their herds and flocks. Conducting regular monitoring and surveillance of fasciolosis in livestock to track the effectiveness of control measures over time.

Keywords: Prevalence, Fasciola Gigantica

I. INTRODUCTION

Fasciolosis, commonly referred to as liver fluke disease, is caused by trematodes from the *Fasciola* genus, with *Fasciola gigantica* being the most widespread species worldwide. This parasite has a wide geographical distribution and affects various livestock such as cattle, sheep, goats, pigs, and camels (Ballweber, 2018). The prevalence and severity of these infections vary globally, with significant cases reported in North America, Asia, Australia, and Africa. *Fasciola gigantica* infections result in considerable losses in livestock due to the condemnation of infected organs, reduced meat and milk production, and lower overall production. The financial impact includes veterinary treatment costs and the diminished market value of infected livestock, particularly in regions where livestock farming is vital for income.

The lifecycle of *Fasciola* involves snails as intermediate hosts. Infected animals often show chronic or acute liver inflammation, bile duct damage, sub-mandibular oedema, anaemia, and general intoxication, which can lead to death. The affected livers are condemned during meat inspections (Price *et al.*, 1993). Economic losses from *Fasciola gigantica* infections, such as liver condemnation, are substantial (Behm, 1999). Liver, a highly nutritious organ rich in iron and proteins, is often condemned due to parasitic infections for aesthetic reasons and liver damage. Its price is generally higher than that of regular meat due to its nutritional value (Hosseini *et al.*, 2020). In the United States, while *Fasciola* infections in cattle are relatively rare, hydatidosis is occasionally reported in sheep and goats in South-Western states.

In Asia, *Fasciola gigantica* infections are prevalent in multiple domestic livestock in Iran, for instance, cattle and goats are commonly infected with hydatid cysts, and *Fasciola gigantica* infections in cattle and sheep are widespread. A study by Ahmadi *et al.* (2017) revealed significant economic losses due to organ condemnation. In India and Pakistan, buffaloes frequently suffer from *Fasciola* infections, causing

substantial losses in the dairy and meat industries. In Southeast Asia, regions where water buffaloes and goats are reared, the conditions provide an ideal environment for *Fasciola gigantica*, to significantly affect animal productivity (Thammasirirak *et al.*, 2016). Johnson *et al.* (2018) reported that although Australia has a well-regulated livestock industry with stringent veterinary controls, occasional outbreaks of *Fasciola gigantica* in cattle, sheep, and goats occur, particularly in the tropical northern regions.

In Africa, *Fasciola gigantica* and *Echinococcus granulosus* are endemic parasites, affecting not only cattle and sheep but other domestic animals also such as goats, pigs and camels. In Central Africa, *Echinococcus granulosus* are common in goats and pigs, leading to significant losses for smallholder farmers. Goats, essential for subsistence farming, suffer from reduced meat and milk production due to this infection. In Cameroon, Kalla *et al.* (2020) reported a high prevalence of *Echinococcus granulosus* in cattle and goats, contributing to economic losses from organ condemnation and decreased productivity.

In Sub-Saharan Africa, where livestock farming is crucial for many communities, the presence of *Fasciola gigantica* exacerbates poverty and food insecurity. In East Africa, economic losses attributed to *Fasciola gigantica* in livestock exceed USD 10 million annually (Fikire *et al.*, 2020). This region where pastoralism is prevalent, *Fasciola gigantica* and *Echinococcus granulosus* infections are widespread across various livestock species. In Ethiopia, for example, the highest prevalence of *Fasciola gigantica* in cattle, goats, and sheep, severely impacting the agricultural sector. A study by Fikire *et al.* (2020) revealed that *Echinococcus granulosus* is prevalent in camels, which are critical to pastoral communities in arid regions. In Tanzania, abattoirs report high levels of *Echinococcus granulosus* in goats and sheep, resulting in significant economic losses in the meat industry (Matemu *et al.*, 2018).

Kenya faces a significant challenge with parasitic infections among livestock, especially in its arid and semi-arid regions, where *Fasciola gigantica* and *Echinococcus granulosus* are common. These infections affect cattle, sheep, goats, camels and pigs. In counties such as Marsabit, Isiolo and Garissa, camels, which are vital to pastoral communities, often suffer from hydatid cysts, leading to reduced milk production and severe economic losses. Wanjala *et al.* (2019) found a high prevalence of *Fasciola gigantica* and *Echinococcus granulosus* in camels in Marsabit County, compounding the challenges faced by livestock farmers.

