

An Abattoir Survey of Bovine Liver Fluke Infections in Bauchi, Nigeria

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Abstract: Liver fluke infection is one of the major parasitic conditions affecting cattle productivity in the Nigerian livestock sector and has accounted for enormous losses globally. Availability of information on these parasites is necessary for instituting control measures against them. Reports on these infections for various parts of Nigeria exist but only few is available for the Bauchi area. Therefore, a study was conducted to investigate the prevalence of liver fluke infections among 410 cattle slaughtered at the Bauchi metropolitan abattoir between the months of November to December 2017. The age, sex, reed and body condition score of each animal was assessed using standard procedures. Thereafter, liver and gall bladder were examined for adult worms and eggs of the flukes. Out of the 410 cattle examined 62.2% (255) had liver fluke infections *Dicrocoelium hospes* being the most prevalent (63.5%) followed by *Fasciola gigantica* (18.4%) while mixed infection involving *Dicrocoelium* and *Fasciola* was uncommon. The gender and ages of cattle examined did not show significant association with infection ($p>0.05$) but there was significant differences ($p<0.05$) in infection on the basis of breed and body condition score of cattle examined. The overall prevalence of liver fluke infection in this study was high. In view of this, it is recommended that there should be massive enlightenment campaigns to the farmers on the sources of liver fluke infections with its attendant consequences as well as ways of controlling the diseases in order to enhance livestock production in the area.

Keywords: *Dicrocoelium hospes*, *Fasciola gigantica*, Infections, Cattle, Bauchi, Nigeria.

INTRODUCTION

One of the major constraints to profitable cattle production in Nigeria as in many other countries is the effect of diseases caused by gastrointestinal parasites like Fasciolosis and Dicrocoeliosis. These diseases often lead to enormous losses in terms of reduction in meat and milk quantity and quality, reproductive failure, loss of draught power and mortality [1, 2].

While these diseases have received great attention in many places [3-8], studies on liver fluke infections in the Bauchi area have been limited. The few reports are those of Babalola and Schillhorn Van Veen [9] who worked on the incidence of fascioliasis in cattle in Bauchi, Istifanus *et al.* [10] who reported on prevalence of gastrointestinal helminth parasites among cattle slaughtered at Bauchi abattoir and Karshima *et al.*, [11] who reported on prevalence and risk factors of *Dicrocoelium dendriticum* and *Euretrema pancreaticum* in Bauchi. Aside from the fact that most of these studies were conducted more than two decades ago, the focus was mainly on *Fasciola* and did not cover other equally important trematode species that cause substantial economic losses as well. Therefore, current status of

liver fluke infections in cattle in Bauchi is being presented.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted at the Bauchi metropolitan abattoir located in Bauchi, the Bauchi State capital. The town occupies a total land mass of 3,687 KM² and is located between latitude 10.3°N and longitude 9.8°E. it has an elevation of 616 M above sea level. The town has a population of 493,810 people as per the 2006 nation census figures. The area falls within the Sudan savannah vegetation zone and is rocky due to its location on the northern edge of the Jos Plateau. The area experiences two marked seasons, a rainy and a dry season. Rainfall starts around April or May and last through October with peak precipitation in August while the dry season last from November to April. Relative humidity level is low during the dry season and high during rainy season with peak periods between July and September. The area is drained by three major streams namely Barkindo stream, Shadawanka stream and Rafin Tambari. The major tribes found within the area include Gerawa, Fulani, Sayawa, Jarawa, Gere, Kir-Balar and Zumbun among others.

Determination of General Characteristics of the animals examined

A total of 410 cattle were examined during the study between November and December, 2017. During each sampling occasion, detail records about the breed, gender, age and body condition score of the animals were assessed. The breeds of the cattle were determined on the basis of phenotypic characteristics while gender was assessed by the presence of mammary glands in the females and testicles in the males. Ages of cattle examined were estimated by observing the rostral dentition using eruption of the frontal teeth as an index in line with the method of Getty *et al.*, [12] while the body condition scores were assessed using the technique by Queensland State of North-eastern Australia (2011) based on a scoring of scale 1-5.

