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# Prevalence and Risk Factors of *Fasciola* Infection in Slaughtered Cattle: A Cross-Sectional Study in Abuja, northern Guinea savannah zone of Nigeria.

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**Abstract**

*Fasciolosis is known worldwide as an important parasitic disease of ruminants with public health significance. A cross-sectional study was conducted across the dry and wet seasons. An abattoir in each of the area councils of Abuja was visited once every week and slaughtered cattle infected with Fasciola species were identified and noted for a period of 8 months (February to September 2023) using a systematic sampling technique. Parameters like age, sex, breed and body condition scores were recorded. A total of 4,796 slaughtered cattle were sampled with 602 (12.6%) found to be infected. The sex distribution of Fasciola species in the slaughtered cattle across the six area councils was: 52.2% for male and 47.8% for female; 8.1% in the young and 91.9% in the adult cattle examined. The prevalence of Fasciola infection according to the breeds of the animals was White Fulani 65.8%, Red bororo 13.5%, Sokoto gudali 12.3% and Bunaji 8.5%. There was no significant association (P> 0.05) between infection with Fasciola infection and sex of the cattle, but there was (P ≤ 0.05) with their age and breed. There were positive correlations between the body condition scores of the cattle and infection with Fasciola species. This study therefore provided useful information on body condition scores of cattle slaughtered in Abuja, FCT in relation to prevalence of Fasciola infection. Restricting these cattle from grazing in open pastures and drinking from stagnant water among other measures will help control this disease.*

**Keywords:** *Fasciola*, Cattle, Abuja, Guinea Savannah, Nigeria

Prévalence et facteurs de risque de l'infection à *Fasciola* chez les bovins abattus : une étude transversale à Abuja, dans la zone nord de la savane guinéenne du Nigeria

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## Résumé

*La fasciolose est reconnue mondialement comme une maladie parasitaire importante des ruminants, avec une signification en santé publique. Une étude transversale a été menée pendant les saisons sèche et humide. Un abattoir dans chaque zone administrative (AC) d'Abuja a été visité une fois par semaine, et les bovins infectés par des espèces de Fasciola ont été identifiés et notés sur une période de 8 mois (février à septembre 2023) en utilisant une technique d'échantillonnage systématique. Des paramètres tels que l'âge, le sexe, la race et les scores d'état corporel ont été enregistrés. Au total, 4 796 bovins abattus ont été échantillonnés, dont 602 (12,6 %) étaient infectés. La répartition par sexe des infections à Fasciola dans les six zones administratives était de 52,2 % chez les mâles et 47,8 % chez les femelles ; 8,1 % chez les jeunes bovins et 91,9 % chez les adultes examinés. La prévalence de l'infection selon les races était : White Fulani (65,8 %), Red Bororo (13,5 %), Sokoto Gudali (12,3 %) et Bunaji (8,5 %). Aucune association significative (P > 0,05) n'a été observée entre l'infection à Fasciola et le sexe des bovins, mais une association significative (P = 0,05) a été notée avec l'âge et la race. Des corrélations positives ont été établies entre les scores d'état corporel des bovins et l'infection à Fasciola. Cette étude fournit donc des informations utiles sur les scores d'état corporel des bovins abattus à Abuja (FCT) en relation avec la prévalence de l'infection à Fasciola. Limiter le pâturage des bovins dans les pâturages ouverts et leur accès à des eaux stagnantes, entre autres mesures, contribuerait à contrôler cette maladie.*



**Mots-clés** : *Fasciola*, Bovins, Abuja, Savane Guinéenne, Nigéria


**٢. انتشار وعوامل خطر الإصابة بالديدان الكبدية (فاشيولا) في الأبقار المذبوحة: دراسة مقطعية في أبوجا، منطقة السافانا الغينية الشمالية في نيجيريا.**


