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Original Research Article

Bovine Fasciola Infection: Prevalence and Intensity among Cattle Slaughtered in Bamenda Abattoir

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Abstract

Cattle production in the North West Region provides direct employment to more than 166166 people. Unfortunately, this important meat source is being infected by *Fasciola,* leading to increased production loss in cattle and human infection. This study, therefore, set out to determine the prevalence and intensity of *Fasciola* infection in cattle slaughtered at Bamenda abattoir. A total of 733 cattle (593 males and 140 females) brought from all seven divisions of the North West Region were sampled from January to June 2016. Faecal samples were collected and analyzed at the Regional Veterinary Laboratory by the formol-ether concentration technique. The intensity was measured as eggs per gram. The overall prevalence of *Fasciola* infection was 20% (147/733). A higher prevalence of *Fasciola* infection 24.2% (90/371) was recorded during the rainy season compared with the dry season 15.7% (57/362). The prevalence of the infection was highest in cattle from Ngoketungia 37.5% (3/8) and lowest in those from Mezam Division 11.8% (24/203). Females had a higher prevalence of Fasciola infection 22.1% (31/140) than males 19.6(116/593). The intensity of *Fasciola* infection was highest in cattle from Bui Division (31.3eggs per gramme, EPG and lowest in Ngoketunjia (2.2 EPG). It was thus concluded that *Fasciola* infection was prevalent in cattle brought for slaughter at Bamenda abattoir with a higher prevalence in females than and greater occurrence in rainy season than dry season.

Keywords: *Fasciola*, cattle, infection, intensity, sex and age prevalence, seasonal variation.

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1. Introduction

Fasciola species, also known as a common liver fluke is a parasitic flatworm of the class Trematoda and phylum Platyhelminthes that infect the livers of various mammals including humans [1]. The disease caused by the fluke is called fascioliasis (also known as fasciolosis). *Fasciola hepatica* and *Fasciola gigantica* are the most common species distributed worldwide and have been known to cause disease and great economic losses in cattle and sheep for many years [2].

There are many emerging parasitic zoonoses that are associated with food and water. Among such diseases, fascioliasis has been recognized as an important public health problem in several parts of the world. Globally, current estimation indicates between 2.4 to 17 million human cases and 91.1 million people are at risk.

A brief mode of transmission of *Fasciola* infection goes thus:

An animal harbouring adult *Fasciola* passes out eggs with the faeces of the animal which contaminate water. The eggs hatch into miracidia. The miracidia locate water snails by chemotaxis. Once in the snail, the miracidia form sporocysts which produce rediae and rediae may produce second generation rediae before developing into cercariae. Cercariae emerge from the snails. The encystment of the cercariae on vegetation occurs at the edge of the water. Cattle and sheep become infected by ingesting metacercariae while grazing. The predisposing factors in *Fasciola* infection transmission are determined by the presence of the intermediate snail host, domestic herbivorous animals, climatic conditions and the dietary habits of man. Sheep, goat, and cattle are considered the

predominant animal reservoirs. Other animals can be infected, but they are usually not very important for human disease transmission. Humans can be infected by ingestion of aquatic plants that contain infectious metacercariae. Several species of aquatic vegetables such as *Nasturtium officinale*, common water cress, and lamb's lettuce are known as vehicles of human infection. Because *Fasciola hepatica* also encysts on the water surface, humans can become infected by drinking of fresh untreated water containing metacercariae [3]. In addition, consumption of raw or uncooked fresh liver infected with juvenile flukes could lead to human infection [4].

1.1 Statement of Problem

Cases of bovine *Fasciola* infection have been observed frequently in Bamenda municipal abattoir at slaughter but no empirical evidence exists on its prevalence, intensity, variation amongst them in terms of demographic data and the season in question.

1.2 Research Question

1) What is the prevalence of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir?
2) What is the intensity of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir?
3) What are the seasonal variations of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir?

1.3 Objectives

1) To determine the prevalence of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir
2) To establish the intensity of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir
3) To determine the seasonal variation of the prevalence of *Fasciola* infection among cattle slaughtered in the Bamenda municipal abattoir

2. Materials and Method

The study was carried out in the Bamenda Municipal Abattoir. It is located in Nkwen, Bamenda III Sub Division, Mezam Division, North West Region with coordinates 5°56'N, 10°10'E and is 1614 m above sea level. The study animals were all brought from all the seven divisions of the North West Region, namely, Boyo, Bui, Donga Mantung, Menchum, Mezam, Momo and Ngoketunjia, and the cattle were slaughtered in the Bamenda Municipal Abattoir.