In Uasin Gishu County, *Fasciola gigantica* and *Echinococcus granulosus* infections are prevalent in cattle and sheep, as well as goats and pigs. The Eldoret Slaughterhouse, one of Kenya's largest, frequently reports organ condemnation due to parasitic infections. A study by Mutua *et al.* (2021) found hydatid cysts in 15% of goats and 18% of cattle, while *Fasciola gigantica* was present in 20% of cattle and 12% of sheep. These infections have led to significant economic losses due to the condemnation of affected organs and reduced production of meat and milk. The economic impact of parasitic infections in Uasin Gishu County extends beyond direct losses to farmers. The local economy, heavily reliant on livestock farming, is burdened by the reduced market value of infected animals, the costs of treating parasitic infections, and lost income from condemned organs. The presence of these parasites in multiple domestic animals exacerbates the financial strain on farmers and the broader meat value chain in the region.

II. MATERIALS AND METHODS

2.1. Study area

The study was carried out at the Eldoret Slaughterhouse, located in the City of Eldoret, Uasin Gishu County, Kenya. The City of Eldoret is the headquarters of Uasin Gishu County and a major livestock-trading hub in the North Rift region of

Kenya. Eldoret Slaughterhouse is situated just outside the City of Eldoret centre at Latitude 0°31'47.24"N and longitude 35°16'28.92"E off the Eldoret-Iten road as shown in Figure 3.1. The slaughterhouse handles 15-25 cattle and 12-30 sheep per day sourced from various farms and markets within the North Rift region which are composed of Uasin Gishu, Elgeyo Marakwet, Bomet, Turkana, West Pokot, Kericho and Trans-Nzoia County) and its neighbouring counties has a mixed climate, with parts classified as semi-arid, making it suitable for investigating *Fasciola gigantica* parasitic infection in livestock.

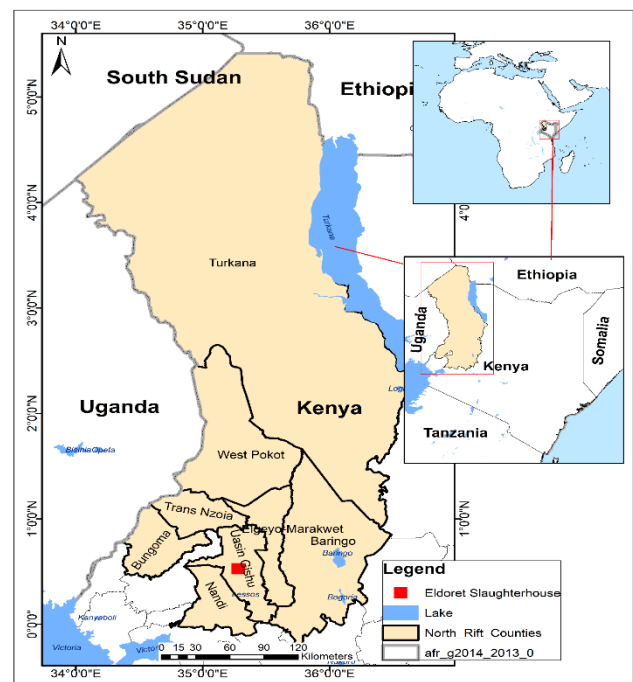


Figure 3.1: Map of the study area showing location of North Rift counties and Eldoret slaughterhouse.

2.2. Study design

The study employed mixed method approach taking experimental research design.

2.3. Study population

The study population included all cattle and sheep slaughtered at the Eldoret Slaughterhouse over a span of 30 days Slaughterhouse from 4th May to 4th June, 2024. The animals were of both sexes and different ages, originating from different farms in Uasin Gishu County and neighbouring Counties. All the 479 cattle

and 313 sheep slaughtered during the study period were e

2.4. Data Analysis

2.4.1. Prevalence estimation

Data was analysed in Statistical Package for Social Sciences (SPSS version 21). Descriptive statistics such as frequencies, percentages, and means were used to analysis the data on the prevalence of parasites and financial losses. The prevalence of *Fasciola gigantica* and hydatid cysts was calculated as the proportion of infected cattle and sheep over the total number of animals slaughtered. Prevalence was calculated separately for *Fasciola gigantica* and hydatid cysts, as well as for each species (cattle and sheep). The formula for prevalence was:

$$\text{Prevalence} = \frac{\text{Number of infected animals}}{\text{Total number of animals slaughtered}} \times 100$$

Inferential statistics were employed to explore relationships between variables. Chi-square tests were used to assess the significance of differences in prevalence rates between cattle and sheep. Correlations were tested using Spearman’s rank correlations. Descriptive Statistic was obtained from the analysis of the data from the interviews and questionnaires, and results were presented using tables, graphs, pie-charts etc. as appropriate.

