



## **Epidemiological Investigation and Public Health Implications of Fascioliasis in Animals Slaughtered in Delta State, Southern Nigeria**

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### **Abstract**

Fascioliasis is a snail-borne parasitic disease of ruminant animals such as cattle, goats and sheep, horses, and buffalo. It is a threat to the livestock industry in many parts of the world and specifically, Nigeria where animal husbandry is an occupation for many. The aim of this study was to identify the prevalence and risk factors associated with fascioliasis in cattle and goats slaughtered in three towns in Delta State, southern Nigeria, between August 2011 and February 2022. Gross lesions (liver) of animals at post-mortem were also tested for the presence of adult parasites. Faecal and bile samples were obtained and processed using the formal ether concentration technique for the presence of *Fasciola* sp. Gross lesions (liver) of animals at post-mortem were also tested for the presence of adult parasites. Of the 1019 animals comprising 525 cattle and 494 goats examined, a prevalence of 13.5% and 11.5% was recorded for cattle and goats respectively ( $P=0.778$ ). Similarly, of 575 males and 414 females examined, 70(12.2%) and 58(14.0%) were infected respectively, this difference was however not statistically significant ( $P=0.720$ ). With prevalence of 43 (19.1%) and 33 (12.2%) in cattle and goats, respectively aged 2 years and above ( $P=0.030$ ), it was found that infection was more common in older animals. Statistical analysis revealed no correlation between age and sex, risk factors, and the prevalence of infection. Overall prevalence recorded in the study was 12.9% with animals slaughtered in Warri having a significantly higher prevalence (19.05%) than those slaughtered in Obiaruku and Agbor (8.42% and 8.18% respectively) ( $P=0.001$ ). A total of 165 adult worms were recovered from the liver of animals with goats in Obiaruku harboring the highest number (34). This study has reported a moderately high rate of infection of this zoonosis and calls for concern. Treatment of animals regularly, vector control, proper and regular meat inspection as well as public enlightenment are advocated to reduce the public health impact and economic losses due to this disease.

**Keywords:** Prevalence, Fascioliasis, *Fasciola* sp, Cattle, Goat, Delta State.

## Introduction

Fascioliasis is a zoonosis and it is one of the neglected tropical diseases (NTDs) caused by parasitic snail-borne trematodes belonging to the genus *Fasciola*. They infect the liver of various mammals including man hence called 'liver fluke' [1, 2]. Two species *Fasciola gigantica* (tropics) and *Fasciola hepatica* (temperate regions) are responsible for transmission globally and most importantly in Nigeria where both species have been reported [3, 4]. This is very significant as livestock farming is a major source of animal protein, income and livelihood for majority of Nigerians especially rural settlers. Records have it that the livestock industry contributes about 5.2% while the dairy sector contributes about 4.2% to the National Gross Domestic Product (GDP) of Nigeria and South Africa respectively [5,6]. Fascioliasis is a significant issue for domesticated ruminants like cattle, goats, and sheep (although other mammals, including humans, may become unintentional hosts). In most cases, it causes not only significant financial losses (condemnation of liver) annually around the world, but also a lack of animal protein for direct consumption, weight loss, and poor carcass quality of the animals, all of which worsen the socioeconomic situation of rural farmers [7, 8, 9, 10, 11, 12, 2, 13]. Fascioliasis is endemic in 61 countries and has been described as a rising food-borne disease of public health importance and one of the most important parasites of ruminants in many parts of the world [14, 15, 16, 17, 18, 19]. The geographical distribution of fascioliasis has been reported to be determined by the presence and distribution of the *Lymnaea* species which are the