Examination of Liver and Gall bladder

After estimation of the general characteristics of the animals, liver and bile duct from each of the carcass was systematically examined as described by Urquhart *et al.*, [13]. In addition, gall bladder samples from each slaughtered animal were collected in sterile

polythene bags and brought to laboratory where they were examined under the microscope at $\times 40$ magnification for the presence of *Fasciola* and *Dicrocoelium* eggs using a modified technique of Thienpont *et al.* [14]. Parasite eggs were subsequently identified on the basis of morphological characteristics as described by Urquhart *et al.* [13].

Data Analysis

Data obtained with respect to prevalence of parasites among different breed, gender, age and body condition scores of cattle were analysed by Chi-square analysis at 95% confidence level using SPSS computer software version 21.

RESULTS

Out of the 410 cattle examined 255 (62.2%) were infected with two species of liver flukes namely *Dicrocoelium hospes* and *Fasciola gigantica*. Majority of cases of the infection were of single infection while few cases were mixed infection. These are set out in Table 1. It was also observed that *Dicrocoelium hospes* was more prevalent than *Fasciola gigantica*.

Table-1: Prevalence of liver flukes encountered in cattle slaughtered at the Bauchi abattoir

Trematodes spp	No. Positive (N=410)	Prevalence (%)
<i>Dicrocoelium hospes</i>	162	63.5
<i>Fasciola gigantica</i>	47	18.4
<i>F. gigantica</i> + <i>D. hospes</i>	46	18.1
Total	255	62.2

Parasitic infection in relation to breed of cattle examined is presented in Table 2. It can be seen that the Sokoto Gudali breed had the highest prevalence of infection followed by the White Fulani breed while the

Red Bororo breed had the least prevalence of infection. These observed differences in the infection rates among breeds of cattle examined were statistically significant ($p < 0.05$).

Table-2: Prevalence of infection in relation to breed of cattle slaughtered at the Bauchi abattoir

Breed	No. Examined	No. Positive	Prevalence (%)
White Fulani	388	239	61.6
Red Bororo	9	4	44.4
Sokoto Gudali	13	12	92.3
Total	410	255	62.2

$$\chi^2 = 6.278, P = 0.043, df = 2$$

Table 3 shows the prevalence of infections in relation to gender of cattle examined. Infection was observed to be slightly higher in the females than in

males. However, this difference was not statistically significant ($P > 0.05$).

Table-3: Prevalence of liver flukes in relation to gender of cattle examined during the study

Gender	No. Examined	No. Positive	Prevalence (%)
Male	304	183	60.2
Female	106	72	67.9
Total	410	255	62.2

$$\chi^2 = 1.996, P = 0.158, df = 1$$

The age disposition to infection revealed that older cattle had the highest prevalence of infection than young ones as depicted in Table 4. Similarly there was

no significant difference between infection rates among the age groups.

Table-4: Prevalence of liver flukes based on age of cattle examined during the study

Age	No. Examined	No. Positive	Prevalence
Young	68	31	54.4
Adult	342	218	63.7
Total	410	255	62.2

$$X^2=2.1, P=0.147, df=1$$

The association between the body condition score of cattle examined and liver fluke infections is given in Table 5. Clearly, cattle with poor body condition had highest prevalence of infection while

those with very good body condition had least prevalence of infection. The apparent disparity was also statistically significant ($p < 0.05$).

Table-5: Prevalence of liver flukes in relation to body condition score of cattle examined during the study

Body condition score	No. Examined	No. Positive	Prevalence (%)
Poor	58	47	81.0
Good	322	197	61.2
Very good	41	11	36.7
Total	410	255	62.2

$$X^2=17.211, P=0.000, df=2$$

DISCUSSIONS

The overall prevalence of liver fluke infections obtained in this study is a high one. It is higher than the 26.5% obtained by Olubukola *et al.*, [8] in their study on gastrointestinal helminths in cattle in Ibadan Southwestern Nigeria. It is also higher than the 26.7% reported by Agumah *et al.*, [15] in fecal effluents from cattle slaughtered in Abakaliki abattoir Southeastern Nigeria and those of Yahaya and Tyav [16] who reported a prevalence of 13.9% in cattle slaughtered in Wudil, Kano State, Northwestern Nigeria as well as the prevalence of 42.7% reported by Nwosu and Srivastava [17] who worked on liver fluke infections among livestock in Borno state northeastern Nigeria. However, the result is slightly lower than the 72.0% obtained by Iyaji *et al.*, [18] who worked on *Fasciola gigantica* and other associated parasites in Kogi state northcentral Nigeria. The high prevalence of infection observed in this study may be associated with the poor nutritional status of the animals as cursory observation during the study showed that majority of cattle that had heavy infections were emaciated. More so, high prevalence of infection with liver flukes has been shown to occur especially during the dry season which corresponds to the period when this study was conducted. During such time of the year, there is generally scarcity in availability of food and portable water [19]. These conditions promote cluster feeding habits in the few areas where green grasses and water are available. Undoubtedly, this enhances the chance of acquiring infection. It may also be associated with the occurrence of the snail intermediate hosts within the area. Earlier studies by Kela *et al.* [20] and Istifanus [21] had reported of the occurrence of snail intermediate hosts of especially *Fasciola gigantica* in the study area. The indiscriminate deworming habits by farmers which result in anthelmintic resistance in the animals may also be responsible for the high prevalence of infection recorded since the parasites can no longer

