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Research Article

DISTRIBUTION OF *FASCIOLA GIGANTICA* IN CATTLE SLAUGHTERED IN MAN ABATTOIR, WESTERN OF CÔTE D'IVOIRE

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ABSTRACT. A study was carried out in 2023 to examine for infection with *Fasciola* spp. during the routine inspection of the meat of 630 cattle that were slaughtered at the abattoir in Man.This study aimed to provide the first data on *Fasciola gigantica* in cattle from the Man abattoir. Out of the 630 cattle examined, 171 (27.1%) were males and 459 (72.9) were females. The results showed that out of 630 cattle examined at post mortem, 19.4% (122) were positive for fasciolosis. *F. gigantica* prevalence was 18.9% and 20.5% in females and males, respectively. Young cattle (2-4 years) were more contaminated (22.1%). There was no statistically significant association between infection and age and between infection and sex of the cattle sampled ($P > 0.05$). Animals slaughtered during rainy season were most infected (25.8%, n=85) than those slaughtered in dry season (12.3%, n=37). From all infected animals (n=122), 42.62% (n=52) were classified as lightly infected (≤20 flukes), 31.14% (n =38) as moderately infected with 20-50 flukes and 26.23% (n=32) as heavily infected with more than 50 flukes per animal. The present study showed that *F. gigantica* existed among the infected ruminants in Man abattoir. Animals slaughtered during the rainy season must need to be specially inspected, as contamination is higher during this period.

Keywords: *Fasciolosis, cattle, prevalence, Man abattoir.*

INTRODUCTION

Fasciolosis is a zoonotic parasitic disease considered to be the most dangerous disease of domestic ruminants in Africa from a health and economic point of view [1]. *Fasciola* is commonly recognized as liver flukes and they are responsible for widespread of morbidity and mortality in cattle characterised by weight loss, anaemia and hypoproteinemia, reduced production of meat, milk, and wool, and expenditure for anthelmintics treatment [2]. *Fasciola* contamination of meat causes economic losses in slaughterhouses. In Ethiopia, financial losses were estimated at 106,400 Ethopian birr (8312.5 USD). In Algeria and Nigeria, the loss was estimated at one million Algerian dina (7401.97 USD) and 237,600 Naira (609.23 USD) respectively. There are two

Fasciola species; namely *Fasciola hepatica* and *Fasciola gigantica*. Fascioliasis is endemic in West Africa with the predominant species being *F. gigantica* [1]. It occurs abundantly in wetland pastures where the life cycle of the parasite is facilitated by intermediate host molluscs *Lymnaea natalensis*. Bovine fasciolosis caused by *F. gigantica* occurs enzootically in several African countries. The prevalence of fasciolosis in cattle in many parts of the Africa has been reviewed. Prevalence rates of 24% in Nigeria; 44.1% in Guinea; 28.4-63.8% in Tanzania; 33% in Cameroon, has been reported [3-6].

In Côte d'Ivoire several studies have reported the presence of *F. gigantica* in cattle and other animal species. The first case of bovine *Fasciola* was reported in Côte d'Ivoire in 1950 in "Taurin" farms in the north of the country [7]. In 2018, a cross-sectional survey was carried out in 13 departments in the North, Centre and West of Côte d'Ivoire on cattle at the abattoir and cattle on farms. The results showed that the overall *F. gigantica* infection rate was 19.7% for cattle at the abattoir and 29.5% for cattle encountered on farms. [8]. In addition, recent studies by Traoré et al. [9] carried out in the Savanes district (Northern Côte d'Ivoire) revealed a prevalence of 45.5% in animals. Moreover, the findings of Kouadio et al. [10] reported 6.22% of infection by *Fasciola*.

Seizures of cattle meat due to Fascioliasis are significant in slaughterhouses, which constitutes a huge loss for cattle butcher. The Man abattoir is considered to be the largest slaughterhouse in Tonkpi, receiving cattle from various breeding areas and controlled by the municipal veterinary service. However, data on zoonotic diseases, especially *Fasciola*, in slaughtered cattle are scarce in the literature.

The objective of the present study was to provide the first data on *Fasciola* in cattle from the Man abattoir.

MATERIALS AND METHODS

Collection of Samples and Examination for Parasites

This study was carried out at the Man abattoir. The department of Man is located in the west of Côte d'Ivoire between 7°24'45"North and 7°33'13" West. The climate of the region is subequatorial. This climate is characterized by two seasons, a rainy season (April to October) and a dry season (November to March). The average annual rainfall is 1632 mm and the average annual temperature varies around 25°C [11].