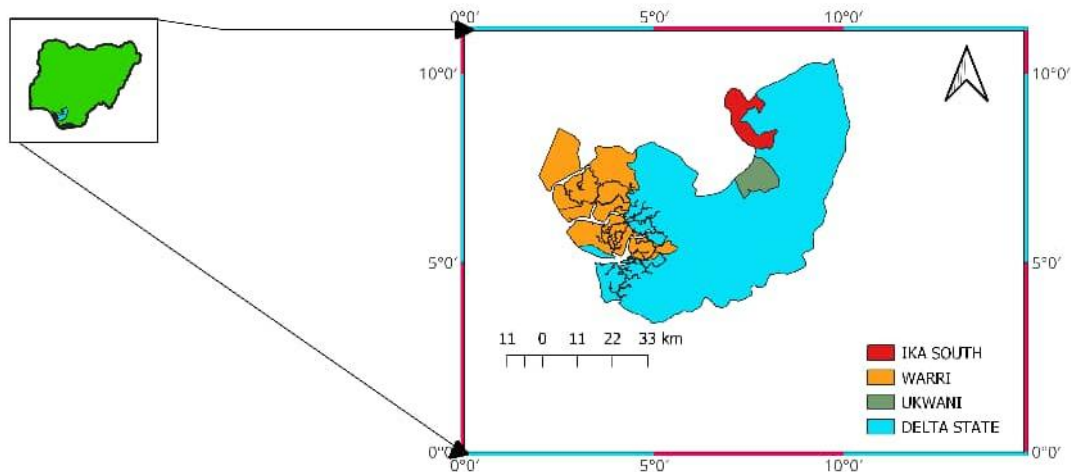
intermediate hosts of the parasite enhanced by favorable climate, weather pattern, increased rainfall and poverty (especially in endemic areas) [19]. [20, 21] and other researchers such as [22, 23, 10, 24, 25] and [26] have documented reports on fascioliasis and the livestock industry in Nigeria.

This current study seeks to evaluate the incidence of fascioliasis in cattle and goats slaughtered in major towns of Delta State, Southern Nigeria, evaluate the public health significance of the disease and make recommendation to appropriate authorities for intervention where necessary.

## Materials and Methods

### Study Area.

This study was conducted in three major towns; Obiaruku, Agbor and Warri in Delta State. The entire study area lies between latitude 6.2057<sup>0</sup>E and longitude 5.5494<sup>0</sup>N as presented in fig 1. Agbor is a commercial and an educational hub, Warri is a well developed urban area described as the oil rich city and Obiaruku is semi-rural characterized more by farming and a few commercial activities due to its proximity to Abraka a university community just a few kilometers from the main town. The three towns share similar characteristics in terms of geography and other social cultural affinities though speak different languages. The total area is characterized by typical wet and dry seasons occurring between March to October as well as November to December respectively with temperatures ranging from 68<sup>0</sup>F and 89<sup>0</sup>F across both seasons.



**Figure. 1: Map of study locations in Delta State**

### **Study Animals and Population**

The study population comprised cattle and goats presented for slaughter at three major abattoirs within the study area and study period.

### **Study Design, Data and Sample Collection**

The abattoirs were visited weekly between the months of August 2011 and February 2022. The abattoirs were visited routinely in the early hours of the morning between 06:00hr and 10:00hrs GMT when animals are brought in for slaughter. All animals presented for slaughter were examined at postmortem. A total Of the 989 animal comprising 525 cattle and 464 goats were examined within the period of study. First, the age, sex, origin and breed of animals were obtained and recorded. Immediately after slaughtering, the livers were examined for *Fasciola* sp following standard practice by making length wise incisions of the ventral side of the liver in such a way that the bile duct is cut open and the bile drained and collected in a test tube and preserved in 10% formalin according to the method of [19]. The exposed worms in the bile duct and gall bladder were removed using forceps, and the flukes that were found (from each

animal) were put in marked containers and transferred to the lab for additional examination, such as identification, counting, and preservation [8]. Fresh stool samples from the rectum were also taken from each animal, covered in sterile containers, and preserved in 10% formalin as explained by [12 and 19] using sterile hand gloves. They were promptly taken to the Department of Animal and Environmental Biology (Parasitology Unit) Laboratory of the Delta State University, Abraka, where they were coded appropriately and examined for the presence of *Fasciola* spp. eggs. The age of the animals was estimated using their teeth according to the method of [27].

