International Journal of Biomedical and Health Sciences
Vol. 1, No. 1, March 31, 2005
Printed in Nigeria

IJBHS 2004026/1101

Vector Competence and Prevalence of *Fasciola gigantica* in Cattle Slaughtered in Gwagwalada Abattoir, Abuja, Nigeria

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(Received September 29, 2004)

Abstract: Study on the prevalence of *F. gigantica* in slaughtered cattle in Gwagwalada abattoir was carried out over a period of fifteen (15) weeks, (January-April, 2004). A total number of 263 cattle were examined during the study period, consisting of 153(58.18%) males and 110(41.83%) females within the age range of 4 years and 13 years. Faecal samples obtained were analyzed using Formol-ether technique for the presence of eggs, while fresh liver samples were examined by direct pressing of flukes out of ducts or by incising the bile ducts length-wise. An overall prevalence rate of 54.00% was recorded during the study. There was a statistically significant relationship ($P<0.05$) between infection rate and the months of the year the study was carried out. The percentage infection according to the months was January 51(37.50%), February 34(53.97%), March 29(74.36%) and April 28(48.28%). Sex-specific rates showed a statistically significant relationship ($P<0.05$), with 75(49.02%) recorded infection in male and 67(60.91%) in female cattle. A high prevalence rate 27(56.25%) was observed in cattle of 8 years of age, while least prevalence was in cattle of the age 12 years (33.33%).No significant relationship ($P>0.05$) existed between the age specific rates. Out of the 183 snail species sampled in Gwagwalada Area Council, 98(53.55%) were *Lymnaea natalensis*, 16(8.74%) were *Melanoides tuberculata*, 22(12.02%) were *Biomphalaria pfeifferi*, 36(19.67%) *Bulinus globosus* and 12(6.56%) were Clams**.** Cercarial shedding in *L. natalensis* recorded 35.65%**.** Control measures such as reduction of worm burden through chemotherapy and eradication or reduction of snail intermediate host population will help to reduce high rate of infection with *F. gigantica* of livestock in Gwagwalada Area Council.

Key Words: Liver fluke; *Fasciola gigantica*; Vector competence; Prevalence rate; Abattoir; Abuja; Nigeria.

Introduction

The liver fluke, *Fasciola gigantica* is an important animal parasite that inhabits the liver and bile ducts of domestic and wild ruminants such as Cattle, Sheep, Swine, and some mammals and occasionally Man (WHO 2001). It is of great veterinary importance, causing the disease condition called *Fascioliasis* or liver rot in cattle. Cattle are a major source of meat for the people of Nigeria, but the animals serve as definitive host for numbers of trematode parasite, which includes *Fasciola gigantica.* Losses, as a result of the disease is enormous because of mortality, condemned livers, reduction of milk and meat production, secondary bacterial infections and expensive antihelminthic treatment (Schimdt and Roberts, 1985).

F. gigantica causes serious growth retardation in cattle in Nigeria. The danger from these parasites is undoubtedly greatest where large herds are kept especially where overstocking occurs. Thus, our expanding

cattle industry calls for extensive studies of *F. gigantica* infections in order to make sound recommendations for the control of this parasite. The life cycle of *F. gigantica* requires fresh water snail of the genus *Lymnaea natalensis* that serves as an intermediate host. According to WHO, (2001) urbanization, migration and development practices such as dam building and irrigation have increased the population at risk and the infection rate are high enough to make *F gigantica* infection a serious public health concern.

There is, therefore, need to conduct a study on the prevalence of *F. gigantica* in local foci such as Gwagwalada Area Council in order to ascertain its prevalence. There is also a need to create awareness and provide information on the degree of faecal contamination in the study area. Consequently, the researches will proffer control measures and management of ruminants' parasitic helminthes infection particularly that of *F. gigantica*.

This research work therefore, aims at studying the prevalence of *F. gigantica* in Gwagwalada Area Council through the Isolation and identification of eggs of *F. gigantica* from faeces, adult flukes from bile ducts of slaughtered cattle from the abattoir and in the snail vector. It will also determine the relationship between infection rate and age and sex of cattle.

