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Investigations into prevalence of *Paramphistomum cervi* infections of ruminants in Abia State, Nigeria

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Abstract
Between December and May 2020 regular examinations of ruminants slaughtered in 3 abattoirs randomly selected from *Umunneochi* Local Government Area of Abia State revealed the prevalence of acute paramphistomiasis. Of the 175 cattle (*Bovis sp);* 234 goats (*Capra sp.)* and 98 sheep (*Ovis sp.)* examined, 37 (21.14%) of the cattle; 58 (24.79%) of the goats and 13 (13.27%) of the sheep had serious infections with *Paramphiostomum cervi*. The prevalence rates however, vary between 3.64% to 35.48% in (cattle); 7.14% to 36.44% (goats); and 0% to 18.75% (sheep) in the various abattoirs. The sex showed no significance relationship with the infections, age was found to be highly significant (p<0.01). Older animals have more infections than the younger ones. Highest infection rate was recorded in the rainy and early dry seasons. *Bolinus b forsake* was also found to be the snail hosts of the larvae of *P. cervi* in the study area.

Keywords: Ruminants, infection, *Paramphistomiasis*, worms, abattoir, investigations

Introduction
Paramphistomum cervi is a type of species of *Paramphistomum*, it is a parasitic flatworm belonging to the class Trematoda. It is a tiny fluke mostly a parasitic infection of livestock ruminants, as well as some wild mammals.
The role of gastrointestinal- helminth parasites in animal husbandry in Nigeria is vastly recorded. Grazing of ruminants occurs freely without any set plans and often occur repeatedly on road sides and abandoned farm lands. These animals consequently become infected with worms. Worms, therefore, are one of the key factors adversely affecting productivity in the livestock industry. Among the helminthic trematodes of great importance in gastro-enteric diseases are *Fasciola gigantica, Cotylophoro cotylophoron, Paramphistomum microbothrium and P. cervi.* Reports from most parts of the tropics show that *Fasciola gigantica* is the most prevalent [1, 2]. *D. hopes* has also been found to occur commonly [3]. Much has not been written about the cone flukes except brief mentions of their occurrence in parts of the country [4]. In their check list of parasites of live stocks in Nigeria Schillhon van Veen et al showed that *P.cervi* has been recorded only in Jos provinces. They even doubted whether the species was not *P. microbothrium* which is widely prevalent and not *P. cervi.* Though recent researchers are currently picking up interests on the topic.
A survey of snail hosts of helminth parasites in parts of Lokpa, Abia State was undertaken. This study among other things showed that most of the *Bollinus forskalii* collected were shedding *amphistome cercaria*.
These later developed into *Paramphistomum cervi*. Because of the high infection rates in the snails collected, an epizoological study on the parasites was carried out in ruminants slaughtered in an adjoining area (Amuda and Ngodo within the same Local Government Area). In the study, information collected make clearer the picture of the prevalence, intensity and patterns of *Paramphistomum cervi* infections in the ruminants in this area.

Materials and methods
Monthly examinations of the guts of ruminants were done at some selected abattoirs in Umunneochi Local Government Area of Abia State, Nigeria. In each examination, the slaughtered ruminants (cattle, goats and sheep) were first examined in situ. Then the rumen and reticulum of these animals were ligatured and their contents were taken off to the laboratory for separate examinations.

Also faecal specimens were collected and the diagnostic "Dinnik and Dinnik" adopted in the search for the eggs of the parasite. This involved collecting about 8g of faecal sample and stirring it with 250 ml of ice cold water. The mixture formed was placed in a beaker and allowed to settle for 30 minutes in a refrigerator. The turbid fluid and debris was then carefully poured off until the sediments were about to flow out. The beaker is then refilled with fresh ice cold water, stirred and allowed to settle again in the refrigerator for 20-25 minutes. The supernatant is poured off and the process repeated for about 8 times. From the sediment that is finally left some quantity (0.5ml) was collected, stained with 1% neutral red and searched for trematode eggs using a dissecting microscope. *P. cervi* eggs are usually differentiated from *F. gigantica* eggs because while the eggs of *Paramphistomum* are colourless with embryo at the centre of the egg those of *Fasciola* are yellow brown with embryo near the operculum.
The contents of the rumen and reticulum were mixed thoroughly then washed in tap water and passed through a sieve of small mesh size to dispose of bigger particles. Sediments passing the sieve were then stained for trematode eggs. The worms retained on the sieves were picked up, stored in 10% formalin with a few drops of glycerol for later characterization and identification. The identification of eggs and adult worms were confirmed at Department of zoology Faculty of sciences Abia State University, Uturu.