### **Identification of Parasites**

Adult fluke collected directly from the liver and bile after incision were measured, recorded and bile content examined for various stages and species of *Fasciola* as described by [28]. Stool samples and bile were further analyzed using the Formol-ether concentration technique as described by [29]. *Fasciola* eggs/ova were identified based on their characteristic large, oval, and yellowish color with a distinct flat operculum as described by [28, 30, and 14]

**Results**

Of the 989 stool samples examined, an overall prevalence of 12.56% was recorded. The prevalence in warri (19.08%) was higher, followed by Obiaruku (8.42%) and while the least was Agbor (8.18%).The difference in prevalence was statistically significant (P=0.001) among the three study areas as shown (Table 1). Cattle recorded a higher prevalence of 13.5% as opposed to goats (11.54%), however, this difference in infection rates was not statistically significant (P=0.778) (Table 2). Furthermore, 5% of female and 0% of male cattle and 133% of female and 9% of goats were infected in Obiaruku. In Agbor abattoir, 10% of both female and male cattle and 11.43% of female and 2.22% of goats were infected. In Warri abattior however, 18.1% of

female and 22.8% of male cattle and 15.25% of female and 16.84% of male goats were positive for fascioliasis. Despite these differences in infection rate among and within species, the differences were not statistically significant (P=0.720) (Table 3). Older animals across species were observed to harbor more infection than younger ones. Infection was higher in cattle (19.1%) > 3 years and least in cattle between 0-1 year (8.5%). Similarly, in goats, older animals (12.2%) were more infected than younger animals (10.3%). These differences was however not statistically significant (P=0.030) (Table 4). With respect to warm burden, a total of 165 adult worms were recovered from the liver of animals from the different locations with goats in Obiaruku recording the highest number (Table 5).

**Table 1:** Overall prevalence of Fascioliasis in Cattle and Goats in selected Towns in Delta State

Towns	Number Examined	Number Positive	Prevalence (%)
Obiaruku	285	24	8.42
Agbor	330	27	8.18
Warri	404	77	19.05
Total	1019	128	12.56

*P*<0.05, *P*=0.001

**Table 2:** Species Prevalence of Fascioliasis in animals slaughtered in selected Towns in Delta State

Towns	ANIMALS			
	Cattle		Goats	
	No. Ex	No. +Ve (%)	No.Ex	No. +Ve (%)
Obiaruku	105	2 (1.9)	180	22 (12.22)
Agbor	170	17 (10)	160	10 (6.25)
Warri	250	52 (20.8)	154	25 (16.23)
TOTAL	525	71 (13.5)	494	57 (11.54)

*P*>0.05; *P*=0.778

**Table 3: Prevalence of Fascioliasis in relation to sex of animals slaughtered in selected towns in Delta**

Towns	Obiaruku				Agbor				Warri			
Animals	Cattle		Goat		Cattle		Goat		Cattle		Goat	
	No Ex.	No. +ve(%)	No Ex.	No. +ve(%)	No Ex.	No. +ve(%)	No Ex.	No. +ve(%)	No Ex.	No. +ve(%)	No Ex.	No. +ve(%)
Male	65	-(0)	95	9(9.47)	100	10(10)	90	2(2.22)	145	3(22.8)	95	6(16.84)
Female	40	2(5)	85	13(15.29)	70	7(10)	70	8(11.43)	105	19(18.1)	59	9 (15.25)
Total	105	2(1.9)	180	22(12.22)	170	7(10)	160	10(6.25)	250	52(20.8)	154	25(16.2)

*P* > 0.05, *P* = 0.720

**Table 4: Prevalence of Fascioliasis in relation to Age of animals slaughtered in abattoirs in selected towns in Delta State.**

Age (Years)	Animal Species			
	Cattle		Goat	
	No Ex.	No +ve(%)	No Ex.	No +ve(%)
0 - 1	130	11(8.5)	145	15(10.3)
1 - 2	170	17(10)	79	9(11.4)
>2	225	43(19.1)	270	33(12.2)
TOTAL	525	71(13.5)	494	7(11.5)