Bamenda municipality harbours the biggest cattle market in the Region where cattle sold come from all the seven divisions of the region. A range of 800—1000 cattle are sold in this cattle market weekly. It is from this cattle market that the majority of cattle slaughtered at Bamenda abattoir are obtained.

Constructed some twenty years ago with a slaughter capacity of 75 cattle per day, the abattoir has the following features:

- The main building where slaughter takes place,(kill floor and post mortem inspection section).
- Lairage (fence for ante-mortem inspection measuring 50mx50m).
- Commercial area with meat sale slabs
- Sewage tank and meat condemnation pit.

Cross-Sectional study design and a multi-stage sampling technique were used to select all the cattle from which all necessary data was collected at the abattoir. In the first stage, four days of the week were randomly selected such that the same days were used for sample collection throughout the study period. In the second stage, all the cattle to be slaughtered each day were numbered and the even numbers were used for sample collection. Since there was no previous study in Bamenda to establish the prevalence and intensity of bovine *Fasciola* infection, the sample size required for this study was determined based on the expected prevalence (30%) of bovine fascioliasis and the 5% desired absolute precision and 95% confidence interval, using the formula according to Thurfield [5].

i.e. $N = \frac{(1.96)^2 \, x \, P_{ex} \, (1-P_{ex})}{d^2}$

- Where N = required sample size
- P_{ex}= expected prevalence=50%
- d= desired absolute precision =5%
- 1.96= constant for 95% confidence interval

Faecal samples were collected directly from the rectum of the cattle with gloved hands into labelled tightly closed stool containers. The samples were then taken to the Regional Veterinary Laboratory and examined for *Fasciola* eggs using the formol-ether concentration technique as described by Cheesbrough [6]. Briefly, 2 g of faeces was put in a small mortar and 7ml of 10% formalin was added to it. The faeces were then dissolved with a wooden stick applicator. A sieve of merge size 90 was used to filter the faeces sample into a centrifuge tube. 3ml of ether was then added to the solution in the centrifuge tube and the tube was shaken vigorously for 30seconds. The mixture was then centrifuged at 3000rpm for 2minutes. Four layers were formed at the end of the centrifugation. The first layer was the ether with fats dissolved in it, the second was the debris, the third was the formaldehyde solution and the fourth was sediments of eggs and/or larvae. The debris on the surface and at the interface between the two liquids was loosened from the wall of the tube with a stick and the supernatant was decanted leaving only the sediment. The upper part of the tube was wiped clear of debris. The sediment was examined by sampling a drop with a pipette and depositing onto a glass slide.

The slide was covered with a cover slip and observed under the x10 objective lens of the light microscope (Olympus optical. Co. Ltd., Japan) (Fig.12) as described by Cheesbrough [6]. The eggs of *Fasciola* were identified as large yellow oval eggs using the charts of Arora and Arora [7].

3. Results

A total of 733 cattle were sampled in the Bamenda Municipal Abattoir during slaughter for a period of six months in two phases of three months each. The overall prevalence of infection from the studied area was 147 (20.0%) and the intensity of infection was 13.7±4.0 epg of faeces. The intensity of adult worms per liver in the cattle from the studied areas was 118.3 fluke per liver (fpl). The prevalence of eggs in cattle less than five years was 13.7% (366) while that of cattle ≥5years was 26.4% (367).

The first phase covered January to March and 362 cattle were sampled, while the second phase covered April to June and 371 cattle were sampled. From all the cattle sampled, 140 (19.0%) were females and 593 (81%) were males. The highest number of cattle slaughtered came from Mezam Division (27.7%, 203), while the least was from Ngoketunjia Division (1.1%, 8) as shown in Table 1.

Table 1: Demographic data of cattle slaughtered at Bamenda municipal abattoir

Characteristic	Category	Number examined	Number infected (Prevalence) (%)
Gender	Female	140	31 (22.1)
	Male	593	116 (19.6)
Age (years)	< 5years	366	50 (13.7)
	≥ 5years	367	97 (26.4)
Seasons	Dry	362	57 (15.7)
	Wet	371	90 (24.2)
Origin	Boyo	123	23 (18.7)
	Bui	199	49 (24.6)
	Donga-Mantung	60	19 (31.6)
	Menchum	82	20 (24.4)
	Mezam	203	24 (11.8)
	Momo	58	9 (15.5)
	Ngoketunjia	8	3 (37.5)
Overall *Fasciola* infection prevalence		733	147 (20.0)

The overall prevalence of *Fasciola* infection in the study area was 20.0% (147/733). The highest prevalence of infection was recorded in Ngoketunjia Division (37.5%, 3/8) while the least was recorded in Mezam Division (11.8%, 24/203) as shown in Table 2, though no significant difference in infection was noticed.