Materials and Methods

The survey was concentrated in Gwagwalada town abattoir in Gwagwalada Area Council. It is one of the six (6) municipal councils under the Federal Capital Territory, Abuja and is located on the latitude 800°N and longitude 700°E in the woodland savannah region of the middle belt. It has moderate annual rain fall of 2500-3000mm. Gbagis are known as the indigenes, but of the three major ethnic groups living in Gwagwalada, the Hausas and Fulanis predominate. Farming is the principal occupational activity of the people, though the neighboring villages more extensively practice it.

Study Population

A total number of 263 fresh liver and faecal samples from slaughtered cattle within the age range of 4 and 13 years were examined for a period of 15 weeks (January to April, 2004). Faeces were collected manually from the rectum of the slaughtered cattle or fresh samples as soon as the cattle voided them. Small specimen bottles with tight rubber cap were used to put the faeces after adding 10ml of formal saline. Each bottle was fully labeled with a particular number ascribed to each cattle. For each cattle sampled, the liver was equally examined for adult fluke. Once a case is determined the liver is labeled taken to the laboratory for fluke isolation, identification and preservation.

The faecal specimens were equally immediately taken to the laboratory for analysis. When analysis could not be completed on the same day, the specimens were placed in refrigerator at a temperature of 0° C (Okon *et al*., 1980).

Snail Survey

A survey of fresh water snails was equally conducted in Gwagwalada Area Council, where three randomly selected sites were used. Scooping net technique for a period of 15 minutes with a long handled scoop net was carried out (Idris and Ajanusi, 2002). The scooped snails were emptied into a Kilner's jar and taken to the laboratory for identification and cercariae shedding.

Parasitological Analysis

In the laboratory, each of the faecal specimens was examined for the presence of eggs using Formal-ether concentrated method as described by Schillhorn van Veen (1979). An estimated 10g of fresh faecal material was mixed with 15 ml of normal saline to emulsify faeces. The suspension was strained / filtered through layers of clinical gauze into a 15ml conical centrifuge tube. The suspension was centrifuged in the conical centrifuge tube for 5 minutes at 1500rpm, the supernatant was decanted and the process repeated. Ten ml of 10% formalin was added to the sediment, mixed and allowed to stand for 5 minutes. Additional 3ml of diethyl ether was added to the suspension. The tube was covered with a stopper, and shaken

vigorously. The cork stopper was carefully released after shaking and centrifuged for 2 minutes at 1500rpm. An applicator-stick was used to remove the plug of fatty debris and ether that was formed at the top of the tube and the supernatant poured-off leaving the sediment for examination. A drop of 2% aqueous iodine was added to the sediment and mixed thoroughly, and a drop taken on a slide, covered with a cover slip. The slide was examined under microscope using X40 objective lens.

Histological Analysis

For the histology of liver, only livers from freshly slaughtered cattle were examined. Liver specimens were washed in distilled water before cutting into transverse slices, while bile ducts were cut open lengthwise. Worms adhering to the cut surface or pressed out of ducts were recovered and put into bottle containing formalin. Only flukes and head ends of mutilated ones were counted and recorded. The liver examination was done between January and April 2004.

Cercariae Shedding

Live snails were transferred into Petri dishes with 5ml of distilled water, a light source was used and observed for cercariae shedding under a dissecting microscope.

Data Analysis

Data were analyzed using Chi-square to determine the prevalence of *F. gigantica* infection. A case is when the egg of *Fasciola gigantica* is recovered from the faeces or an adult fluke is isolated from the liver (Plates 1 and 2) or cercariae shedding from snail.