2.5. Ethical Considerations

Permission was sought from the Eldoret Slaughterhouse management to conduct post-mortem examinations on the livestock. Ethical clearance was obtained from county director of veterinary services Uasin Gishu county ensuring that animal welfare standards were maintained throughout the study.

III.FINDINGS, INTERPRETATION AND DISCUSSION

3.1. Prevalence of *Fasciola gigantica* in cattle

There were four hundred and seventy-nine (479) head of cattle slaughtered during the period of study from May to June 2024. The average egg count of bile per herd of cattle was 207.13±39.7 SE fasciola eggs per 10 mils while the average faecal egg count per sample 61.67±8.48 SE per 3grams of faeces. Out of 479 head of cattle 187(39.03%) had *Fasciola gigantica* eggs in the bile while 93(19.41%) had in the faecal. 95(19.83%) livers were condemned and trimmed65 (13.5%) There is no correlation between the bile and faecal samples of cattle *Fasciola gigantica* eggs. but the correlation between the numbers of livers verses the bile there is a correlation due some factors, the parasite is hermorpharadites they lay eggs by themselves, the eggs lays are not uniformly and they lay once a time .as illustrated in Figure 4.1. The bile was found to have more fasciola eggs than in the faeces due to several factors related to the lifecycle of Fasciola since the parasite releases its eggs directly in to the bile. The bile receives eggs after they have passed through the digestive system then Eggs transit to faeces during these transit some eggs may be destroyed, get trapped or not reach the faeces in detectable quantities. There was a significant difference in prevalence levels recorded in bile and faeces ($\chi^2=6.8479$, df. =1, p=0.0089).

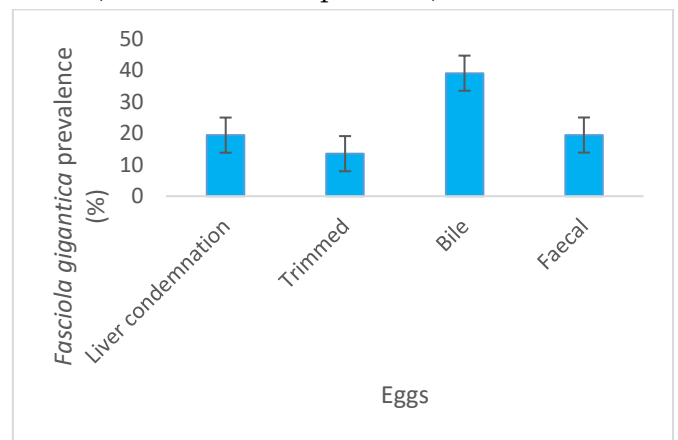


Figure 3.1: Prevalence of *Fasciola gigantica* in cattle slaughtered at the Eldoret Slaughterhouse



Figure 3.2: Photo of liver with *Fasciola gigantica*



Figure 3.3: Photo of *Fasciola gigantica* under microscope

To determine if there was a relationship between the number of eggs in bile and faeces, the correlation coefficient was calculated. The correlation coefficient between bile egg counts and faecal egg counts was -0.0018 , with a p-value of 0.9788 , indicating no significant ($P \geq 0.05$) relationship between bile egg counts and faecal egg counts.

3.2. Prevalence of *Fasciola gigantica* in sheep slaughtered at the Eldoret Slaughterhouse

Three hundred and thirteen (313) sheep were slaughtered during the period of the study. The

identification of *Fasciola gigantica* eggs in the bile and faeces of sheep using sedimentation technique. The average egg count of bile per herds of sheep was 31.2332 fasciola egg per 5mils while the average faecal eggs count per sample per 3gram faeces. Out of 313 herds of sheep 78 (24.92%) had fasciola eggs in the bile while faecal forty-six 46(14.69%) faeces. 37(11.82%)Livers condemned and 13 (4.15%) were trimmed due to fasciola gigantica .as illustrated in Figure 4.2. There was no significant($P \geq 0.05$) difference in prevalence levels recorded between eggs in bile and faecal.