يُعرف داء الفاشيولا (فاشيولوسيس) عالميًا كأحد الأمراض الطفيلية المهمة التي تصيب المجترات وله أهمية صحية عامة. تم إجراء دراسة مقطعية خلال موسمي الجفاف والأمطار، حيث تم زيارة مسلخ واحد في كل من مجالس المناطق (Acs) في أبوجا مرة واحدة كل أسبوع، وتم تحديد وتسجيل الأبقار المذبوحة المصابة بأنواع الفاشيولا لمدة ثمانية أشهر (من فبراير إلى سبتمبر 2023) باستخدام تقنية العينة المنهجية. تم تسجيل بيانات مثل العمر، الجنس، السلالة، وتقدير حالة الجسم. تم فحص ما مجموعه 4,796 من الأبقار المذبوحة، ووجد أن 602 منها (12.6٪) مصابة. كانت نسبة توزيع الإصابة بأنواع الفاشيولا بين الأبقار المذبوحة في المجالس الستة كما يلي: 52.2٪ للذكور و47.8٪ للإناث؛ وُجدت الإصابة بنسبة 8.1٪ في الأبقار الصغيرة و91.9٪ في الأبقار البالغة. أما بالنسبة للسلالات، فكانت نسب الإصابة كالتالي: الفولاني الأبيض 65.8٪، البورورو الأحمر 13.5٪، سوكوتو قدالي 12.3٪، والبناجي 8.5٪. لم يكن هناك ارتباط معنوي (P> 0.05) بين الإصابة بالفاشيولا وجنس الأبقار، لكن وُجد ارتباط معنوي (P ≤ 0.05) بين الإصابة وكل من العمر والسلالة. كما وُجدت علاقة طردية بين تقديرات حالة الجسم للأبقار والإصابة بأنواع الفاشيولا. وبالتالي، وفرت هذه الدراسة معلومات مفيدة حول حالة الجسم للأبقار المذبوحة في أبوجا، إقليم العاصمة الفيدرالية، فيما يتعلق بانتشار داء الفاشيولا. إن تقييد رعي هذه الأبقار في المراعي المفتوحة ومنعها من الشرب من المياه الراكدة، إلى جانب تدابير أخرى، سيساعد في السيطرة على هذا المرض.

**الكلمات المفتاحية :**فاشيولا، أبقار، أبوجا، سافانا غينيا، نيجيريا.

## Introduction

Fasciolosis is a disease caused by *Fasciola* species which contribute to widespread morbidity and mortality in ruminants (Bozorgomid *et al*. (2018). Fasciolosis is zoonotic and has been classified as a top neglected tropical disease (NTD) affecting mainly people of lower income in the rural settings of the developing world (Aryaeipour *et al*. (2017). The adult worms are flat, non-segmented and leaf-like in shape (Center for disease control and prevention). The body is covered with a tegument and they appear greyish brown in color. They are hermaphrodites having both male and female reproductive systems. They have simple digestive systems and primarily feed on blood. There are many species of *Fasciola* parasite but only *Fasciola gigantica* and *Fasciola hepatica* are taxonomically valid (Liu *et al*. (2011) All the species are endo-parasitic with anterior and posterior suckers. The anterior end has a cone shaped projection. *Fasciola* adult worms live in the liver and lay eggs in the intestine while the eggs are excreted along with the faeces (Tenerio and Molina (2021). It is also reported to infect various parts of the body e.g blood vessels, gastro-intestinal tracts, lungs but cause severe damage to the liver (Amer *et al*. (2014) and Mas-Coma *et al*. (2014) They have either monogenic or digenic life cycle with snails of the *Lymnea* species as their intermediate hosts playing significant role in the epidemiology of fasciolosis (Usip *et al*. (2014).The two main host life cycles of *Fasciola* species are the asexual stage which develops in the intermediate host (fresh water *Lymnea* snail) and the sexual stage which is found in either cattle or other ruminants as their definitive hosts (Tsagaye *et al*. (2011). The presence of the *Lymnea* snail, adult parasite load, temperature, altitude and humidity create favorable environment for a higher risk of the infection (Gihuana *et a*l. (2011). Fasciolosis has been reported to be more common in animals than in humans. It causes obstruction to the flow of bile leading to inflammation in the surrounding liver tissue. A report by World Health Organization revealed that *Fasciola* species were limited to some geographical areas but is getting cosmopolitan by the day. *Fasciola hepatica* are found in cooler areas of high altitude in the temperate and subtropics and are reported in sheep, goat, cattle, pigs, rats and rabbits while *Fasciola gigantica* is predominant in the tropical areas of Africa, Asia and Middle East (Urquhart *et al*.(2003). There is high level of *Fasciola* species infection being recorded among herding communities with