be eliminated by the routine drugs thereby enhancing their survival and spread.

The comparatively higher prevalence of *Dicrocoeliosis* obtained in this study is noteworthy considering reports that it is either poorly known or often underestimated by researchers and practitioners [22]. The prevalence of *Dicrocoelium hospes* obtained in the present work is higher than figures obtained from different parts of Nigeria including Istifanus *et al.*, [10] for the Bauchi area, Nwosu and Srivastava, [17] for Borno State Northeastern Nigeria, Amadi *et al.* [23] for Abia State Southeastern Nigeria and Elelu *et al.* [24] for Kwara State Northcentral Nigeria. However, the prevalence obtained in this study is lower than the value obtained elsewhere in western Asia by Ahmadi *et al.*, [3] who worked on prevalence of *Dicrocoelium dendriticum* infection in cattle, sheep and goat in Gilan province, Northern Iran. This high prevalence of infection with *Dicrocoelium* species may be linked with poly-parasitism which is known to lead to immunosuppression in cattle and this promote the dominance of a particular parasite within the host. The current study was conducted during the dry season a period where the cattle could be easily exposed to the ant intermediate host while grazing in the open fields. This could have been responsible for the high infection rate recorded.

The prevalence of fasciolosis obtained in this study agrees with the finding of Odigie and Odigie [3] who noted a similar infection rate among cattle in Edo State, South-south Nigeria. It is however, higher than the figures reported by Uduak [25] among cattle slaughtered in PortHarcourt, Rivers State South-south Nigeria and among cattle slaughtered at Akure abattoir, Ondo State Southwestern Nigeria [26]. Conversely, the prevalence of fasciolosis obtained in this study is lower than levels reported in Ebonyi, Kogi, Kaduna, Borno

States of Nigeria by Ngele and Ibe [27], Iyaji *et al.* [18], Raji *et al.* [28], Bui *et al.* [7] respectively. The low prevalence of infection reported in this work compared with elsewhere may be associated with the effect of season as majority of the works were carried out in the rainy season. During the dry season, environmental conditions are generally unfavourable for the development and distribution of the parasite due to drying of surface water and absence of vegetation and this corresponds with the time this work was carried out. Moreover, the low prevalence obtained may be connected to the influence of temperature. Temperature plays a vital role in the development of *Fasciola* egg, snail intermediate host and survivability of metacercaria. Lower temperature limits the development of *Fasciola* and higher temperature limits (above 30°C) inhibit the development [29]. During the dry season temperatures are usually high and majority of snails may aestivate during such time of the year. Consequently, this may lead to decreased shedding of cercariae and thus low prevalence of infection.

It was remarkable that breed had profound influence on the prevalence of liver fluke infections among cattle examined and this corroborate the finding of Adang *et al.*, [30] in Gombe State Nigeria and Singh and Bello [31] in Sokoto State Nigeria. The high susceptibility observed in the Sokoto Gudali breed is noteworthy. This may be associated with management practices adopted by Fulani pastoralists who are known to feed their cattle on communally owned grazing lands where the animals browse especially in the dry season [32]. As a result, the animals may concentrate around the only available water bodies which may have some green vegetation. Therefore, such animals may be exposed to infection than those who don't browse. The Sokoto Gudali cattle are also known to be sluggish in nature hence they are used as draught animals during the rainy season which may expose them to stress and decreased immunity. Consequently, the cattle may be exposed to the risk of contracting parasitic infections during the dry season owing to weak immunity. The difference in breed disposition to infection may further be connected with differences in intrinsic factors (genetic, physiological and immunological) as well as extrinsic factors such as environmentally related factors among the different breeds.