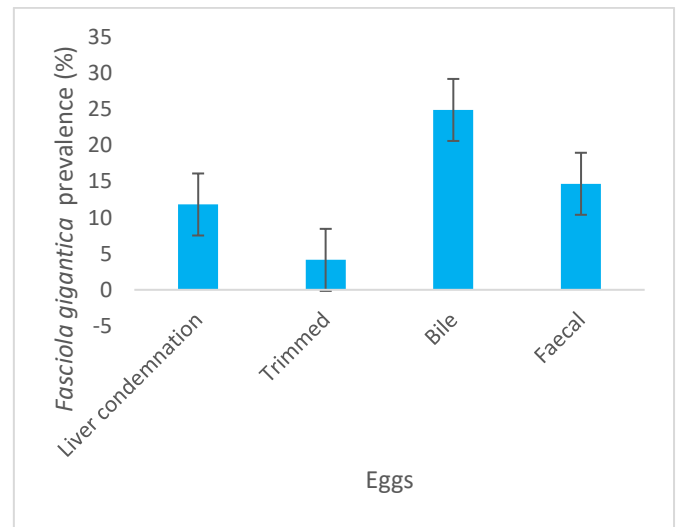


Figure 3.2: Prevalence of *Fasciola gigantica* in sheep slaughtered at the Eldoret Slaughterhouse

The Spearman rank correlation analysis between *Fasciola gigantica* egg counts in sheep bile and faeces slaughtered at the Eldoret Slaughterhouse revealed a moderate inverse relationship with a correlation coefficient of -0.3201 with a p value of 0.0012 indicating that as the number of eggs in bile increased, the number of eggs in faecal samples tended to decrease and vice versa. This gave a low coefficient of determination of 0.104 , which implied that the correlation cannot be reliable for any prediction.

3.3. Other pathological findings

Other pathological findings were infectious necrotic hepatitis, abscesses, tumours, fibrosis, oedema and hematoma in the animals examined. Out of four

hundred and seventy-nine (479 herds of cattle and 313 sheep examined, twenty-one ((15)) were found to have other pathological conditions. The Infectious necrotic hepatitis had affected 0.63% of the cattle, with 1.25% having abscesses, 0.42% having fibrosis in their sampled livers while 0.42% and 0.21% had lungs and hearts with abscesses as illustrated in Table 4.3.

For the three hundred and thirteen sheep (313) examined, six (6) (0.32%) had their livers affected by Infectious necrotic hepatitis and Abscesses. Oedema and Fibrosis was recorded in the lungs of the 0.32% of the sheep examined while a similar proportion was recorded in the hearts with abscesses as summarised in Table 4.3.

Table 4.3: Other pathological finds

Ungulate	Organ affected	Pathology	Number of affected organs	Proportion of animals affected (%)
Cattle	Liver	Infectious necrotic hepatitis	3	0.63
		Abscesses	6	1.25
		Tumor	2	0.42
		Fibrosis	1	0.21
sheep	Lung	Abscesses	2	0.42
	Heart	Abscesses	1	0.21
	Liver	Infectious necrotic hepatitis	1	0.32
		Abscesses	1	0.32
		Lung	Oedema	1
		Fibrosis	1	0.32
	Heart	Abscesses	1	0.32
	Kidney	Hematoma	1	0.32

The prevalence of *Fasciola gigantica* in cattle at the Eldoret Slaughterhouse indicated a significant parasitic burden, with notably higher prevalence detected in bile compared to faeces. In the study, the prevalence rate was (39.03%) of the eggs in bile having fasciolosis eggs and (19.41%) in faecal samples. These results align with the biological characteristics of *Fasciola gigantica*, which predominantly resides in the bile ducts of the liver. Consequently, bile samples tended to show higher egg counts compared to faecal samples. Both studies corroborate our finding that bile samples were more effective in detecting *Fasciola* species in cattle than faecal samples, underscoring the general principle that bile serves as a more reliable sample for diagnosis than faeces.

The prevalence of fasciolosis at the Eldoret Slaughterhouse showed elevated infection rates of

[insert your specific rate, which can be linked to the presence of local swamps and wetlands that support the intermediate snail hosts. This rate is [higher/lower/comparable] to the findings of Mungube et al. (2019), who observed *Fasciola gigantica* infection rates ranging between 45% and 60% in areas where cattle grazed in wetlands.

The environmental factors noted in both our study and Mungube et al.'s reinforce the notion that grazing in wetland areas creates a higher risk for cattle to contract fasciolosis due to the thriving populations of intermediate hosts like *Lymnaea* snails. Our findings at the Eldoret Slaughterhouse, where cattle from Uasin Gishu and neighbouring counties primarily graze in swampy areas, with Mungube et al.'s observations, fostering an environment conducive to the life cycle of *Fasciola gigantica*. The study also

found no significant correlation between bile and faecal egg counts for *Fasciola gigantica*. This lack of correlation implies that bile egg counts are not predictive of faecal egg counts, a finding consistent with Mungube *et al.* (2019), who noted variability between these measures and recommended bile as a more reliable indicator of infection levels. Omega *et al.* (1998) and Ahmed *et al.* (2020) also reported no significant correlation, attributing it to the irregular nature of egg shedding by the gall bladder into the intestines, leading to uneven distribution of the eggs in the faeces. Ayana *et al.* (2021) supported this view, emphasizing the need for multiple diagnostic approaches to accurately assess infection prevalence and confirming that bile provides a more accurate measure of parasite burden.

