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ORIGINAL ARTICLE

Prevalence of gastrointestinal helminth parasites of trade cattle in Aguata and Orumba South Local Government Areas, Southeastern Nigeria

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Abstract The prevalence of gastrointestinal helminth parasites of trade cattle were investigated in Aguata and Orumba South Local Government Areas (LGA), Southeastern Nigeria. Between February and May, 2017, 210 cattle were randomly sampled in Aguata (140) and Orumba South (70) LGAs. Characteristics of each trade cattle such as sex, breed and body condition scores were noted. Fecal samples were collected per rectum from the selected animals and were subjected to floatation and sedimentation techniques. The overall prevalence of gastrointestinal helminth parasites was 57.6% (95% CI = 0.509–0.643). Of the 140 cattle screened at Aguata LGA, 74 (52.9%; 95% CI = 0.446–0.609) were positive for gastrointestinal helminth ova while 47 (67.1%; 95% CI = 0.555–0.77) were positive out of the 70 cattle screened at Orumba South LGA. A variety of gastrointestinal helminth ova were detected including strongyle, strongyloid, *Toxocara*, *Fasciola*, *Schistosoma*, *Moniezia* and *Paramphistomum* ova. Four helminth ova detected in the study area were zoonotic. Strongyle eggs were the most prevalent eggs detected in single infections followed by *Fasciola* eggs. Mixed infections were more common than single infection. Body condition score was significantly associated ($p < 0.0001$) with the prevalence of gastrointestinal helminth parasites of cattle in the study area while sex and breed were not. It was therefore concluded that trade cattle in Aguata and Orumba South LGAs, Southeastern Nigeria were affected by variety of gastrointestinal helminth parasites including zoonotic helminthes. Thus, routine anthelmintic treatment, good management practices and public enlightenment on the zoonotic importance of helminth parasites is highly essential.

Keywords Prevalence · Gastrointestinal helminth parasites · Cattle · Southeastern Nigeria

Introduction

The livestock industry remains a crucial sub-sector of the Nigerian economy accounting for billions of Naira (Babagana et al. 2016). Cattle, which is the most prominent amongst Nigerian livestock is estimated to be more than 19 million (Lawal-Adebowale 2012) and are largely concentrated in the northern parts of the country. The gains accruing from cattle production in Nigeria cannot be overstated as cattle constitutes important sources of animal protein, raw materials, income, farm power, employment and organic manure (Nwosu et al. 2007). In some parts of Nigeria, ownership of cattle reflects wealth and status/class. However, the productivity and income generation from cattle production has continued to dwindle due to several reasons including parasitic infections (Marskole et al. 2016).

Parasitic infections particularly gastrointestinal parasites poses a serious health threat and negatively impacts livestock production via its associated morbidity, mortality, treatment and control costs (Nwosu et al. 2007). Also, most of these parasitic infections are zoonotic and thus could

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pose a deleterious threat to public health. The incidence and severity of gastrointestinal parasites are influenced by the climate, number of infective eggs and larva in the environment, pasture management, presence of intermediate host, vectors, grazing habits and nutritional status (Adedipe et al. 2014; Marskole et al. 2016).

Gastrointestinal parasites are ubiquitously distributed and prevalence studies have been variously carried out in different geographical regions of Nigeria (Adedipe et al. 2014; Oluwole et al. 2016; Karaye et al. 2018; Lemy and Egwunyenga 2017). However, paucity of information exists on the prevalence of gastrointestinal parasites of cattle in Southeastern Nigeria. Good management and knowledge of the prevalence of gastrointestinal parasites are essential for the prevention and control of parasitic infections, especially zoonotic parasites. Therefore, this present study was undertaken in Aguata and Orumba South Local Government Areas, Southeastern Nigeria to determine the prevalence of gastrointestinal parasites of trade cattle.

Materials and methods

Study area

The study was conducted between February and May, 2017 in Aguata (Uga and Igbo-Ukwu abattoirs) and in Orumba South (Umunze abattoir) Local Government Areas of Anambra State, Southeastern Nigeria. The geographical coordinates of Aguata and Orumba South Local Government Areas are 6° 01′ 0″ N 7° 05′ 0″ E/6.01667° N 7.08333° E and 5° 58′ 0″ N 7° 13′ 0″ E/5.96667° N 7.21667° E respectively. Large numbers of cattle are slaughtered in these abattoirs which serve as a major source of meat to the teeming population of surrounding local government areas.