low income because of their regular contact with these livestock. Livestock farming is a lucrative venture in this part of the world because rearing healthy cattle greatly increases productivity through improved sales of quality livestock products (milk, meat, wool etc). It also reduces the expenses involved in treatment of infected animals. *Fasciola* species infect these livestock and cause decrease and economic losses in their production. These economic losses are categorized as either direct losses in form of cost of treatment, labor and liver condemnations at the abattoirs or indirect losses usually seen in poor growth rates, low fertility, decreased productivity of wool, meat and dairy products, increased costs of replacement stock (Chick and Blumer(1999). Despite the increasing cases of this infection in various parts of Nigeria and Abuja (the Federal Capital Territory), studies involving the prevalence have been scanty. This study therefore will expose the level of awareness of livestock owners on this disease, the causes, distribution, pathological effects and the haemato-biochemical indices in slaughtered and sedentary cattle across Abuja, the Federal Capital Territory

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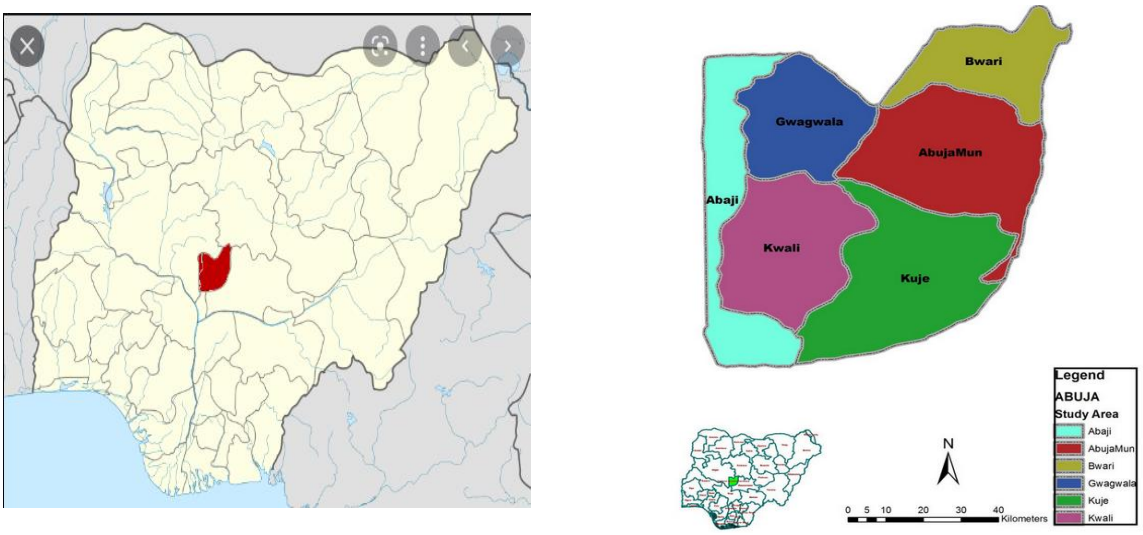
## Materials and methods

### *Study Area*

Abuja is the seat of the Federal Capital Territory Authority (FCTA). FCT is geographically located at the Centre of the country. It lies between latitudes 8.25‘N and 9.20‘N, and longitudes 6.45‘and 7.39‘E. Based on the Nigerian National census of 2006, the FCT has a population of about 1,405,201 people and a land mass of approximately 7,315km2 situated within the northern Guinea savannah zone with moderate climatic conditions (fcda.gov.ng). The FCT is made up of six area councils, comprising Abuja Municipal (AMAC), Abaji, Bwari, Gwagwalada, Kuje, and Kwali Area Councils. The FCT climate features tropical wet and dry seasons. It experiences three weather conditions annually. They include warm, humid-wet and dry seasons. The annual total rainfall is in the range of 1100mm to 1600mm,temperature ranges between 22.9ºC - 29.6ºC, while humidity ranges between 26- 87%. The vegetation is mainly savanna with limited forest areas (https://www.britannica.com/place/Abuja-federal-capital-territory-Nigeria).

