

**INTERNATIONAL JOURNAL OF SCIENCE FOR GLOBAL SUSTAINABILITY****Prevalence of *Fasciola* species from Cattle Slaughtered at Birnin Kebbi Modern Abattoir****¹Kabiru Zaki, *¹Aliyu Mahmuda, ²Yusuf Yakubu, ¹Aminu Alhaji Mohammed, ¹Musibau Olayinka Alayande ¹Mohammed Dalhatu Lawal, ¹Mahmud Usman and ¹Abdulwahab Habibullah Olabisi**¹Department of Parasitology and Entomology, ²Department of Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto, Nigeria*Corresponding Author's E-mail: alibadra1213@gmail.com

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ABSTRACT

Diagnostic tools to detect and differentiate *Fasciola* species have improved, but the understanding of the distribution and population structure of this parasite is location dependent. This study was aimed to phenotypically identify *Fasciola* species from cattle brought for slaughter at Birnin Kebbi Modern Abattoir. Ante-mortem faecal samples were collected from the sampled cattle for worm egg detection and post-mortem inspection of liver samples were performed. Two methods of Parasitological (Flukefinder Kit and formalin-ether sedimentation) methods were performed on the faecal samples. Results have yielded a high prevalence (31.2%) of fluke eggs with the Flukefinder Kit than with formalin-ether sedimentation technique (8.5%). Prevalence was higher (34%) in the males than in female (26.2%) cattle. Younger cattle (34.3%) were also more infected than their older (30.7%) counterpart. Sokoto Gudali had the highest prevalence of 44.0% followed by Red Bororo with 34.0%, and the least prevalence was observed in Bunaji breed with 18.0%. Statistical analyses results had revealed no significant relation between prevalence of fasciolosis and the co-variables (sex, age) as $p > 0.05$ but there was a significant association between prevalence and breed of cattle ($p = 0.018$). There was no significant agreement between the methods of faecal analyses used. Prevalence of 15.8% was observed from the post-mortem examination. This have increased the knowledge about the existence of the parasite in the study area. It is recommended that the Flukefinder® Kit should be used in diagnosis of *Fasciola* species due to its high sensitivity compared to the conventional sedimentation method.

Keywords: *Fasciola* species; Slaughtered Cattle; Prevalence; Birnin Kebbi; Modern Abattoir.**1.0 INTRODUCTION****1.1 Background Information**

Fasciolosis is one of the major helminthic disease of ruminants caused by *Fasciola* species with an estimated prevalence range between 50-80% in tropical countries (Chongmobmi and Panda, 2018). Although, it is not possible to quantify exactly the economic losses caused by *Fasciola* infection in cattle, it is known that it constitutes one of the principal causes of poor performance in many areas (Elelu and Eisler, 2018; Fasseha and Asefa, 2022). Ruminants' populations are one of the most important assets possessed by many parts of the tropics. These animals provide valuable animal protein for human consumption and occupation for several families in form of livestock trade (Masoud *et al.*, 2020).

1.2 Disease Development and Relevance

Fasciolosis is a fluke infection of cattle, whose larval stages develop in a molluscan (snail) intermediate host (Addy *et al.*, 2020). Subclinical infections are more dangerous as they are unrecognized by breeders and drain immensely the productivity of farm livestock, and retard growth in the young (Akinaw, 2021). Fasciolosis is a subclinical disease presenting with herd- or flock-level production losses rather than the clinical signs in individual animals (Howell *et al.*, 2020; Howell, 2023). Frigerio *et al.* (2020) reported lower weight of carcasses from infected animals and liver condemnation at post-mortem which leads to substantial visible economic losses.

1.3 Justification of the Study

Kebbi State is one of the major livestock producers in Nigeria with an estimation of 1.8

million cattle. These animals serve as sources of meat, milk, work and contribute manure for crop production (MAHF&H, 2018). Fasciolosis causes significant economic losses to global agriculture (Mirahmadi *et al.*, 2018). The presence of water bodies (rivers, lakes etc) and wetland (*fadama*) areas in the State makes cattle at risk of acquiring *Fasciola* infections. There is need for information on the available *Fasciola* species prevalent in the study area which will be helpful for designing and implementation of more effective control action plan against fasciolosis.

2.0 MATERIALS AND METHODS

2.1 Study Area

Kebbi State is located between the latitude 10° and 30° North and longitude 3° and 6° East. It shares international borders with the Republic of Benin and the Republic of Niger to the West and internal borders with Sokoto and Zamfara State on the North, and Niger State to the South. The state occupies approximately 36, 800 square kilometers. Over 75% of the human populations reside in rural areas with farming as their major occupation. Kebbi State is one of the major livestock producers in Nigeria with an estimation of 1.8 million cattle, 2.2 million sheep, 2.8 million goats, 50,000 camels and 200,000 donkeys (MAHF&H, 2018).