Study population and sampling method

Cattle presented for slaughter at the above-stated abattoirs were sourced from different locations mostly from the northern Nigerian and surrounding African countries. The cattle were sampled utilizing the systematic random sampling method. The sex, breed and body condition scores of the cattle were recorded. Breed identification was based on morphology while appearance of external genitals was the basis for sex differentiation. The body condition score of cattle was evaluated on a two point scale based on the modification of the method described by DEFRA (2001).

Sample collection and examination

Fecal samples were collected from 210 cattle per rectum prior to slaughter into a well labeled containers. The containers were placed in a flask containing ice packs before being transported to the Animal Science Laboratory of the Department of Agricultural Education, Federal College of Education (Technical), Umunze for analysis. Floatation technique was carried out to detect nematode and cestode eggs while sedimentation technique was employed to demonstrate trematode eggs. Parasite eggs were identified based on their morphological characteristics (Soulsby 1982; Hansen and Perry 1994).

Ethical considerations

Institutional ethical clearance and approval was obtained from the School of Agriculture and Home Economics Education Research Ethics Committee of the Federal College of Education (Technical), Umunze, prior to the commencement of the study. Also, necessary approvals and consents were gotten from the Veterinary Directorates of both Aguata and Orumba South Local Government Areas prior to the study.

Data analysis

The data obtained from this study were analyzed descriptively and the results presented in percentages. The prevalence of gastrointestinal parasites in relation to breed, sex and body condition score was analyzed using Chi square test or Fisher exact test where necessary. Values of $p < 0.05$ were considered significant. All statistical analysis was carried out using Graphpad® statistical software.

Results

The prevalence of gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Areas were 52.9% (95% CI = 0.446–0.609) and 67.1% (95% CI = 0.555–0.77) respectively while the overall prevalence was 57.6% (95% CI = 0.509–0.643) (Table 1). Seven helminth ova namely strongyle, strongyloid, *Toxocara*, *Fasciola*, *Moniezia*, *Schistosoma* and *Paramphistomum* eggs were identified in Aguata LGA while five helminth eggs including strongyle, strongyloid, *Toxocara, Fasciola* and *Moniezia* were identified in Orumba South LGA (Tables 2 and 3). Mixed infection had the highest prevalence in the study area followed by single infection with strongyle eggs (Tables 2, 3 and 4). Amongst the mixed infection, co-infection of strongyle worms and *Fasciola* had the highest prevalence in the both LGAs.

Table 1 Prevalence rates of gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Areas

	No examined	No. positive	Prevalence (%)	95% confidence interval	
				Lower limit	Upper limit
Aguata	140	74	52.9	0.446	0.609
Orumba South	70	47	67.1	0.555	0.77
Overall	210	121	57.6	0.509	0.643

Table 2 Prevalence rates of different gastrointestinal helminth parasites of cattle in Aguata Local Government Area

Helminth parasites	No. Positive	Prevalence (%)	95% confidence interval	
			Lower limit	Upper limit
Strongyle eggs	20	14.3	0.093	0.211
Strongyloid eggs	1	0.7	0.0001	0.043
Toxocara eggs	2	1.4	0.0006	0.054
Fasciola eggs	6	4.3	0.0178	0.092
Moniezia + *Fasciola*	2	1.4	0.0006	0.054
Strongyle + *Fasciola*	10	7.1	0.038	0.128
Fasciola + strongyloid egg	2	1.4	0.0006	0.054
Moniezia + strongyle eggs	5	3.6	0.0131	0.083
Strongyle + *Toxocara*	4	2.9	0.0087	0.074
Strongyle + Strongyloid	6	4.3	0.0178	0.092
Toxocara + Strongyle + *Moniezia*	8	5.7	0.0276	0.110
Strongyle + *Fasciola* + Strongyloid	1	0.7	0.0001	0.043
Fasciola + *Schistosoma* + *Moniezia*	2	1.4	0.0006	0.054
Strongyle + *Schistosoma* + *Fasciola* + *Moniezia*	1	0.7	0.0001	0.043
Fasciola + *Moniezia* + strongyle + *Paramphistomum*	2	1.4	0.0006	0.054
Paramphistomum + Strongyle + Strongyloid	2	1.4	0.0006	0.054

Table 3 Prevalence rates of different gastrointestinal helminth parasites of cattle in Orumba South Local Government Area