In this study, the post-mortem investigation was carried out by examining 630 cattle slaughtered at the Municipal abattoir of Man. Cattle samplings were taken during the dry season (January-February) and rainy season (June-July) 2023. Demographic information such as sex, age, breed of animal were recorded. After the route meat inspection, the livers of infected animals (Fig. 1) were removed, labeled, placed into a cooling box with ice and transferred to the Man University laboratory for fluke isolation. Macroscopic inspection of the liver of animals for adult flukes was carried out of the billary duct. The big bile duct were opened with a pair of scissors and flukes were isolated using forceps and placed into Petri dishes containing 0.9% normal saline solution. Individual worms were washed extensively in physiological saline, identified morphologically as *F. gigantica* according to existing keys and descriptions based on general appearance, particularly body shape and length, form of the apical cone [12, 13]. A semi-quantitative estimate of the number of flukes was made based on the number of parasites counted in the exposed surfaces. Infected animals were classified by type according to the classification described by Boucheikhchoukh et al. [14]. Infection was classified as low

(≤20 flukes), medium (20–50 flukes), or high (≥50 flukes) intensity. To determine the size of flukes isolated, individual measurements were taken from a number of samples using a graduated ruler. A total of 15 flukes were used (n=15).

Data Analysis

All collected data were recorded in SPSS software. The association between the independent factors (sex, age groupe, breed, season) and the prevalence of the parasites were evaluated using the Chi-square test (χ 2). In all the analysis, confidence level was held at 95%, and $P<0.05$ set for significance.

RESULTS AND DISCUSSION

Characteristics and Distribution of Cattle Slaughtered according to Sex, Age and Breed during the Study

A total of 630 slaughtered cattle were examined. The majority of cattle slaughtered in this abattoirs were females (72.9%) following by male (27.1%). Two cattle breeds were slaughtered: "Zébu" (82.4%) and "Taurin" (17.6%). Most of the cattle (57.9%) were over four years old. The distribution of animals examined by sex, age and breed is presented in Table 1.

Table 1. *The distribution of animals examined according to sex, age and breed*

		Cattle examined	%	(95%CI)
Sex	Male	171	27.1	23.6 - 30.5
	Female	459	72.9	69.4 - 76.4
Age group	-2 years	70	11.1	8.03 - 14.2
	2-4 years	195	31.0	27.4- 34.6
	+ 4 years	365	57.9	54.1- 61.7
Breed	Taurin	111	17.6	14.7- 20.5
	Zébu	519	82.4	79.5- 85.3
Total		630		

Distribution of Fasciola gigantica in Slaughtered Cattle

Observation of isolated flukes based on shape and size made it possible to identify a single species which was *F. gigantica* (Fig. 2).

F. gigantica specimens (n=15) measured between 3.1 cm and 4.6 cm, with a mean size of 3.6 cm.

Of the 630 cattle inspected at the Man slaughterhouse, 122 (19.4%; 95% CI: 16.3-22.4%) were found to be infected with *F. gigantica*. Contamination was more observed in males (20.5%) than in females (18.9%). Young cattle aged between 2-4 years were more contaminated (22.1%) than adults (19.5%) and calves (11.4%). The result showed that there was no significant association between parasitic infection and breed, sex and age of cattle ($p > 0.05$). The prevalence in the rainy season (25.8%, n=85) was higher than that obtained in the dry season (12.3%, n=37). The analysis revealed a strong relationship ($p<0.05$) between the season and *F. gigantica* infection.