The examination of *Fasciola gigantica* prevalence in sheep at the Eldoret Slaughterhouse also reveals significant findings, with higher prevalence detected in bile (24.92%) compared to faecal samples (14.69%). This pattern is consistent with the parasite's biological behaviour, as *Fasciola gigantica* predominantly resides in the liver, leading to these eggs being laid in the bile duct of the host liver. They can be found in bile, which is secreted into the intestine and faecal eggs were excreted via faeces after passing through the intestine hence these leads to higher concentrations of eggs in bile.

A study by Ayele *et al.* (2021) conducted in Ethiopia reported a prevalence rate of *Fasciola* infection in bile samples at 38%, compared to a much lower prevalence of 21% in faecal samples. The higher rate in bile samples was attributed to the concentration of the parasite in the liver and bile ducts, which made bile a more accurate medium for detecting the infection. Similarly, Mungube *et al.* (2022) in Kenya found a prevalence of 42% in bile samples, significantly higher than the 25% prevalence observed in faecal samples. The study highlighted the challenges of using faecal egg counts due to variability in egg excretion, whereas bile samples provided a more consistent indication of infection levels. These findings reinforce the

prevalence trends observed in the Eldoret Slaughterhouse, where the higher detection rate in bile samples can be attributed to similar factors of parasite concentration in the liver.

In contrast, Zewdu *et al.* (2023) in Tanzania observed a pronounced difference between bile and faecal samples, with bile showing a significantly higher infection rate of 47%, compared to 18% in faecal samples. Their study emphasized the importance of using bile for accurate diagnosis due to the higher concentration of *Fasciola gigantica* in the liver and bile ducts, which leads to more reliable detection compared to faecal samples, where egg excretion can be inconsistent.

However, Zewdu *et al.* (2023) also noted that regional variations, influenced by local environmental and management conditions, play a critical role in shaping prevalence rates. Factors such as grazing patterns, the presence of wetlands, and the management of livestock contribute to differences in infection rates between regions. This variability underscores the complex interaction of local factors, such as climate and livestock practices, in determining the prevalence and detection efficiency of *Fasciola gigantica*. These findings further highlight the importance of considering environmental and regional influences when assessing infection prevalence, similar to the high prevalence observed in the Eldoret Slaughterhouse, where local wetland conditions favoured the transmission of the parasite.

The Spearman rank correlation analysis from this study revealed a moderate inverse relationship between bile and faecal egg counts in sheep. This indicates that as the number of eggs in bile increased, the number of eggs in faecal samples tended to decrease, suggesting irregular shedding of eggs into faeces. Similar findings were reported by Ayele *et al.* (2021), who also found an inverse relationship, reinforcing the idea that bile offers a more consistent reflection of infection compared to faecal counts. Mungube *et al.* (2022) observed similar variability,

further supporting the reliability of bile samples in assessing infection levels.

IV. CONCLUSION

In conclusion, the prevalence of fasciolosis in cattle by observation of the parasites in the livers was 62.84%, while the prevalence of fasciolosis in sheep by observation of the parasites in the livers was 33.22%. Similarly, there was no significant correlation between parasite numbers, eggs in bile, and eggs in faeces in cattle. Additionally, there was a moderate inverse relationship between egg counts in bile and faecal samples in sheep.

V. RECOMMENDATIONS

Taking cognizance of the prevalence of fasciolosis obtained and given the high prevalence of fasciolosis in cattle (62.84%) and sheep (33.22%) at the Eldoret Slaughterhouse, we recommend:

- i. Implementing a comprehensive parasite control program, including regular deworming of livestock with effective fasciolicides.
- ii. Improving pasture management to reduce the risk of *Fasciola gigantica* infection, such as fencing off wet areas and providing clean drinking water sources.
- iii. Educating farmers on the lifecycle of *Fasciola gigantica* and preventive measures they can take to reduce infection rates in their herds and flocks.
- iv. Conducting regular monitoring and surveillance of fasciolosis in livestock to track the effectiveness of control measures over time.

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