2.2 Sample Collection and Transportation

Fresh faecal samples were collected from the rectum of each sampled cattle before slaughter using a gloved hand. The sampled cattle were followed until slaughtered and were examined at meat inspection for post-mortem examination of their liver samples. The samples of the liver were thoroughly examined to check for the possible tracts of fluke migration in the liver and or presence of adult *Fasciola* species in the bile ducts. Both adult fluke and faecal samples (20 grams) of the corresponding slaughtered cattle were then placed in a plastic container and were transported on ice to the Veterinary Parasitology and Entomology Laboratory, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto for processing and identification.

2.3 Parasitological Examinations

All faecal samples were subjected to parasitological examination using two different concentration methods (Formalin-ether

sedimentation technique and Flukefinder® Kit.) for detection of Fluke eggs.

2.4 Statistical Analyses

Chi Square test was used to determine the association of the variables (sex, age and breed) with *Fasciola* infection. *Cohen's Kappa* was used to determine agreement between formalin-ether sedimentation technique and Flukefinder® kit used in detection of fluke eggs. The value of $p < 0.05$ was considered significant in the studies and statistical software InvivoStat version 3.7 was used for the statistical analyses.

2.5 Flukefinder® Kit Information

Flukefinder® kit was used widely and is considered highly sensitive and specific compared to other faecal egg detection methods, it was found to have 92.7% sensitivity and 94.9% specificity (Faria *et al.*, 2008; Zarate-Kendon *et al.*, 2019).

3.0 RESULTS

3.1 Parasitological Prevalence of Fluke Infection (Ante-mortem)

Out of 234 faecal samples examined for the presence of fluke eggs using Flukefinder® Kit, it was found that 73 were positive which constituted a prevalence of about 31.2% while 8.5% (20/234) prevalence was observed using formalin-ether sedimentation technique. A total of 51 males were positive with a higher prevalence of 34% (51/150). On the other hand, a 26.2% (22/84) prevalence rate was recorded for the females (Table 1). There was no statistically significant association between the prevalence and the sex of cattle ($p = 0.27$).

The age specific prevalence of flukes revealed that young cattle (<4 years) had higher prevalence of 34.3% (12/35) while older cattle (>4 years) had lower prevalence of 30.7% (61/199). There was no statistically significant association between the prevalence and age of cattle as $p = 0.961$ (Table 2). The breed specific prevalence of flukes showed that Sokoto Gudali had the highest prevalence of 44.0% followed by Red Bororo (34.0%), White Fulani (29.2%), Rahaji (22.2%), and the least is Bunaji (18.0%), but there is statistically significant association between the prevalence and breeds as $p = 0.018$ (Table 3).

3.2 Prevalence of *Fasciola* Infection (Post-mortem)

At post-mortem examination, 37 (15.8%) of 234 cattle sampled had shown visible signs of fluke migratory tracts and presence of adult fluke in the bile ducts.

3.3 Comparison of Diagnostic Agreement between Flukefinder® Kit and Formalin-ether Sedimentation Technique

The two methods of faecal examination yielded different prevalence rates. The Flukefinder® kit had a prevalence of 31.2% (73/234) while the formalin-ether sedimentation method had a prevalence of 8.5% (20/234). The Kappa test for agreement had expressed that there was no statistically significant agreement between the Flukefinder® kit and formalin-ether sedimentation technique as $K = 0.143$ (Table 4).

Table 1: Univariable Analysis (Chi-square) Between Fasciolosis and Sex of Cattle Slaughtered at Birnin Kebbi Modern Abattoir.

Variable	Number positive	Number negative	Total (N=234)	Prevalence (%)
Male	51	99	150	34
Female	22	62	84	26.2
Total	73	161	234	31.2

$\chi^2 = 0.170$; $p = 0.27$

Table 2: Univariable Analysis (Chi Square) of Fasciolosis with Age of Cattle Slaughtered at Birnin Kebbi Modern Abattoir.

Variable	Number positive	Number negative	Total (N=234)	Prevalence (%)
Old (≥ 4 years)	61	138	199	30.7
Young (<4years)	12	23	35	34.3
Total	73	161	234	31.2

$\chi^2 = 0.9619$; $p = 0.961$

Table 3: Univariable analysis (Chi-square) Between Fasciolosis with Breeds of Cattle Slaughtered at Birnin Kebbi Modern Abattoir.

Breed	Number of Samples	Number Positive	Prevalence (%)
Bunaji	61	11	18.0
Rahaji	27	6	22.2
Sokoto Gudali	75	33	44.0
Red Bororo	47	16	34.0
White Fulani	24	7	29.2
Total	234	73	31.2

$\chi^2 = 11.89$; $p = 0.018$

Table 4: Kappa Analysis for Agreement Test between the Flukefinder® Kit and Formalin-ether Sedimentation Techniques of Faecal Analyses.

