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Fascioliasis in Cattle Slaughtered for Human Consumption in Minna Metropolis, Niger State, Nigeria

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Abstract
A survey was conducted to determine the prevalence and intensity of fascioliasis among cattle slaughtered for human consumption in Minna metropolis, Niger State, Nigeria. A total of 405 cattle were examined for twenty one weeks in the months of May-September, 2012, for fascioliasis. The result showed that 131 cattle were infected with *Fasciola gigantica*, giving the overall prevalence rate of 32.3% in Minna. The overall Geometric Mean Intensity (GMI) of infection of 133.8 eggs per gram of faeces (epgf) was obtained. The study showed high prevalence rate and intensity of infection. There was no significant difference in prevalence of the disease between male (25.0) and female (39.2 %) ($p > 0.05$). The intensity of infections between male and female cattle was, however, significantly different, higher in cows (137.6 epgf) than in bulls (127.8 epgf) ($p < 0.50$). Only *F. gigantica* was encountered in the cattle studied. The high prevalence and intensity of infection observed in the study have serious economic implication on cattle production.

Key words: Prevalence, GMI, *Fasciola gigantica*, Cattle, Minna metropolis.

Introduction

One of the most neglected food-borne-diseases in the international public health arena is fascioliasis [1]. The disease is caused by two digenetic trematodes (*Fasciola hepatica* and *F. gigantica*), commonly called liver flukes, belonging to the genus *Fasciola*: Family, Fasciolidae. These two species are the economically recognized ones in the temperate region [2]. Fascioliasis, a zoonotic disease of domestic herbivorous animals such as sheep, cattle and goats, which are the definitive hosts, is caused by infection with the liver fluke, *Fasciola hepatica*. Humans become infected by eating uncooked, and usually unwashed, aquatic vegetables on which larval parasites are encysted. Although animals can support enormous worm burdens without developing serious disease, *Fasciola* species can cause severe, even fatal disease in humans [3].

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In the past, fascioliasis was limited to populations within well-defined watershed boundaries; however, recent environmental changes and modification in human behaviour are defining new geographical limits or widespread throughout the world and increasing populations at risk [4; 1]. *Fasciola gigantica* measures 4 – 10 cm in length and the distribution of the species is limited to the tropics and has been recorded in Africa, Middle East, Eastern Europe and South and Eastern Asia [5].

Fascioliasis in tropical and subtropical countries limit productivity of ruminants, particularly cattle [6; 7; 8; 9; 10]. Apart from its great veterinary importance throughout the world, it is also a known zoonosis, affecting a number of human population [11; 12]. A large variety of animals such as sheep, goats, cattle, buffalo, horses, donkeys, camels, and rabbits, show infection rates that may reach 90% in some areas [13]. A four-year (2009 - 2012) research work at Alkadroo Abattoir in Sudan by Mohamed [14] revealed that the prevalence of fascioliasis among cattle was as high as 91%. In Egypt, donkeys and camels as well, are hosts for *F. gigantica* [15]. Fascioliasis may occasionally affect man. Human infection causes serious hepatic

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pathological sequences that add to the already known threats to the liver of the Egyptian population. Two clinical stages are recognized in human fascioliasis. Also, in Egypt, human infection with fascioliasis was very sporadic until the last three decades when clin ical cases and outbreak were reported [15]. H uman infection causes serious hepatic patholo-gical consequences due to the severe damage which occurs in the liver cells mainly during the early migrating stages of the flukes. The disease affects the general immune status of the animal, and there is no accurate method for early diagnosis before time of egg deposition adopted [16]. Hence, there is now a need to control the human infection along with the veterinary infection [17]. The disease is a fresh water lymnaeid snail borne, particularly members of genus *Lymnaea*, with widest latitudinal and longitudinal distribu-tion [18]. In Europe, America and Oceania, only *F. hepatica* is present, but distribution of both species overlap in Africa and Asia [19]. As a zoonotic disease, fascioliasis is of high public health importance due to its worldwide distribution, high incidence in endemic areas, infecting all classes of grazing animals and the rearers (humans) as well as causing extensive financial waste and thus, becoming a major concern to the world animal industry [20]. Economic losses result from death, inefficient use of feeds, low meat and milk production, condemnation of livers by veterinarians, the cost of treatment and control programme, predisposition to other diseases, restricted use of infected lands and protein deficiencies [21]. Meat derived from cattle, sheep and goat provides major sources of animal protein for the populace of Nigeria [22].