Fig 1: M**ap of Nigeria showing Abuja (FCT)**




(https://www.britannica.com/place/Abuja-federal-capital-territory-Nigeria).

***Sample size***

The sample size from each abattoir was calculated based on the number of slaughter per day in the selected abattoirs. For instance, in Kwali and Abaji abattoirs where the average slaughter is 6 cattle per day, one in every two cattle was sampled. In Kuje abattoir with daily slaughter of 10 cattle, one in every three cattle was sampled. In Gwagwalada abattoir with daily slaughter of 20 cattle, one in every four cattle was sampled. In Dei-Dei (Bwari) abattoir with average daily slaughter of 60 cattle, one in every 5 cattle was sampled. Finally in Karu abattoir (Abuja Municipal Area Council) with average daily slaughter of 120 cattle, one in every eight cattle was sampled.

A total of 4,796 cattle of different age, sex and breed were sampled in both dry and wet seasons.

***Sampling procedure***

These cattle were examined shortly before slaughter and information on the sex and breed were recorded. The age was estimated and classified as adult (over 3 years) and young (below 3 years). The body condition scores from (0-5) were determined based on the method described by Richard *et al*. (2014) by palpating key areas like the backbone, ribs, hips, pin-bones, tail-head, brisket and noted. The body condition scores from (0-5) were determined based on the method described by Richard *et al*. (2014) by palpating key areas like the backbone, ribs, hips, pin-bones, tail-head and noted as follows: Bone structure of

shoulder, ribs, back and pins visible and sharp to touch**.** Cattle had no evidence of fat deposition with ribs easily visible with spaces between them**.** Some had very little fat cover over the loin, back and fore-ribs with backbones still visible**.** Some had their fore-ribs slightly noticeable and little fat cover over the ribs**.** Some cattle took blocky appearance with no bone structure on the ribs visible**.** Others had no bone structure felt, tail-head buried in fat with square appearance.

***Data Analysis***

Data generated were recorded in Microsoft excel 2013 and analyzed using GraphPad Prism 8.01. Chi-square test was used to test the relationship between the prevalence rate and the risk factors in the infected cattle and P values $\leq 0.05$ were considered significant. Results were expressed as means and simple averages and presented in tables

**Results**

The total number of slaughtered cattle examined at the abattoirs was 4796 (97.2%) and 602 (12.6%) found to be infected with *Fasciola* adult parasites. The total number of slaughtered cattle samples during the early dry season was 978 (20.4%) and 96 (15.9%) were infected. During the late dry season, 1013 (21.1%) were sampled with 116 (19.3%) infected. However in the early wet season, the total number of cattle sampled were 1231 (25.7%) with 191 (31.7%) infected. During the late wet season, the total number of cattle sampled were 1574 (32.8%) with 199 (33.1%) infected with *Fasciola* species (Table 1).

A total of 602 (12.6%) slaughtered cattle were infected with *Fasciola* species, 314 (52.2%) bull were infected while 288 (47.8%) cow were infected. There was no significant difference ($P > 0.05$) between sex and infection with *Fasciola* species.

**Table 1: Prevalence of *Fasciola* parasites based on sex**

| Sex | Total No examined | No Infected | % Infected |
|---|---|---|---|
| Bull | 3302 | 314 | 52.2 |

| | | | |
|---|---|---|---|
| Cow | 1494 | 288 | 47.8 |
| **Total** | **4796** | **602** | **100** |

$X^2 = 2.704$ (P=0.4396)