*P* < 0.05; *P* = 0.030

**Table 5: Worm burden of fascioliasis in Cattle and Goats from slaughtered in selected towns in Delta State**

Towns/Animal sp	Obiaruku	Agbor	Warri
Cattle	31	32	28
Goat	34	18	22

## Discussion

The overall prevalence of 12.26% and species prevalence of 13.5% and 11.54% for cattle and goat respectively recorded in the study though moderately high is comparable with reports from other parts of Nigeria. [8] reported a prevalence of 10.51% for cattle in Onitsha, Anambra state. Other reports include those of [31, 30, 18, 32, 1, 33 and 2] who reported prevalence rates of 21.8%, 37.89%, 28.42%, 17.1, 29.8% , 7.07% and

19.2% in Adamawa, Ebonyi, Sokoto, Kaduna, Bauchi , Ondo and Edo states respectively in cattle. Results from this study are also not different from previous studies on goats where prevalence of 27.36% [34] 16.0% [12] and 6.19% [19] has been documented across Nigeria. The prevalence recorded in this study calls for concern. Regular influx of cattle and other livestock from the northern part of the country could be a major reason for this level of infection

as most of these animals are already infected. Another reason for this level of infection could be the fact that the ecological conditions of Delta state characterized by adequate temperature, rivers and presence of freshwater snail intermediate host may have contributed to the transmission dynamics [35]. However, it is possible to generalize that the observed variations in prevalence across the county are due to a number of factors, including the animal's source and health status, the availability of intermediate hosts like snails, the climatic and environmental conditions that favor disease spread, and abattoir management [36, 8, 37, and 12]. Furthermore, even though the Agbor main abattoir is bigger, the Warri abattoir recorded a higher prevalence. This could be as a result of the larger sample size from that abattoir, the source of the animals and also can be attributed to the poor abattoir facility characterized by poor sanitation, lack of good and adequate water supply as well as poor meat inspection as observed during the periods of study. This finding is in agreement with [33] who reported a higher prevalence in private abattoirs than public or government owned abattoirs and attributed this to poor meat inspection practices in such abattoirs.

In addition, the higher prevalence recorded in cattle than in goats in this study is similar to reports of [34 and 38]. This result further corroborates the thinking that cattle are more susceptible to fascioliasis than goats especially when infection is attributed to *F. gigantica* which has been established as the most prevalent specie in West Africa [38]. Furthermore, female animals (both cattle and goats) were more infected than males except in Warri where more males were infected and this can be due to the higher numbers of male animals slaughtered than females in that abattoir. The result from this study of female animals being more susceptible to fascioliasis is in agreement with [39, 40, 33 and 12] but disagrees with [41 and 42] who reported higher prevalence in males in cattle and goats from Bangladesh and Sokoto respectively. Even though a number of authors have established a relationship between host sex and the intensity of helminths infection [43, 44], this current study has revealed no

significant difference in rate of infection across sex. However, differences in susceptibility to infection between sexes has been suggested and might be as a result of several factors some of which are related to genetics, physiology and immunology of animals as well environmental factors and management practices [11, 34]. Furthermore, across species, older animals were more infected than younger one. This finding is consistent with reports of [31, 42, 45 and 6] which possibly is a reflection of the long period of exposure to risk factors and probably decreased immunity as the animal grows older [46, 47]. However, [48] documented a significant difference and inverse correlation between infection and age in Ethiopia while [18] also documented higher infection in younger animals and attributed this to the fact that calves are more susceptible to high doses of metacercariae than adults.

## **Conclusion and Recommendation**

Findings from this study have established the occurrence of fascioliasis in the three locations under review and this is one of the very few reports on fascioliasis from this region. This is worrisome considering the level of infection recorded and the economic loss that can be inferred from the number of adult worms recovered from liver tissues which will eventually be destroyed. There is therefore need for swift intervention from all concerned as this could pose a major public health problem. Government support in terms of provision of basic amenities such as clean water and improved sanitation in and around abattoirs, improvement of management practices, regular meat inspection at slaughter, destruction of snail intermediate hosts which usually abounds during the rainy season, periodic treatment of ruminants with anthelmintics and public enlightenment on this disease are recommended to curb this neglected tropical zoonosis in the area.

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