In the tropical countries, information about *Fasciola gigantica* infections in animals is derived from abattoir records of slaughtered animals particularly bovine. The abattoir-based researches on prevalence of *F. gigantica* among cattle revealed varying degrees of prevalence. In Abeokuta, Ogun State, Western Nigeria, [23] recorded 15.52%; Ejima and Ugberaese [24] in Idah, Kogi State, Middle Belt, Nigeria, 89.0%. Other workers recorded overall, Geometric Mean Intensity (GMI) of infection of 21.7 per gram of faeces (epgf) was recorded in Idah, Kogi State; Elkannah [25] in Jalingo, Taraba State, 20.95%; and Olusegun-Joseph et al. [26] in Zaria, Northern Nigeria, 52.1%. The disparity in prevalence of *Fasciola gigantica* infection in different regions could be attributed to variations in prevailing factors such as standard of living and poor sanitary conditions [27; 28]. Solomon [29], reported that the male hosts are more susceptible to some helminth infection than the females. Larry et al. [30] support the fact that the incidence of helminth species is influenced by the sex of the host.

The work of Biu et al. [31] in Maiduguri abattoir revealed prevalence of fascioliasis among cattle of 80.8%; and data on estimated loss in naira equivalent and condemnation in weight (kg) showed that fascioliasis had 539.41 kg with an estimated economic value of ₦188,804. In the same vein, an assessment of 123,790 cattle in Tanzania by Mwabonimana et al. [32], revealed that 8,302 (6.7%) examined livers were condemned due to fascioliasis. Also, in Tanzania, high prevalence rate (87%) of fascioliasis among cattle was recorded by Swai and Ulicky [8]. Simwanza et al. [6] recorded that out of 118,477 cattle that were slaughtered in Western Province of Zambia, 24,060 (20.77%) whole livers were condemned due to fascioliasis, resulting in a direct financial loss of approximately ZMK 1.2 billion which is currently equivalent to approximately US$ 245, 000.

Estimation of economic losses due to fascioliasis at national level is limited by lack of accurate estimation of the prevalence of the disease. Published data on animal and human fascioliasis are lacking in Minna, Niger State. Nigeria. No study has been undertaken to ascertain the prevalence and

intensity of liver fluke infections in slaughtered cattle for human consumption in Minna metropolis, Niger State, Nigeria. Hence, the aim of this study is to determine the prevalence and intensity of fascioliasis in cattle slaughtered for human consumption in Minna metropolis, Niger State, Nigeria. The findings would provide baseline information on the status of the disease in the area and thus form the basis for preventive and control measures.

Materials and Methods

Study Area

The research is limited to Minna in Niger State. Minna is a city with an estimated population of 304,113 (2007 census) in west central Nigeria. It is the capital of Niger State; one of Nigeria's Federal States and is the headquarters of Chanchaga Local Government area. Minna lies between longitude 6°33'E and latitude 9°37'N extending from the north by its boundary with Bosso local government at km8 from centre of Minna town and it is bounded on the east by Bosso extending to the south and west.

Sample Collection

Samples were collected twice weekly between the hours of 6.30 am and 8.30 am at the Minna main abattoir where cattle are slaughtered daily. The exercise was conducted for 21 weeks between the months of May and September, 2012. Cattle are brought to the abattoir and killed, by butchers who skinned them off, split the bowel open, thus revealing the small intestine, stomach, duodenum, caecum and liver from where the faecal samples as well as the live flukes were separately collected. The collected specimens were kept in labelled screw-capped specimen containers and brought to the laboratory (Biological Sciences Department-Parasitology/Entomology Unit, FUT, Minna) for analysis. The live worms were collected by cutting open, the hepatic region close to the bile duct secretion with the aid of a knife and pressing hard to release the live *Fasciola* worm. The live *Fasciola* worm collected was washed with water to remove the blood and preserved in 10% formalin.