Fig. 1. *Cattle liver infected by flukes*

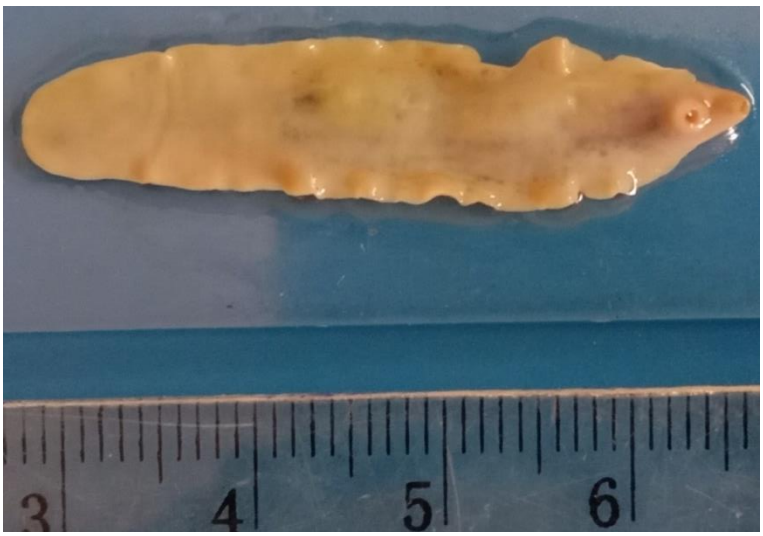


Fig. 2. *Fasciola gigantica isolated from cattle bile ducts*

Table 2. *Prevalence of Fasciola gigantica according sex, age, breed and season*

Parameters		Animal examined	Animal positif	%	(CI 95%)	Chi-square	p-value
	Male	171	35	20.5	17.3-23.6		
Sex						0.183	0.669
	Female	459	87	18.9	15.4-22.4		
	-2 years	70	8	11.4	8.9-13.9		
Age group	2-4 years	195	43	22.1	18.9-25.3	3.727	0.155
	+ 4 years	365	71	19.5	16.4-22.6		
Breed	Taurin	111	24	21.6	18.4-24.8	0.439	0.507
	Zébu	519	98	18.9	15.8-21.9		
Season	Rain	330	85	25.8	22.3-29.3	18.136	0.003
	Dry	300	37	12.3	9.2-15.4		
TOTAL		630	122	19.4			

Mean Load of Flukes Isolated from Cattle

The estimated parasite load (Fig. 3) determined taking into account adult flukes was carried out in a portion of liver from the 122 infected cattle. The mean load was 28 parasites per cattle.

Among the positive cattle (n=122), 42.62% (n=52; 95% CI: 33.7-51.4%) were classified as lightly infected (≤20 flukes) with an average load of 9.86±4.8 flukes; 31.14% (n=38; 95% CI: 22.9-39.3%) as moderately infected (20 to 50 flukes) with an average load of 29.1±8.4 flukes and 26.23% (n=32; 95% CI: 18.4- 34.1%) as heavily infected (≥50 flukes) with an average load of 56.9±6.4 flukes.

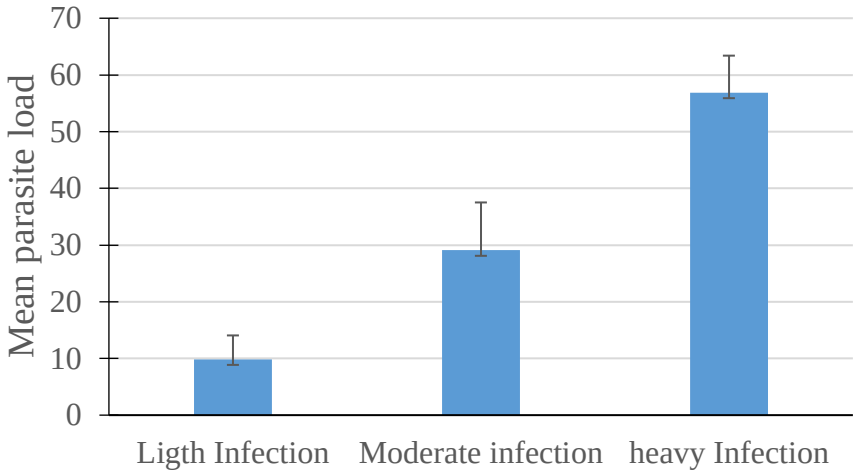


Fig. 3*. Mean parasite load depending on infection intensity*

The Man abattoir is the largest slaughterhouse in the Tonkpi region. The slaughtered animals are distributed on the local market and in surrounding towns and villages.

In this study, the majority of animals slaughtered were females. In addition, adults (age >4 years) were the most numerous. Siama et al. [15] also reported the slaughter of more females than males in the main abattoirs of the far northern region of Cameroon. According to this author, males are used more for reproduction and harnessing by breeders and farmers, hence their low number in abattoirs.