Helminth parasites	No. positive	Prevalence (%)	95% confidence interval	
			Lower limit	Upper limit
Strongyle eggs	10	14.3	0.0775	0.245
Strongyloid eggs	2	2.9	0.002	0.104
Toxocara eggs	4	5.7	0.018	0.142
Fasciola eggs	4	5.7	0.018	0.142
Moniezia + *Fasciola*	2	2.9	0.002	0.104
Strongyle + *Fasciola*	6	8.6	0.037	0.178
Fasciola + strongyloid egg	4	5.7	0.018	0.142
Moniezia + strongyle eggs	3	4.3	0.0098	0.124
Strongyle + *Toxocara*	2	2.9	0.002	0.104
Strongyle + Strongyloid	5	7.1	0.027	0.160
Toxocara + Strongyle + *Moniezia*	4	5.7	0.018	0.142
Strongyle + *Fasciola* + Strongyloid	1	1.4	0.0001	0.084

Table 4 Overall prevalence rates of different gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Area

Helminth	No. positive	Prevalence (%)	95% confidence interval	
			Lower limit	Upper limit
Strongyle eggs	30	14.3	0.101	0.197
Strongyloid eggs	3	1.4	0.0029	0.043
Toxocara eggs	6	2.9	0.012	0.062
Fasciola eggs	10	4.8	0.025	0.087
Moniezia + *Fasciola*	4	1.9	0.0057	0.050
Strongyle + *Fasciola*	16	7.6	0.047	0.121
Fasciola + strongyloid egg	6	2.9	0.012	0.062
Moniezia + strongyle eggs	8	3.8	0.018	0.075
Strongyle + *Toxocara*	6	2.9	0.012	0.062
Strongyle + Strongyloid	11	5.2	0.029	0.092
Toxocara + Strongyle + *Moniezia*	12	5.7	0.032	0.098
Strongyle + *Fasciola* + Strongyloid	2	1.0	0.0004	0.036
Fasciola + *Schistosoma* + *Moniezia*	2	1.0	0.0004	0.036
Strongyle + *Schistosoma* + *Fasciola* + *Moniezia*	1	0.5	0.0001	0.029
Fasciola + *Moniezia* + strongyle + *Paramphistomum*	2	1.0	0.0004	0.036
Paramphistomum + Strongyle + Strongyloid	2	1.0	0.0004	0.036

Sex-wise, higher prevalence rates were observed in males (48.4%; 95% CI = 0.359–0.491) compared to the female cattle in the study area (Table 5). Based on the breeds of cattle sampled, White Fulani breed of cattle recorded the highest prevalence of 32.9% (95% CI = 0.256–0.410) in Aguata LGA while Sokoto Gudali had the highest prevalence rate of 31.4% (95% CI = 0.217–0.431) in Orumba South LGA (Table 6). Overall, the highest prevalence rate of 29.5% (95% CI = 0.238–0.360) was observed amongst the White Fulani breed of cattle while the Red Bororo breed had the least prevalence (8.1%; 95% CI = 0.050–0.127). The prevalence of gastrointestinal helminth parasites of cattle in the study area were found not

Table 5 Prevalence rates of gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Area in relation to sex

	Non-infected	Infected	Total	Prevalence	95% confidence interval	
					Upper limit	Lower limit
Aguata LGA						
Male	36	50	86	35.7	0.283	0.439
Female	30	24	54	17.1	0.117	0.243
Total	66	74	140			
$\chi^2 = 2.50$, df = 1, $p = 0.11$						
Orumba South LGA						
Male	22	39	61	55.7	0.441	0.668
Female	1	8	9	11.4	0.057	0.212
Total	23	47	70			
Fisher exact P = 0.254						
Overall						
Male	58	89	147	42.4	0.359	0.491
Female	31	32	63	15.2	0.110	0.208
Total	89	121	210			
$\chi^2 = 1.72$, df = 1, $p = 0.19$						

Table 6 Prevalence rates of gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Area in relation to breed

	Non-infected	Infected	Total	Prevalence (%)	95% confidence interval	
					Lower limit	Upper limit
Aguata LGA						
Sokoto Gudali	23	20	43	14.3	0.094	0.211
Red Bororo	6	8	14	5.7	0.028	0.110
White Fulani	37	46	83	32.9	0.256	0.410
Total	66	74	140			
$\chi^2 = 1.02$, df = 2, $p = 0.60$						
Orumba South LGA						
Sokoto Gudali	9	22	31	31.4	0.217	0.431
Red Bororo	7	9	16	12.9	0.067	0.229
White Fulani	7	16	23	22.9	0.145	0.341
Total	23	47	70			
$\chi^2 = 1.13$, df = 2, $p = 0.57$						
Overall						
Sokoto Gudali	32	42	74	20	0.151	0.260
Red Bororo	13	17	30	8.1	0.050	0.127
White Fulani	44	62	106	29.5	0.238	0.360
Total	89	121	210			
$\chi^2 = 0.07$, df = 2, $p = 0.97$						

to be influenced by sex and breed although male cattle and White Fulani breed of cattle were the most infected.