Analysis of the Faecal Samples

From each of the specimen containers, labelled as bulls and cows, 3g of faecal samples was weighed and emulsified in 45ml formalin [33; 34] The mixture was strained through double layers of fine mesh cheesecloth and then the strained mixture was transferred to a 15ml centrifuge tube, and centrifuged at 1500 to 2000 rpm for 2 minutes. The supernatant was discarded and the sediment was re-suspended in 45ml of formalin and subjected to further centrifugation at 2000 rpm for 1 minute. This procedure was repeatedly done until a clear supernatant was obtained. The supernatant was then decanted and the sediment was then transferred to a microscope slide by pipetting 0.15ml and covered with a cover slip and viewed under x 10 objective lens of the microscope for the characteristic eggs of *Fasciola.* The eggs were systematically sought for and counted. Identification of eggs isolated from the faecal samples was done following the description note given by Blacklock and Southwell [35]. The faecal sedimentation technique employed in this study was in accordance with the method adopted by Ejima and Ugberaese [24]. Quantitation of the *Fasciola* worm load was done by estimating the number of eggs in 1g of faeces. Since, the dilution of faeces (3g in 45ml of formalin is 1 in 15) and since the 0.15ml is one hundredth ($1/100^{th}$) part of 15, the number of eggs present in the sample of 0.15ml quantified by multiplying by hundred (100); representing the number of eggs present in 1g of faeces.

Statistical Analysis

The prevalence of *Fasciola gigantica* among bulls and cows were compared statistically, using Chi-square (χ^2) while the geometric mean intensity of infection between the two sexes was evaluated for significant difference using Wilcoxon paired sample T-test [36].

Results and Discussion

Table 1 shows the prevalence and geometric mean intensity (GMI) of eggs per gram of faeces (epgf) of *Fasciola gigantica* infection in Minna metropolis, Niger State. A total of 405 cattle were examined and 131 (32.3%) were infected with fascioliasis due to *F. gigantica* and overall GMI of 133.8 was recorded. The results showed that prevalence of infection was not significantly different between male (bull/♂, 25.0%) and female (cow/♀, 39.2%) ($p > 0.05$). It also revealed that the highest prevalence rates, 35.6% and 53.8%, were recorded for male and female cattle in the months of July and June respectively. Also, the highest prevalence (39.2%) recorded for the pooled data (male & female) was in the month of June. This peak of infection rates also coincided with the peak of rainfall in this region. The highest Geometric Mean Intensity (GMI) (192.2 epgf) recorded for both sexes was however, in the month of May (Table 1).

Table 1: Prevalence and Intensity of *Fasciola gigatica* Infection among Cattle in Minna, Niger State, Nigeria

	(♂)					(♀)					GT	♂ & ♀			GT
Month	No. bulls of ♂ Exa-	No. of ♂+ve	Prev. (%)	95% CL	GMI (epgf)	No. of ♀ Exa-	No. of ♀ +ve	Prev. (%)	95% CL	GMI (epgf)	No. of ♂& ♀ examined	No. ♂& ♀ +ve	Prev. (%)	95% CL	GMI (epgf)
May	36	1	2.8	0.03-0.08	200.0	44	7	15.9	0.04-0.28	191.2	80	8	10.0	0.07-0.13	192.2
June	50	12	24.0	0.12-0.36	157.8	52	28	53.8	0.40-0.67	164.4	102	40	39.2	0.34-0.44	162.4
July	59	21	35.6	0.36-0.62	146.2	62	25	40.3	0.28-0.53	123.7	121	46	38.0	0.33-0.43	133.5
August	36	11	30.6	0.16-0.46	124.1	34	14	41.2	0.24-0.58	116.7	70	25	35.7	0.31-0.40	119.7
Sept	15	4	26.7	0.04-0.05	121.7	17	8	47.1	0.23-0.71	103.2	32	12	37.5	0.33-0.42	117.5
Total	196	49	25.0	0.19-0.31	127.8	209	82	39.2	0.33-0.46	137.6	405	131	32.3	0.28-0.37	133.8

Key: ♂ **- Male (bull);** : ♀ **- Female (cow); ♂& ♀ - Male & Female cattle; Examined; GT – Grand Total**

Difference in prevalence level of *Fasciola gigantica* among bulls (♂) and cows (♀) was not significant statistically ($P > 0.05$; $\chi^2_{cal} = 9.435$; $\chi^2_{tab\ 0.05;\ DF} = 4 = 9.488$). The geometric mean intensity (GMI) of infection between the two sexes of cattle was, however, significantly different, higher in cows (137.6 epgf) than in bulls (127.8 epgf) (Tcal. = 1; $T_{tab.\ 0.50} = 4$; DF =5) ($P < 0.50$).