A total of 19.4% (n=122) bovine livers were positive for *F. gigantica*. Contrary results with higher prevalence have been reported by several authors. Hambal et al. [16] recorded 27% of infection. The prevalence rate was 24.74% among livestock in Ethiopia [2] and 68.5% in Chad [17]. Lower prevalence compared to the results of this study were reported by Piri et al. [18] with 8.3% of infection and Petros et al. [19] with 9% of positive cases in cattle in Iran and Ethiopia respectively. The work carried out on farms and abattoirs by Kouadio et al. [8] in Côte d'Ivoire showed the following prevalence of *Fasciola* in several departments: Duekoué (23.5%), Katiola (40.6%), Korhogo (26.9%) and Yamoussoukro (23.5%). Variation in climatic and ecological conditions such as altitude, precipitation and temperatures as well as the suitable habitat of intermediate hosts snails of the genus Limneae are among the factors that influence the appearance of fasciolosis in certain areas. The animals most infected with *F. gigantica* were young (22.1%) and adults (19.5%). The similar situation were observed in the work of Siama et al. [15] where adults and young were more affected by the parasite with the respective rate of 34.32% and 32.46%. Animals under two years old were weakly infected in our study. This would be justified by a shorter grazing period of these calves compared to adults. It has been reported that calves are fed near to homes and rarely graze with adults. Consequently, they have less contact with the intermediate hosts of the parasites. However, there was no statistically significant difference ($p>0.05$) in the prevalence of cattle fasciolosis in different age groups considered.

The result of present study revealed that the sex of the cattle has no significant effect ($p>0.05$) on the occurrence of bovine fasciolosis. This agrees with the report of Magaji et al. [20] who concluded that sex has no impact on the infection rate therefore both male and female are equally susceptible and exposed to fasciolosis. The breeding systems in the areas where the animals come from would also be the cause of this widespread infection of all sexes.

Generally, both males and females animals are grazed on the same area under the supervision of a pastoralist. These exposes the animals to parasites on the grass or in the water. Most pastoralists are unaware that animals are more exposed to fluke when grazing for the periods time around wetlands close to watercourses. These areas are not avoided by pastoralists when grazing. According to Jean-Richard et al. [17], animal grazing near water points constitutes an important factor in *F. gigantica* contamination.

Today, the fluke constitutes a public health problem but it remains unstudied in this part of Côte d'Ivoire. Most studies were carried out in the north of Côte d'Ivoire, which is considered to be an area of high livestock intensity. This prevalence (19.4%) should alert the veterinary services of this department to take appropriate measures to protect those involved in livestock farming. Prophylactic programmes must must be implemented to reduce the contamination of pasture. This will also help to avoid economic losses linked to the searing of meat.

The inspection of animals at the Man abattoir was carried out in both the rainy and the dry seasons. The contamination rate was higher in the rainy season (25.8%) than in the

dry season (12.3%). This finding indicates that the season is a factor influencing the rate of *F. gigantica* contamination of cattle. This result confirms that of Siama et al. [15] who found a relationship between these two parameters. The western zone of Côte d'Ivoire (Mountain Region) is a humid zone with precipitation of up to 1632 mm and numerous water points. This climate would be very favourable to the presence of snails of the genus Lymnaea which are the intermediate hosts of the flukes whose presence has been reported in the western of Côte d'Ivoire [21]. *Fasciola gigantica* infection in cattle is usually high during the wet season because *Lymnaea* is usually active and breeds during this season [22]. Rainy season is also favorable to the development of *Fasciola* eggs and the miracidium which needs water medium to swim and locate the intermediate host [23].

The parasitic load was assessed on only the portions of livers (semi-quantitative method) seized by veterinary agents. Ideally, the research would be carried out on the entire liver to get a better idea of the parasitic loads. The similary remarks were observed in the work of Jean-Richard et al. [17] performed on animals from different abattoirs in Chad.

In the present study, cattle with ligth infection were more numerous (41.2%) than those moderately infected (32.3%) and heavily infected (26.5%). It appears that only 26.5% of cattle had high pathogenicity (≥50 flukes). These results corroborate those of [15] who also found more cattle with ligth infection (54.4%). But our results are contrary to those reported by Jean-Richard et al. [17] with a high infection rate (61%) in cattle in Chad.

The mean parasite load was 28 flukes per cattle in this study. This result is low compared to the data of Alemu and Belay [24] who obtained 52 flukes per liver. A higher mean load was also reported by Traoré et al. [9] with 145 parasites per liver. This difference could be explained by the use of the entire liver of cattle to isolate the flukes in their work, as indicated by Jean-Richard et al. [17].

CONCLUSION

The results of this research carried out at the Man abattoir, provided the first data on *Fasciola* infection in cattle in the department, with a prevalence of 19.4%. These data show that the rainy season is the period when cattle destined for slaughter are more contaminated with *F. gigantica*. Treatment of animals against *Fasciola* during this period should be recommended to avoid losses due to seizure of meat. These measures will also help to avoid contamination of consumers.

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Conflict of Interest. The authors declared that there is no conflict of interest.

Authorship Contributions. Concept and Data Collection: B.Y.C., Z.B.Z.F.Y., Analysis: B.Y.C., E.A.S.A., Writing: B.Y.C., Z.B.F.Y., D.A.

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