Cattle with emaciated body condition were observed to have higher prevalence (28.6%; 95% CI = 0.217–0.366) compared to cattle with good body condition in Aguata LGA. In Orumba South LGA, good body condition cattle recorded higher prevalence rate (34.3%; 95% CI = 0.242–0.460) compared to emaciated cattle. However, on the overall, a higher prevalence (30%; 95% CI = 0.242–0.365) was recorded in emaciated cattle when compared to cattle with good body condition (Table 7). The prevalence of gastrointestinal helminth parasites in the study area was significantly ($p < 0.05$) associated with the body condition score.

Discussion

The results obtained in this study indicate that gastrointestinal helminth parasites are endemic in cattle in Aguata and Orumba South LGA, Southeastern Nigeria. The overall prevalence of 57.6% (95% CI = 0.509–0.643) reported in the study area is very high compared to 3% prevalence reported by Ameen et al. (2015) in Ogbomosho, Oyo State Nigeria. The prevalence rates of 50.4% in Abraka, Delta State Nigeria; 53.8% in Jos, Plateau State Nigeria; 47% in Ngorongoro district, Tanzania and 50.2% in Western Oromia, Ethiopia reported by Lemy and Egwunyenga (2017), Pam et al. (2013), Swai et al. (2006) and Regassa et al. (2006) respectively is comparable to the prevalence rate reported in this study. However, the 57.6% prevalence obtained in this study is low compared to 73.3% in Bauchi State Nigeria (Yuguda et al. 2018), 74% in South Kivu Province, Congo (Bisimwa et al. 2014) and 95.5% in Southern Ghana (Squire et al. 2013). The differences in the gastrointestinal helminth parasite prevalence could be due to the seasonal differences, climatic conditions of the different locations, livestock management system, diagnostic method utilized and number of samples examined, frequency of anthelmintic treatment, and availability of vectors/intermediate hosts amongst other factors.

The gastrointestinal helminth ova identified in the study area were nematodes (strongyle, strongyloid and *Toxocara*), cestode (*Moniezia*) and trematodes (*Fasciola, Schistosoma* and *Paramphistomum*). Similar findings have been reported in many parts of Nigeria and Africa by several authors (Regassa et al. 2006; Squire et al. 2013; Adedipe et al. 2014; Oluwole et al. 2016: Bisimwa et al. 2014). Their occurrence in cattle is usually, not without huge impacts on livestock productivity as they can induce reduction in body weight, reduced productivity, impaired reproductive performance, condemnation of most organs at

Table 7 Prevalence rates of gastrointestinal helminth parasites of cattle in Aguata and Orumba South Local Government Area in relation to body condition

	Non-infected	Infected	Total	Prevalence (%)	95% confidence interval	
					Lower limit	Upper limit
Aguata LGA						
Emaciated BC	16	40	56	28.6	0.217	0.366
Good BC	50	34	84	24.3	0.179	0.321
Total	66	74	140			
$\chi^2 = 12.92$, df = 1, $p = 0.0003$						
Orumba South LGA						
Emaciated BC	3	23	26	32.9	0.230	0.445
Good BC	20	24	44	34.3	0.242	0.460
Total	23	47	70			
Fisher exact P = 0.0038						
Overall						
Emaciated BC	19	63	82	30	0.242	0.365
Good BC	70	58	128	27.6	0.220	0.340
Total	89	141	210			
$\chi^2 = 20.33$, df = 1, $p = 0.0001$						

BC body condition

slaughter, mortality and economic losses. More so, the finding of strongyle, strongyloid, *Fasciola* and *Schistosoma* ova considering their zoonotic nature (Karshima 2018), are of significant public health importance considering their zoonotic nature.