Discussion

Fascioliasis is considered an important parasitic disease of ruminants and has been implicated as the commonest infection of the liver, leading to liver condemnation. The overall prevalence of *Fasciola gigantica* infection recorded among cattle in Minna metropolis was relatively high when compared to the overall prevalence rates 15.2% recorded by Idowu et al. [23] in Abeokuta, Ogun State, Nigeria: 20.95% by Elkannah [25] in Jalingo, Taraba State, Nigeria, and 6.7% by Mwabonimana et al. [32] in Tanzania. In contrast, the overall prevalence of 52.1% recorded by Olusegun-Joseph et al. [26] in Zaria, Kaduna State, Nigeria, and that of Ejima and Ugberaese [24], 89.0% in Idah, Kogi State, Nigeria were comparatively higher.

The disparity in prevalence of *Fasciola gigantica* infection in different regions could be attributed to variations in prevailing factors such as standard of living and poor sanitary conditions [27; 28]. The study showed high prevalence rate and intensity of infection. There was no significant difference in prevalence of the disease between male (25.0 %) and female (39.2%) ($p > 0.05$). The intensity of infections between male and female cattle was however, significantly different, it was higher in cows (137.6 epgf) than in bulls (127.8 epgf) ($p < 0.50$). The higher intensity of infection in cows than bulls may be due to difference in their

feeding habits; females require more calories of food due to parturition and breast feeding of their young ones and therefore graze more on all kinds of vegetations that may be highly contaminated with infected faecal samples [24]. Moreso, cows are restricted in movement especially when they give birth to their young ones in other to breastfeed them and the confined ranch where they are kept during this period may be contaminated with infected faecal samples, leading to reinfection.

On the contrary, there are some reports suggesting that male hosts are more susceptible to some helminth infection than the females [29]. Nevertheless, these conflicting observations and other studies [30], all support the fact that the incidence of helminth species is influenced by the sex of the host. The disparity in susceptibility to helminth infection between the two sexes could be connected with the differences in the host intrinsic factors (genetics, physiology and immunology) and extrinsic factors (environment and management practices).

The data recorded on external measurements agrees with the findings of Torgerson and Claxton [5], who recorded that *F. gigantica* measures 4 – 10 cm (in length). An overall intensity of infection of 133.8 eggs per gram of faeces (egpf) recorded in this work was considered moderate when compared to other intestinal worms. Mas-coma et al. [37] categorized intensity of infection of intestinal trematode (*Fasciola sp.*) < 100 epgf as light infection; 101- 400 epgf as moderate infection and > 400 epgf as heavy infection.

Only *F. gigantica* was encountered in the cattle studied and was in line with the observations of Mas-coma et al. [38] who reported that *F. gigantica* is better adapted as parasite of cattle than *F. hepatica* in Africa.

Findings from this work has shown the prevalence of *F. gigantica* infection in cattle slaughtered at Minna main abattoir which have great economic impact on both cattle and humans. The baseline information provided will, no doubt, be useful for planning control measures against the disease in Minna.

Conclusion

The study showed relatively high prevalence (32.3%) of Fascioliasis due to *Fasciola gigantica* in Minna and also revealed that the disease thrives better in cows {♀} than in the bulls (♂). Hence, it is pertinent to recommend here that basic health education on the epidemiology of fascioliasis infections be instituted by the government; improvement in standard sanitation so as to forestall further spread of the disease. Furthermore, more comprehensive investigation into prevalence and intensity of fascioliasis in cattle and in humans in this region should be undertaken to establish its economic importance.

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