Out of the 602 slaughtered infected cattle in this study, the infected young were 49 (8.1%) while the infected adult were 553 (91.9%). There was a significant difference ($P < 0.05$) between age and infection with *Fasciola* species. Out of the 602 slaughtered infected cattle, White Fulani breed were 396 (65.8%). Red bororo were 81 (13.5%), Sokoto gudali were 74 (12.3%) and Bokoloji breed of cattle were 51 (8.5%). There was a significant relationship ($P < 0.0001$) between breed and infection with *Fasciola* species (Table 2)**.**

**Table 2: Prevalence of *Fasciola* parasites based on age**

| **Age** | **No examined** | **No Infected** | **% Prevalence** |
|---|---|---|---|
| Young | 243 | 49 | 8.1 |
| Adult | 4553 | 553 | 91.9 |
| **Total** | **4796** | **602** | **100** |

$X^2 = 25.29$ (P=0.0001)

**Table 3: Seasonal prevalence of *Fasciola* parasites**

| Season | Cattle examined | No infected | % Infected |
|---|---|---|---|
| Early Dry | 978 | 96 | 15.9 |
| Late Dry | 1013 | 116 | 19.3 |
| Early Wet | 1231 | 191 | 31.7 |
| Late Wet | 1574 | 199 | 33.1 |
| **Total** | **4796** | **602** | **100%** |

**Table 4: Prevalence of *Fasciola* parasites based on breeds**

| Breeds | No examined | No Infected | % Infected |
|---|---|---|---|

| | | | |
|---|---|---|---|
| White fulani | 2836 | 396 | 65.7 |
| Red bororo | 884 | 81 | 13.5 |
| Sokoto gudali | 745 | 74 | 12.3 |
| Bokoloji | 331 | 51 | 8.5 |
| **Total** | **4796** | **602** | **100** |

$\chi^2 = 37.37$ (P = 0.0001)

**Discussion**

The overall prevalence of 12.6.1% recorded in this study could be attributed to the size of the study population with large number of cattle sampled. The findings in this study is similar to 14.6% prevalence reported by Ejeh *et al*. (12015) in Makurdi, Benue –State, Nigeria. Okaiyeto *et al. (*2012*)* also reported 14.1 % in Calabar and Raji *et al*. (2010) reported 14.2% in Zaria, Nigeria. However, Odigie and Odigie (2013) recorded a very low prevalence rate of 3.33% *Fasciola* species with 180/5400 samples in Edo-State, Nigeria. The prevalence obtained in this study was lower than 37.1% reported by Ulayi *et al*.(2017) from Zaria and 23.3% report by Njoku-Tony (2011) from Imo abattoirs Nigeria, 27.7% prevalence report by Magaji *et al*. (2014) from Sokoto abattoir but similar to the prevalence report of 13.6% by Usip *et al*. (2014) from Akwa-Ibom abattoirs, 13.4% by Ekwunife *et al*. (2008) from Onitsha, Anambra-State, Nigeria and 17.1% by Aliyu *et al.* (2014) in Zaria, Nigeria. These disparities could be due to differences in the climatic and ecological conditions such as altitude, rainfall and temperature. For instance, Abuja recorded heavy rainfall from 1190 mm to 1590 mm during the period of this study with high movements of water which may have affected the survival of snail habitats and led to the overall prevalence observed in this study (NiMet, 2022). This finding is in agreement with report by Elelu *et al*., (2016). This report