Table 1: Incidence of *Paramphistomum cervi* infections in ruminants slaughtered in Umunneochi LGA, Abia State

	Cattle (*Bovis sp*)			Goat (*Copra sp*)			Sheep (*Ovis sp*)		
	No.	No.	%	No.	No.	%	No.	No.	%
Abattoir Location	Exam.	Infect.	Infect.	Exam.	Infect.	Infect.	Exam.	Infect.	Infect.
Lokpanta	89	24	26.96	107	39	36.44	40	07	17.50
Amuda	31	11	35.48	42	03	07.14	26	00	0.00
Ngodo	55	02	3.64	85	16	18.82	32	06	18.75
Total	175	37	21.14	234	58	24.79	98	13	13.27

Table 2: Distribution of Paramphistomiasis in ruminants (according to sex)

Ruminant species and Station	Male			Female		
	No.	No.	%	No.	No.	%
	Exam.	Infect.	Infect.	Exam.	Infect.	Infect.
Cattle						
Lokpanta	56	11	20.	33	13	39.39
Amuda	21	07	33.	10	04	40.00
Ngodo	36	02	05.55	19	00	00.00
Goats						
Lokpanta	59	21	36.	48	18	37.50
Amuda	20	02	10.00	22	01	04.54
Ngodo	48	11	23.	37	05	14.
Sheep						
Lokpanta	22	06	27.	18	03	17.
Amuda	19	00	00.00	07	00	00.00
Ngodo	20	02	10.00	12	02	17.

Table 3: Distribution of Paramphistomiasis in ruminants (according to age)

Ruminant species and Station	Young Animals (< 2 years)			Old Animals (>/= 2 years)		
	No.	No.	%	No.	No.	%
	Exam.	Infect.	Infect.	Exam.	Infect.	Infect.
Cattle	15	01	06.67	160	36	22.50
Goats	35	02	05.71	199	48	24.12
Sheep	00	00	00.00	98	13	13.27

Table 4: Monthly Variation in Number of *Paramphistomum cervi* in slaughtered ruminants

Ruminant	Month	No. Exam.	No. Infect.	%
Catt	December	45	07	15.56
	January	13	01	07.69
	February	04	00	00.00
	March	57	07	12.28
	April	24	09	37.50
	May	32	13	40.63
Goats	December	52	14	29.92
	January	40	06	15.00
	February	20	02	10.00
	March	30	05	16.67
	April	45	14	31.11
	May	47	17	36.17
Sheep	December	23	04	17.39
	January	04	02	10.53
	February	17.39	00	00.00
	March	19	00	00.00
	April	02	03	17.65
	May	10.53	04	21.05

Results

A) Incidence of *Paramphistomum cervi* infections

The result of the incidence of *Paramphistomum* infections in ruminants slaughtered in these abattoirs are recorded in table 1. The prevalence rate is highest in goats (24.79%) followed by cattle (21.14%), while the rate is low in sheep, (13.27%). Analysis of this data showed that there was significant differences between incidence of the infection in cattle and sheep as well as in goat and sheep ($P<0.05$). It is important also to note that some of the ruminants have mixed infections of *P. cervi* and *Cotylaphron catylaphorum.*

B) Prevalence of Paramphistomiasis in relation to sex in slaughtered ruminants.

The figurative details of the distribution of *Paramphistomium cervi* infections in these slaughtered ruminants according to sex is shown in Table 2. It was shown that all the ruminants that were slaughtered in the studied area were infected with the worm parasite. Analysis of the data (using x^2) indicates that there is no significant difference in the prevalence of this infection in either the males or the females and so the distribution of the parasites is not sex dependent or associated with sex ($P>0.05$).

C) Distribution of infection with P. cervi according to age:

The distribution of infection with *Paramphistomum cervi* according to age of the slaughtered ruminants is shown in table 3. An obvious problem in this aspect of the study is the inadequate information on the young animals many of which are not slaughtered freely. Despite this problem this table shows that few of the young ruminants studied harbored the infection. Data analysis show that age is significant in the distribution of the infection ($P<0.01$). No young sheep was observed to be slaughtered.