Table 2: Prevalence of *Fasciola infection* in the studied areas

Division of study	N° Sampled	N° infected	Prevalence (%)
Boyo	123	23	18.7
Bui	199	49	24.6
Donga-Mantung	60	19	31.6
Menchum	82	20	24.4
Mezam	203	24	11.8
Momo	58	9	15.5
Ngoketunjia	8	3	37.5
Overall	733	147	20.0
P Value =0.324			

From the cattle examined in each Division, the highest prevalence of infection was 50% observed in female from Ngoketunjia Division while the lowest was from Momo Division with a prevalence of 11.1% (1). The differences between the lowest and the highest prevalence of infection with respect to sex were not significant (p = O.26) (Table 3).

Table 3: Prevalence of *Fasciola* infection among cattle slaughtered in the studied areas with respect to sex

Division of study	N° Sampled		N° infected and Prevalence (%)		Statistics (P-values)
	Female	Male	Female	Male	
Boyo	21	102	5 (23.8)	18(17.6)	0.32
Bui	32	167	9 (28.1)	40 (24.0)	0.029
Donga-Mantung	17	43	6 (35.3)	13 (30.2)	0.06
Menchum	20	62	4 (20)	16 (25.8)	0.51
Mezam	39	164	5 (12.8)	19 (11.6)	0.48
Momo	9	49	1 (11.1)	8 (16.3)	0.14
Ngoketunjia	2	6	1 (50.0)	2 (33.3)	0.089
Total and Mean Prevalence of infection	140	593	31 (22.1)	166(19.6)	0.26

The prevalence of *Fasciola* in cattle of age group < 5years was lower13.7% (50/366) than that in cattle of the age group ≥5years 26.4% (97/367), although the difference was not statistically significant (P=0.75). Cattle of age < 5years from Menchum recorded the highest prevalence of *Fasciola* infection 50% (10/20) while those from Donga-Mantung Division recorded the lowest prevalence11.8% (2/17). Furthermore, cattle of age group ≥5years from Donga-Mantung 39.9% (17/43) and Mezam 6.1% (10/167) recorded the highest and lowest prevalences of *Fasciola* infection respectively (Table 4).

Table 4: Prevalence of *Fasciola* infection among cattle slaughtered in the studied Areas with respect to Age

Division of study	N° Sampled		N° infected % (Prevalence)		Statistics (P-values)
	< 5 years	≥5 years	< 5 years	≥ 5 years	
Boyo	63	60	9 (14.3)	14 (23.3)	0.064
Bui	96	103	11(11.5)	38 (36.9)	0.42
Donga-Mantung	35	25	2 (5.8)	17(68.0)	0.032
Menchum	42	40	10 (23.8)	10 (25)	0.27
Mezam	96	107	14 (14.6)	10 (9.3)	0.022
Momo	28	30	3 (10.7)	6(20.0)	0.28
Ngoketunjia	6	2	1 (16.7)	2 (10.0)	0.23
Overall	366	367	50 (13.7)	97(26.4)	0.75

Mean eggs per gram (epg) of stool was examined with respect to the origin of the cattle. Using ANOVA, the highest intensity (19.2±2 epg of stool) was from Mezam while the lowest intensity of infection was from Ngoketunjia Division (2.2±0 epg of stool). The differences in intensity of infection between males and females from various locations were analyzed using Krustall Wallis test. There was a significant difference in intensity of infection between males and females of Mezam (P=0.032), Donga Mantung (p = 0.010) and Bui (P=0.032). There was a significant difference in infection in males and female cattle recruited in this study (P=0.04). (Table 5).

Table 5: Mean egg count with respect to Division of origin of cattle

Origin	Mean EPG ± SEM		Total EPG ± SEM	Level of significance (P value)
	Female	Male		
Mezam	21.6±3	16.7±2	19.2±2	0.032
Boyo	17.5±5	13.3±1	15.4±3.1	0.071
Menchum	11.3±1	13.3±3.5	12.2±2	0.403
Donga Mantung	13.4±0.5	3±0.5	8.2±0.7	0.0104
Bui	25.8±5	36.7±6	31.3±2.3	0.032
Momo	8.2±1	6.7±1	7.5±0.9	0.71
Ngoketunjia	2.1±2	3.3±1	2.2±0	0.61
Overall	14.3±3.4	13.3±3.7	13.7 ± 4	0.047

The highest prevalence of infection with *Fasciola* was in cattle from Bui Division in the dry season 45.6% (26/110) while the lowest was in Momo 6.9% (2/29) still in the dry season. Overall, the prevalence of *Fasciola* in the slaughtered cattle at the Bamenda municipal abattoir was 15.7% in the dry season and 24.2% in the rainy season. The difference was significant at P = 0.038. See Table 6 for detail.