is however contrary to Mas-Coma *et al*., (2005) who reported that prevalence of helminth parasites in cattle is highest in the sub –tropical areas where rainfall is high. The current study recorded a steady increase in distribution rate across the seasons from early dry (15.9%), late dry (19.3%), early wet (31.7%) and late wet seasons (33.1%). This could be because pasture where metacercaria encyst abound during the wet season. This study is in agreement with the report of Mekky *et al.* (2015) that the severity and timing of *Fasciola* species is dependent on the number of metacercaria accumulating on pasture at a particular time with the availability of suitable habitat for the intermediate host. This study also agrees with Njoku-Tony (2011) who reported higher prevalence of *Fasciola* species during the wet season in Imo-state, Nigeria. Njoku-Tony (2011) noted that animals get infected with *Fasciola* species during and after onset of wet season by ingesting these metacercaria which is attributed to the positive relationship between this prevalence and rainfall. Damwesh and Ardo (2012) also reported higher prevalence during the wet season in Adamawa, north-eastern, Nigeria. This study revealed a higher prevalence rate in bulls (52.2%) than in cows (47.8%). The higher number of bulls could be due to more bulls being brought for slaughter while the cows are retained for breeding and milk production. This is in accordance with the findings of Magaji *et al*. (2014). This study also agrees with the studies earlier reported by Idris and Madara (2005) and Obadiah (2010) who reported a higher prevalence rate among the male cattle than the female in Gwagwalada abattoir, Federal Capital Territory, Abuja and Jalingo abattoir, Taraba state, Nigeria. This study is contrary to reports by Affroze *et al.* (2013) with 41.3% and 13.8%, also reports of Onyeabor and Wosu (2014) with 27.82% and 17.82% in cows and bulls respectively. Also study by Rouhani *et al*. (2017) reported that cows are more susceptible to *Fasciola* species due to stress associated with pregnancy and parturition. Although the current study observed more infected bulls than cows but no statistically significant difference was observed between the distribution of *Fasciola* species in relation to sex. The study however is contrary to Rahmeto *et al*. (2010) who noted in their work that bulls and cows have equal susceptibility to infection.

This study showed higher prevalence of *Fasciola* species in adult cattle than the young. Among the age group classified in this study, the young (below 3years) and adult (above 3years), *Fasciola* species prevalence was higher in adult (91.9%) than young (8.1%)

and was statistically significant ($p \leq 0.05$).This study agrees with Iboyi *et al*. (2017) with almost the same report of 8% for young cattle and also by Affroze *et al*. (2013) with prevalence of 33.3% in adult cattle (above 3years) over 11.0% in young cattle (below 3years). The prevalence in age from this study could be due to adult cattle grazing on contaminated areas while travelling their trade routes as against the young ones that are not subjected to long distance movements and this may have reduced their chances of being infected (Food and Agricultural Organization, FAO 2009). This study revealed a higher prevalence of *Fasciola* species in White fulani breed (65.8%) over other breeds; Red bororo (13.5%), Sokoto gudali (12.3%) and Bokoloji (8.5%) across the seasons. These differences could be due to number of cattle breeds examined in the study. Majority of the cattle brought into the abattoirs within the study period were of White fulani breed. This study agrees with report by Biu *et al*. (2006) who found higher prevalence in White Fulani than other breeds. This report contradicted that of Magaji *et al*. (2014) who reported more infection in Red Bororo than other breeds in Sokoto abattoirs.

Body condition scores of the cattle examined in this study had a direct relationship with the distribution of *Fasciola* species and is consistent with report by Stella *et al*. (2017) which revealed that cattle with severe burden of *Fasciola* flukes had their liver damaged with visible skin rashes and poor carcass quality. The presence of liver flukes has been linked with reduced body weight, carcass quality and body conditions which were not reported in cattle without *Fasciola*. This study associated cattle with poor body conditions and higher prevalent rates with the prevalence of *Fasciola* species. It noted that the better the body conditions of the cattle, the lower the infection rate and the lower the percentage scores and vice-versa. This is similar to reports by Bekele *et al*. (2010) who reported *Fasciola* species as a result of severe fluke infection which caused emaciation of the cattle with associated poor body conditions. Results from this study showed the effects of *Fasciola* species on the body conditions of cattle in Abuja, the Federal Capital Territory. This of course will serve as a diagnostic tool and aid in administration of the appropriate anti-helminthic drugs against this parasite.

The outcome of this study validated the relevance of the findings from this study which recorded significant statistical relationship ($P \leq 0.05$) between body condition scores of slaughtered cattle with the level of infection by *Fasciola* species

## Conclusion

This study revealed that *Fasciola* species is endemic in Abuja and that the effects of this parasite and the severity of the infection was observed on these abattoir bound cattle. There is need to carry out collaborative research involving the Ministries of Agriculture and Health to investigate the disease in humans who are the major consumers of these cattle to better understand the zoonotic significance.

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**Conflict of opinion:** None

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