Mixed infections, indicated by the occurrence of two or more parasites, were more common than single infection in this study. Most common among the mixed infections is the co-infection of strongyles and *Fasciola* (7.6%; 95% CI = 0.047–0.121). Amongst single infections, strongyles recorded the highest prevalence (14.3%; 95% CI = 0.101–0.197) followed by *Fasciola* (4.8%; 95% CI = 0.025–0.087). Squire et al. (2013) made similar observations concerning mixed infections and strongyles in Southern Ghana. However, Oluwole et al. (2016) and Yuguda et al. (2018) reported *Fasciola* to be the highest prevalent helminth parasite in Oyo and Bauchi states, Nigeria respectively. The variations in the prevalence of the parasites and the occurrence of mixed infections could be attributed to the opportunity of exposure of the animals to the infective stages, intermediate hosts and vectors of these parasites, as these animals are from diverse sources.

Based on sex, the overall prevalence of gastrointestinal helminth parasites were high in males (42.4%; 95% CI = 0.359–0.491) compared to the females (15.2%; 95% CI = 0.110–0.208). In both Aguata and Orumba Local Government Areas, males also had higher prevalence than females. This finding is consistent with those of Bisimwa et al. (2014) in South Kivu Province of Congo and Yuguda et al. (2018) in Bauchi State of Nigeria. However, the findings of Regassa et al. (2006) in Western Oromia, Ethiopia; Squire et al. (2013) in Southern Ghana; and Moussouni et al. (2017) in Bass Kabylie, Bejaia Province of Algeria, of female cattle having higher prevalence rates contrasted with this current study. The high prevalence rates observed in males could be attributed to the fact that more males were sampled than the females and also to the aggressive feeding habit of the male cattle. However, sex was not found to influence the prevalence of gastrointestinal helminth parasites in the study area. The reports of Squire et al. (2013) in Southern Ghana; Ameen et al. (2015) in Ogbomosho, Oyo State Nigeria; Bisimwa et al. (2014) in South Kivu Province of Congo and Yuguda et al. (2018) in Bauchi state of Nigeria, is consistent with the findings of the current study. However, Adedipe et al. (2014) found female and male animals respectively to have higher chances of being infected with gastrointestinal parasites.

White Fulani breed of cattle recorded the highest overall prevalence (29.5%; 95% CI = 0.238). In Aguata Local Government Area, white Fulani breed also had the highest prevalence (32.9%; 95% CI = 0.094–0.211) while Sokoto Gudali had the highest prevalence (31.4%; 95% CI = 0.217–0.431) in Orumba South Local Government Area. The greater number of White Fulani cattle breeds sampled in the current study may have contributed to the high prevalence observed in White Fulani breeds. Adedipe et al. (2014) and Yuguda et al. (2018) reported similar findings of white Fulani breed having highest prevalence rates of 46% and 74.8% respectively while Squire et al. (2013)

found N'Dama breeds to have highest prevalence in Southern Ghana. The variations in breed prevalence could be credited to varying geographical locations, management systems and availability of suitable microenvironment for sustained survival and development of infective stage of most parasites. Despite the differences in breed prevalence in the current study, breed did not influence the prevalence of gastrointestinal helminth parasites. This finding conflicts with the reports of Bisimwa et al. (2014) of exotic cattle breeds being 4.6 times more likely to be infected with gastrointestinal helminth parasites in Congo. The reports of Regassa et al. (2006) in Ethiopia, Squire et al. (2013) in Ghana and Yuguda et al. (2018) in Nigeria of insignificant association between breed and the prevalence of gastrointestinal helminth parasites was consistent with the findings of the current study.

Body condition score was significantly associated ($p < 0.0001$) with the prevalence of gastrointestinal helminth parasites of cattle in the study area with emaciated cattle being infected most. This could be attributable to poor nutrition and management as poorly fed and managed animals appear emaciated and are prone to various diseases and infections including helminthosis. Reports of Adedipe et al. (2014) in Oyo State Nigeria, and Moussouni et al. (2017) in Bejaia Province of Algeria of significant associations between body condition score and prevalence of gastrointestinal helminth parasites were consistent with the results of the current study. However, the report of insignificant association between gastrointestinal parasite prevalence and body condition score by Regassa et al. (2006) in Western Oromia, Ethiopia contrasted with the present finding.

In conclusion, trade cattle in Aguata and Orumba South Local Government Area are affected by variety of gastrointestinal helminth parasites including zoonotic helminthes and their prevalence was significantly associated with body condition score. Thus, there is need for routine anthelmintic treatment, and adoption of good management practices to reduce parasitic burden and increase productivity. Also, public enlightenment on the zoonotic importance of helminth parasites is essential.

Compliance with ethical standards

Conflict of interest The authors declare that there are no competing interests.

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