Table 6: Seasonal Prevalence of *Fasciola* in cattle slaughtered at Bamenda municipal abattoir

Division of origin	Dry season		Rainy season		
	Number sampled	Number infected/ Prevalence (%)	Number sampled	Number infected/ Prevalence (%)	Statistic/ P-values
Boyo	68	8 (11.8)	55	15 (27.3)	0.7034
Bui	110	26 (45.6)	89	23(25.8)	0.031
Donga-Mantung	21	6 (28.6)	39	13(33.3)	0.0601
Menchum	44	8 (18.2)	38	12(31.5)	0.5101
Mezam	85	6 (7.0)	118	18(15.3)	0.0132
Momo	29	2 (6.9)	29	07(24.1)	0.0331
Ngoketunjia	05	1 (20.0)	03	02(66.7)	0.0543
Level of significance		0.0001		0.0007	
Total	**362**	**57 (15.7)**	**371**	**90(24.2)**	**0.038**

4. Discussion

Fascioliasis is a well known worldwide helminthic disease of silvatic ruminants, with the widest geographic spread of any emerging vector-borne disease occurring in 51 countries. Global estimations indicate between 2.4 to 17 million human cases, and 300 million cattle infected with an estimated economic loss of 3 billion US dollars annually in the livestock sector. An overall prevalence of 20% was observed in cattle slaughtered in Bamenda Municipal Abattoir using formol-ether concentration technique. The result showed that *Fasciola* infection is prevalent in the study area (Table 2). Although the prevalence here is relatively higher than what Ntonifor and Ndaleh [8] recorded in Jakiri, it is however lower than the finding of Ntonifor and Ndaleh [9] in Douala abattoir most probably due to differences in ecological zones and the fact that their study was carried out from March to September in contrast to this one that was done from January to June. The findings are consistent with the reports of Ardo *et al*[10] in Adamawa, Akpabio [11] in Port Harcourt, Oladele-Bukola and Adetokun [12] in Ibadan, Simbwa *et al*[13] in Lyantonde Uganda and Rahmeto *et al* [14] in Hawasa Ethiopia.

The prevalence was observed to vary with the division of origin of the cattle, (Table 2) with Ngoketunjia recording the highest followed by Donga Mantung and Bui, while Mezam was the least. These concords with the geographic and climatic conditions where *Fasciola* is likely to strive. Ngoketunjia, ui, and Donga Mantung divisions have plains (Ndop and Mbaw plains) with stagnant waters which provide a conducive environment for the multiplication of *Fasciola.* The practice of transhumance, i.e. the seasonal movement of cattle during the dry season from up the hills to the plains in search of pasture and water, allows cattle to easily pick up *Fasciola* infection. It is noteworthy that most cattle slaughtered in Bamenda originate from the other six divisions particularly Bui, Donga Mantung, Menchum and Boyo which are the cattle producing basins of the region [15]. The infection rate was seen to be higher in female than in their male counterparts (table 3). It was also observed on a general note that more male cattle were brought to the abattoir for slaughter than female animals (table 3). This is explained on the basis that cattle owners rear cows for longer periods because they are used for reproduction and also produce milk, unlike the bulls. This longer stay makes them more exposed to parasitic diseases like fascioliasis [12]. The number of males usually presented at slaughter was higher because male generate higher revenue for cattle sellers than the female animals. These findings were in agreement with other works like those of Phiri *et al* [16] and Keyyu *et al*[17].

The intensity in terms of *Fasciola* eggs per gram of faeces was observed to be highest in cattle from Bui (Table 5). The prevalence was higher in the rainy season than in the dry season (Table 6). This is explained by the fact that cattle go on transhumance between January and end of March during which they pick up metacercariae which are the infective stage of *Fasciola.* By the time the cattle return to their rainy season grazing area the metacercariae have completed the migration and attained maturity in the liver bile duct and begin to lay eggs. This finding agrees with the seasonal variation of *Fasciola* infection as described by Radostits and Blood [18].

5. Conclusion

The study demonstrates that bovine *Fasciola* infection is prevalent in cattle brought for slaughter in Bamenda from all the Divisions of the North West Region, with over all prevalence of 20%, higher percentage in females than males. The intensity has been found to be 13.7 ± 4EPG; while a higher prevalence existed in the rainy than the dry season.

Recommendation

- The results should be used to inform policy for some action to be put in place for prevention and control
- Stakeholders should be sensitized on the intensity while technicians are provided with current tools for identification and diagnosis
- A national program for the control of fascioliasis should be elaborated and executed.

- Farmers should be informed and made aware of the importance of fasciolasis and the control program

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