The finding that gender did not profoundly influence infection in this study is a noteworthy one and is in agreement with the findings of Gboeloh [33] in Portharcourt, Rivers State Nigeria and Bui *et al.* [7] in Maiduguri, Borno State, Nigeria. The equal gender disposition to infection may be associated with the grazing pattern adopted in the study area. It is a common practice in the area that both male and female cattle move together in search of food and water under an extensive management system. Therefore, this results in equal exposure of both male and female cattle to the parasites with no anticipated difference in

infection rates. However, the finding is in contrast with those of Obadijah [34] who reported higher infection in male than female cattle in Taraba State Nigeria. The reason for this difference is that majority (74%) of the cattle sampled in his work were males. Consequently, it is of little wonder that more males were found infected than females. Our result also contrasts that of Ardo *et al.* [35] who reported higher infection in female than male cattle in Adamawa State Nigeria. In their study they attributed the difference observed to the fact that the females stay longer in the herds than their male counterparts resulting in prolonged exposure to infection. Secondly, pregnancy and lactation are known to suppress immunity in female cattle and so they easily succumb to infections. Since the herds of the cattle sampled in the current study are not known for which reason it is difficult to ascertain if the females actually had prolonged exposure to infection or not and very few of the females were observed to be pregnant or lactating, the reason accounting for their result would not be applied in this case.

The observation in the present study of no direct association between infection and the ages of cattle examined is striking and is consistent with the reports of Bui *et al.* [7] from Maiduguri, Nigeria and Ayalew *et al.* [36] in Gondar Elfora, Ethiopia. However, this finding does not agree with the reports of Hossain *et al.* [37] and Yesmirach and Meconnen [38] who reported high infection rate in older cattle than young ones. While the former attributed the high prevalence in older cattle to be due to longer exposure time to disease entity and grazing habits close to submerged areas, the latter explained that the low prevalence in the young cattle was due to the fact that young animals were kept indoors or around the home and were not allowed to go far with adult animals for grazing so that they had reduced chance of exposure to infective stages of the parasites when compared to the adult. The present result is also in contrast with the finding of Yatswako and Alhaji [39] who reported high occurrence in younger than older cattle and they linked the difference to development of acquired immunity in older cattle leading to resistance to infection by the parasites while low immunological competence in the young cattle was principally responsible for the observed high infection by the parasites. The result of the present study may be connected with the grazing habit adopted by herders in the study area especially during the dry season where both young and adult cattle move together for grazing. During this time of the year, there is usually scarcity of food and water which may necessitate the release of young ones to go in search of these requirements along with adult counterparts and this may result in equal exposure to the parasites. It was also observed that majority of young cattle examined during the period of this study were between the ages of 12-18 months. This made it easier for them to graze along with their adult counterparts which led to equal disposition to infection

The significant association between body condition score and prevalence of infection among cattle examined in this work is also noteworthy and concurs with the finding of Abebe *et al.* [11] who similarly reported significant relationship between infection and body condition scores. Thus, animals with poor body condition had higher prevalence of parasitic infection because these parasites especially *Fasciola* and *Dicrocoelium* are known to damage liver parenchyma of their hosts causing cholangitis, and liver cirrhosis which are known to interfere with bile flow and this in turn reduce lipid emulsification, digestion and absorption of fatty acids and lipid soluble vitamins. Owing to the serious damage done to the liver, the normal function of this organ is interfered with leading to metabolic problems resulting in malnutrition in the animal. During the dry season when this study was undertaken, food was in short supply because green vegetation as well as water sources had dried up. Malnutrition could therefore easily set in. Consequently, the animals succumbed to infection and developed poor body conditions.

CONCLUSION

The result of this study clearly indicates that infection with liver flukes is high in the study area with *Dicrocoelium hospes* as the most occurring parasite. Infection with the parasites was found to be influenced significantly by breeds and various body conditions of the cattle examined. Therefore, government should introduce policies that will ensure the slaughtering of animals from known sources as this will help in tracing infection sources among animals presented for slaughter. It is also recommended that farmers' enlightenment campaign should be intensified on the sources of liver fluke infections with emphasis on providing their animals with healthy drinking water which will ultimately reduce the level of trematode infections to their animals.

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