D) Monthly variation in number of infected ruminants slaughtered.

The variation in number of monthly infections is shown in table 4. Highest infection was recorded between December, March, April and May. This high infection during the rainy season suggests that the animal must have picked up the infection during the late Dry season. This is in agreement with other reseaches [7, 8] carried out before.

Discussion

The prevalence of acute infection with *Paramphistomum cervi* in this area varies within the ruminant species. For example while the prevalence rate is high in cattle and goats, it is low in sheep. This difference may be attributed to the mode of husbandry which is visibly different. The goats and cattle graze in the wild with herdsmen while sheep are kept mainly in homes and at most in the farms around homesteads. Sex was not significant in the distribution of the infection. This situation must have arisen because there is no difference in the food habits of these animals. Therefore individual animals have equal chance of acquiring the infections in contaminated areas. This is in contrast with the observation of [8]. The difference in the prevalence of *P. cervi* in *cattle* and goats (Table 1.) was not significant indicating that the incidence of *Paramphistomium cervi* is independent of species. This is in agreement with the works of[9] who worked on sheep, goats, cattle and buffaloes, where P>0.05.). According to [13] a total of 447 cattle and 948 sheep at slaughter houses were examined for *parampistomosiss*, 40 (8.95%) and 42 (4.43%) were found positive for *paramphistomum* infection as to gut examination, while all of the parasites in cattle were present at rumen.

Sex was not significant in the distribution of the infection. This is also in agreement with the works of [14] where there was no observed statistical difference in infection between male and female buffaloes, the infection rate in male is 16.12% and in female it was 10.26%. Thus $p>0.05$

While working with nematodes[6] showed that there was always a close association between age and intestinal helminthes. This study showed also that it is applicable to *P. cervi* infections. The findings of this work in relation of infection to age was in contrast with the findings of[11] where there was no significant correlation between age and infection. In this study age had a significance ($p<0.01$) association with the prevalence of P*aramphistomum.* Analysis of the data on age incidence of the infection showed that infection was both higher and more serious in the older animals. The highest was recorded in goats (24.12%), goats followed by (22.5%) in cattle and (13.27%) sheep of the older animals, while there was a significant difference in in younger animals which recorded (6.67%), (5.71%) and (0.00%) in cattle, goats and sheep respectively. This is in agreement with the works of[5] where prevalence (89.58%) was recorded in older animals (>24 months), and (78.57%) in younger animals (12-24 months). This therefore suggests that there may be no progressive resistance to infection with *P.* cervi in these animals.

The relationship between worm burden and pathological manifestations is not usually obvious by mere looking at the animals. Most of the heavily infected ruminants appeared to be in good health. The abundance of natural animal food in this part of the country must be compensating for the losses through heavy worm burden. However the damage to the rumen and other parts of the gastrointestinal tract renders this part of the meat useless. Unfortunately, the part forms a very important source of protein to the low income members of the population and also is served in drinking houses as “pepper soup”. Therefore, the loss due to damage by this parasite is worthy of note.

A fact which emerged from this study is the higher rate of infection in animals that migrate from the northern parts of Nigeria. It, therefore, means that given this uncontrolled grazing habits, and the preponderance of *Bulinus forskalii* in the fresh water habitats the local breed of ruminants will be exposed to unexpectedly higher risk of infection.

The monthly variation in number of infected ruminants Table 4 is in agreement with the findings of[10] where seasonal variation in cattle and sheep were considered and it was found that highest incidence of paramphistomiasis in sheep was during Autumn (September to November) with the prevalence rate of 8.33% followed by 5.18% Summer (June to August, 2.98% in Spring (March to May), 1, 17% in Winter (December to February). Despite the difference in the seasonal vitiations prevalence, and the relation between the intensity and season, there was no statistically significance. The mean intensity of infection in Braham breed was higher (652.66±281.5) than Sistani breed (123.32±32.2). In their work [12] they noted that when old cows were compared with those from bull calves, the values were significantly greater in cows (first year: H =33.42. $p<0.001$; second year H= 19.15, $p< 0.001$)

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