Plate 1: *Fasciola gigantica* Adult Worm isolated from the liver X2

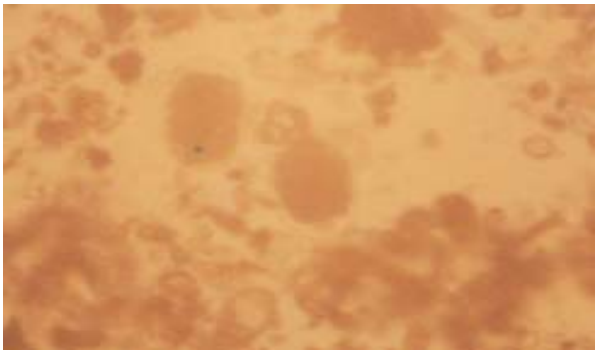

Plate 2: Eggs of *Fasciola gigantica* isolated from faeces X100

Results

The overall result showed that of the 263 cattle examined, 142 (54.00%) were infected with *F. gigantica.* Out of the 263 cattle examined, 103 were examined in January 63 in February 39 in March and 58 in April, with infection rates in these months were 51(49.52%), 34(53.97%), 29(74.36%), and 28(48.28%) respectively A statistically significant relationship (P<0.05) existed between infection rate and month of study (Table1). Sex-specific rates of 75(49.02%) and 67(60.91%) were recorded in the 153 male and 110 female cattle examined respectively (Table 2).

Table 1: Prevalence rate of *Fasciola gigantica* infection in slaughtered cattle in Gwagwalada abattoir, Abuja.

Month of Survey	Number Examined	Number Infected (%)
January	103	51 (49.52)
February	63	34 (53.97)
March	39	29 (74.36)
April	58	28 (48.28)
Total	263	142 (54.00)

$\chi^2 = 8.52$, df = 3, P < 0.05.

The sex-specific rates for males in January were 29(45.03%) while that of females was 22(55.00%). In February 19(50.00%)males and 15(60.00%) females were infected. In March, 13(61.91%) and 16(88.89%) were recorded for males and females respectively, while in April 14(45.16%) and 14(51.85%) males and females were infected respectively. There was a significant difference (P<0.05) between the sex-specific rates.

Table 3 shows the age-specific rates with high rates (56.25%, 57.90% and 87.50%) observed in the 8 years, 10 years and 11 years respectively. No significant relationship (P>0.05) existed between the age-specific rates.

Out of the 183 snail species sampled in Gwagwalada Area Council, 98(53.55%) were *Lymnaea natalensis*, 16(8.74%) were *Melanoides tuberculata*, 22(12.02%) were *Biomphalaria pfeifferi*, 36(19.67%)

Bulinus globosus and 12(6.56%) were Clams (Table 4). Of the 98 *L. natalensis* isolated, 32 (32.65%) were infected.

Table 2: Prevalence rate of *F. gigantica* infection according to sex of slaughtered cattle.

Month of Examination	Male		Female	
	No. Examined	No. Infected (%)	No. Examined	No. Infected (%)
January	63	29 (45.03)	40	22 (55.00)
February	38	19 (50.00)	25	15 (60.00)
March	21	13 (61.91)	18	16 (88.89)
April	31	14 (45.16)	27	14 (51.85)
Total	153	75 (49.05)	110	67 (60.91)

$\chi^2 = 4.78$, df = 1, $P < 0.05$.

Table 3: Prevalence rate of *Fasciola gigantica* by age of slaughtered cattle in Gwagwalada abattoir, Abuja.

Age in Years	Number Examined	Number Infected (%)
4	2	1 (50.00)
5	31	15 (48.39)
6	65	34 (52.31)
7	59	30 (50.85)
8	48	27 (56.25)
9	27	15 (55.56)
10	19	11 (57.90)
11	8	7 (87.50)
12	3	1 (33.33)
13	1	1 (100.00)
Total	263	142 (54.00)

$\chi^2 = 14.87$, df = 9, $P > 0.05$.

Discussion

The factor associated with the high prevalence rate of *F. gigantica* (54.00%) in Gwagwalada Area Council is the prevalence of the fresh water snail intermediate host *Lymnaea natalensis* (53.55%) in two of the three sites screened. The occurrence of potholes of water along riverbanks and leaf debris, moderately short grasses create a favourable environment for the survival of the snail host. Schmidt and Roberts (1985) also associated the prevalence of fascioliasis with nutritional requirement, availability of snail host and the

life cycle of *F. gigantica*. We must not rule out the fact that the cattle may have acquired the infection elsewhere as they travel great distances and may have come across high-risk areas. Hence, these cattle are driven through vast distances in response to the seasons in search of pasture and water. Cattle, sheep, and goat become infected by ingesting metacercariae while grazing during this period of search for better pasture. This seasonal drift is largely believed to have contributed to the high prevalence recorded in this study. It is also believed that one of the contributing factors to this high prevalence is that cattle examined have been infected many seasons ago, or having repeated infections since under natural conditions animals are exposed to repeated infection.