Tests		Flukefinder® Kit		Total
		N	P	
Formalin-Ether Sedimentation	N	153	61	214
	P	8	12	20 (8.5%)
Total		161	73 (31.2%)	234

$K = 0.143$, $p = 0.004$; N = negative; P = positive

4.0 DISCUSSION

The prevalence rates of fasciolosis in cattle in the present study was observed to be 8.5% and 31.2% for both parasitological methods used. Several other studies have reported different prevalence

rates for different countries. Adane *et al.* (2019) reported 16.6% in Ethiopia. Rizwan *et al.* (2021) reported 21.3% in Pakistan. Masoud *et al.* (2020) reported 21% in Iran. These similarities and differences could be as a result of different

geographical locations or different diagnostic methods used. Kwok and Buxbaum (2019) suggested that differences and similarities in prevalence of fasciolosis may be due to either system of management, agro-ecological difference and long exposure time.

The prevalence rate using post-mortem inspection of lesions in the liver and or presence of adult flukes in the bile ducts has been observed to be at a lower rate of 15.8%. Several other studies have reported different prevalence rates using post-mortem examination in different countries. Ahmed *et al.* (2020) recorded 15% from Zamfara State, Nigeria. Nwankwo *et al.* (2019) reported 24%, Nsukka, Nigeria. Nesreldin and Zaki (2020) reported 16.81% in Egypt. Animals with no detectable lesions and adult flukes in the liver might have been at their early stage of invasion with immature flukes as have been previously documented (Adamu *et al.*, 2019). This may also be due to butchers' lack of cooperation to perform thorough inspection of the cattle liver, especially when it involves deep incisions into the samples.

Although higher prevalence was observed in the males than in the females. There was no statistically significant association observed on the prevalence among animals of different sex in this study. This result is similar with the results of several other studies (Kusumarini *et al.*, 2020) who also reported statistically insignificant association between prevalence and sex and concluded that *Fasciola* infections have no sex predisposition. The findings by Nagwa and Wafaa (2017) reported that bulls are usually brought to the Abattoir for slaughter than cows which is in the tradition of cattle producers in many locations.

Although prevalence was also observed to be higher in younger cattle (less than 4 years) than in the old cattle (greater than 4 years). The infection rate in different age categories of the cattle showed no statistical significance ($p > 0.05$). This result is similar with the findings of Kheirandish *et al.* (2016) who also reported statistically insignificant association between prevalence and age and reported that *Fasciola* infections have no age predisposition. Opio *et al.* (2020) have reported higher prevalence of 65.7% of *Fasciola* spp in older cattle in Ethiopia which was contrary to the findings in the present study.

The authors however, suggested that higher number of older cattle were sampled in their study than the young.

Although prevalence was observed to be higher in Sokoto Gudali than in any other breed, while there was statistically significant association observed between prevalence and breeds of cattle slaughtered. Sokoto Gudali breed is more at risk of *Fasciola* infection than the other breeds ($p < 0.05$). The results also concur with the report of Zalizar *et al.* (2021) who also documented statistically significant association between prevalence and breed of cattle slaughtered and concluded that differences in cattle breed had correlation with susceptibility towards *Fasciola* infections. It is also a likelihood that the Sokoto Gudali could have been more exposed to contaminated pasture than the other breeds.

The results of the present study have established a higher prevalence using parasitological methods of diagnosis. However, the prevalence was observed to be higher with Flukefinder® Kit (31.2%) compared to the conventional formalin-ether sedimentation technique (8.5%). This difference in prevalence report could be explained by the different parasitological techniques used. The lower prevalence of fluke egg detection reported using the formalin-ether sedimentation technique indicates the less sensitivity of the test in detecting the presence of the infection. Although there was no agreement between the two methods, the higher prevalence reported using the Flukefinder® Kit indicates the high sensitivity of the kit (Reigate *et al.*, 2021). This indicates the high efficiency of the Flukefinder® Kit over the conventional sedimentation method. Zarate-Kendon *et al.* (2019) have also reported high effectiveness of the Flukefinder® kit as compared with the other parasitological methods in fluke egg detection which concur with the findings of this study.

5.0 CONCLUSION

Prevalence of fluke eggs was found to be 31.2%. Flukefinder® kit was found to be more efficient in fluke egg detection than the formalin-ether sedimentation method. No statistically significant relation was observed between prevalence of fasciolosis and the co-variables (sex, age) as $p > 0.05$ but there was a significant association between prevalence and breed of cattle ($p = 0.018$).

6.0 RECOMMENDATIONS

The need for a deeper investigation comparing *Fasciola* isolates from other livestock is also necessary to determine the species in circulation among animals. The results from Abattoir should be interpreted with caution or whole liver samples should be purchased to have a reliable post-mortem prevalence results in further studies.

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