Table 4: Freshwater snail distribution in three sites in Gwagwalada Area Council, Abuja.

Sites	Snail species collected	Cercariae shedding
1	*Melanoides tuberculata* (16)	Not observed
	Bulinus sp. (36)	Not observed
2	*Lymnaea natalensis* (70)	27 shed cercariae
	Biomphalaria pfeifferi (17)	Not observed
3	*Biomphalaria pfeifferi* (15)	Not observed
	Clams (12)	Not observed
	Lymnaea natalensis (28)	05 shed cercariae

High prevalence rate (54.00%) obtained by sampling of slaughtered cattle over the period covered a range of months when prevalence is usually high. According to McCullough(1965) and Schillhorn van Veen (1980a) in the savanna of West Africa reported that snails population density reaches its climax at the middle of the dry season. In Nigeria, Lymnaeids snails have focal distribution with their habitats scattered over a wide area (Ukoli and Asumu,1989; Idris and Ajanusi, 2002). *Fasciola* infection with snails could have occurred throughout the year particularly between January and April as the case may be (dry months) and this is attributed to the fact that livestock (cattle, sheep, goat) come to reservoirs for water during dry seasons. There was a significant difference in the monthly prevalence statistically ($P < 0.05$). Highest prevalence was recorded in January and February agreeing with literature.

The sex – specific rates between male and female cattle were significantly related ($P < 0.05$) though both sexes move together in search of food and water. They are, therefore both exposed to equal risk of infection. In this study the number of females observed against males was lower and this may be due to the fact that female cattle are allowed to live longer than their male counterparts for the purpose of procreation, and might have been receiving more attention health wise than the male ones for better productivity.

Age – specific rates of cattle examined in this study is of statistical significance ($P < 0.05$). It could be assumed that cattle between the age range (8, 10 and 11 years) have not been administered anti helminthic drugs, while younger cattle are showed much attention in order to obtain better productivity. Another contributing factor could be reasoned that older beef cows from liver fluke disease areas are often treated at a maintenance level just to get a calf before they are culled. Preston and Castelino (1979) stressed clearly that liver fluke disease do not infect livestock of different ages exposed to endemic area equally. They maintained that this is attributed to the systemic resistance to liver fluke damage as related to pattern of nutrition to age. However, Schillhorn van Veen (1979) stated that in many parts of tropical Africa, that there is the possibility of masking the full effect of fascioliasis by culling infected animal prematurely before the full effect of the disease becomes apparent. Slaughtering and selling of meat largely done privately by individual owners with very limited supervision from the health authorities may also be another contributing factor in Gwagwalada Area Council.

References

Idris, H. S. and Ajanusi J. O. (2002). Snail intermediate host and the aetiology of schistosomosis in Katsina State, Nigeria. *The Nigerian Journal of Parasitology*.23(1&2):

McCullough, F.S. (1965). *Lymnaea natalensis* and fascioliasis in Ghana. *Annals of Tropical Medicine and Parasitology*. 59(3), 320-326.

Preston, J., M and Castelino, J.B. (1977). A study of the epidemiology of bovine fascioliasis in Kenya and its control: *British veterinary journal*, 133(6), 600-608.

Schillhorn Van Veen, T.W. (1979). Bovine fascioliasis (*Fasciola gigantica*) on the Ahmadu Bello University farm, *Tropical Animal Health production*, 11(3), 151-156.

Schillhorn Van veen, T.W. (1980a). Dynamics of *Lymnaea natalensis* populations *in* the Zaria area (Nigeria) and the relation to *Fasciola gigantica* infections, *Acta Tropical*, 137, 183-194.

Schmidt, D. G. and Roberts, L. S. (1985). *Foundation of Parasitology*. 3rd Edition. C. V. Mosby Company. 275-327

Ukoli, F.M.A., and Asumu, DI. (1979).Freshwater snails of the proposed Federal Capital Territory in Nigeria, *Nigerian Journal of Natural Science*,1(1),49-58.

World Health Organization Fact Sheet (2001):"Human fascioliasis in some countries of the Middle Eastern Region". New opportunities for the control and combat an age-old disease. <http:/www.emro.who.int/publication/emly/04 01/24.htm>.