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Assessment of gastrointestinal parasites of slaughtered cattle, Minna, Niger State

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Abstract

Assessments of gastrointestinal parasites of slaughtered cattle at Minna Main Abattoir were conducted from November 2013 to February 2014. A total of 508 faecal samples (244 females, and 264 males) were examined for parasite ova using formol ether concentration technique. Results revealed that from the 508 faecal samples examined, helminths parasites (*Paramphistomum* sp., *Trichostrongylus* sp., *Fasciola* sp., *Taenia* sp., *Monieza* sp. and *Oesophagostomum* sp) were observed in 143 cattle representing 28.1%. *Paramphistomum* sp. had a higher prevalence of 8.9% and geometric mean intensity of 3.7 eggs per gram of faeces (epg), while the least (0.8%) prevalence was recorded for *Oesophagostomum* sp with mean intensity of 1.2 epg of faeces. Single infections were 26.2% and 1.9% for mixed infections. Females had a higher prevalence of infection of 31.8% than 24.2% for males with no significant difference ($p > 0.05$). Among age groups, higher prevalence of 33.4% was observed in adult cattle compared to young cattle (20.0%) and a significant difference in the prevalence of infection among the age groups ($p < 0.05$). Parasites were more abundant in abomasum compared to large intestine, small intestine and caecum with a prevalence of 40.9%, 28.4%, 26.8%, and 16.5% respectively but no significant difference in both the intensity and prevalence of parasites isolated from various sections of the stomach ($p > 0.05$). The high prevalence could pose a serious risk for infection to human infections, so adequate control measures are advocated in order to ensure disease free meat.

Keywords: Cattle; gastrointestinal parasites; intensity; Minna; prevalence.

Introduction

Cattle are highly distributed and reared in most part of Nigeria because they serve as a major animal protein source consumed by the people [1]. Cattle are usually slaughtered at virtually all abattoirs in Nigeria where they are sold to the public as beef [1]. Beef got from cattle and mutton got from goats account for about 70% of the total meat consumed in the country, Nigeria [2]. However, parasitic diseases coupled with inadequate management hampered the productive husbandry of these animals [3; 4]. Globally parasitic diseases continue to be a major constraint for poor developing countries. Livestock sector has a substantial contribution to the economy. However parasitic diseases cause a significant problem by lowering the productivity of cattle and in addition to losses from condemnation of affected organs. Productivity losses due to helminth parasites are often substantial [5].

The gastrointestinal tract of cattle harbour a wide variety of parasites mainly helminths, which cause clinical and sub-clinical parasitism. These parasites adversely affect the health status of cattle and cause enormous economic losses to livestock industry [6; 7].These parasites are recognized as by far the most significant part of the diseases in livestock sector [8; 9]. These parasites are ubiquitous and have remained the major constraint hindering the efficiency of rearing cattle successfully [10; 11]. Moreover these diseases are

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known to cause public health problems as humans can be infected from accidental ingestion of parasite egg/ larvae passed into the environment with faeces from definitive hosts [12; 13]. Hyatid cyst, larval stages of *Echinococcus granulosus,* is one of the helminth zoonotic diseases that involves not only animals but also considered as a major health problem in many countries [14]. Other common helminth parasitic diseases are liver trematodes namely, *Fasciola hepatica, Fasciola gigantica and Dicrocoelium dendriticum.* They live in the bile duct of Cattle and cause enormous economic losses [15, 16]. These parasites are considered as an important source of losing protein in animals [17]. Economic losses due to infection with *Fasciola hepatica* is estimated as 5.5 million dollars in the USA [18]. The overall prevalence rates of these GIT parasites recorded by various workers in abattoir based surveys include: 74% by [19], in Democratic Republic of Congo; 58.5% by [20], in Delta State, Nigeria. Information about gastrointestinal parasites of cattle in the study area could provide an overall epidemiological idea about the occurrence and distribution of such parasites in cattle which is necessary for planning preventive and control measures as well as treatment of cattle parasites in Minna and in the country at large. Hence, the aim of the study was to determine the Prevalence and intensity of gastrointestinal parasite infections of cattle slaughtered at Minna Modern Abattoir, Niger State.

Materials and methods

Study area

The study was conducted at Minna Main Abattoir in Tayi Village, Minna, Niger State. Minna is the capital of Niger State. Minna has a land mass of 28.5 km^2 and lies between Longitude 6^{0}33′′ E and Latitude 9^{0}37′′ N. The typical climate of the middle belt zone of Nigeria is a good reflection of Minna climate, with rainy season setting in around April and lasting till October with mean annual rains of 334 mm (52 inches) in September, recording the highest in March at 300 mm (11.7 inches). The mean monthly temperature is highest in March 30.50^{0}C (85^{0}F) and the lowest in August at 22.03^{0}C (72^{0}F). Minna is a city (with estimated population of 304,113 in 2007) in north central Nigeria. Abuja, the capital of the country, is only 150 km away from Minna. The study-area is shown in Figure. 1.

Sample size determination

In order to estimate the number of cattle infected with gastrointestinal parasites the sample size was determined by the formula given by [21], using 50% expected prevalence with 5% absolute desired precision at 95% confidence level. $n=1.96^2P_{exp}(1\text{-}P_{exp})/d^2$. Where n=required sample size, P_{exp}= Expected prevalence, d=Desired Absolute precision. Since there was no similar study done previously in the study area, the expected prevalence was taken as 50%. Therefore using 50% expected prevalence and 5% absolute precision at 95% confidence interval, the total sample size was calculated to be 384. But to increase the precision 508 cattle was examined.

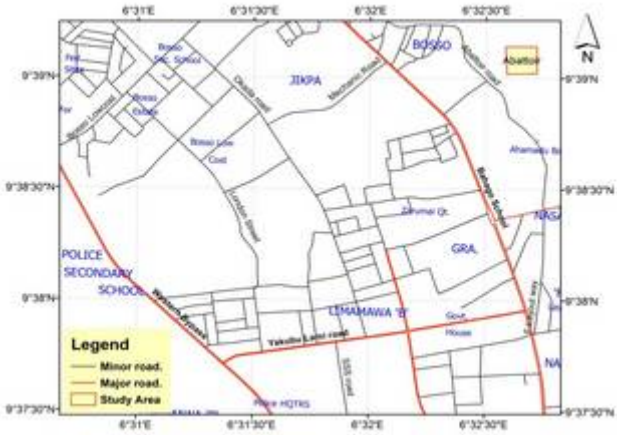

Figure 1. Map of Minna showing the location of abattoir.

Source: Niger State Geographic Information System (NIGIS), 2014.

Sample collection

A total of 508 fresh faecal samples were collected randomly from cattle slaughtered at Minna Main Abattoir. The collection of faecal samples was carried out daily between 6:00 and 8:00 am. Cattle were dissected after slaughtering to expose the intestines, thereby allowing fresh faecal samples to be collected both from large intestine, small intestine, abomasum, and caecum respectively. Each of these specimens was collected in different, clean sterile universal containers and labelled appropriately and transported to the laboratory for Laboratory Analysis. The approximate age of each cattle was obtained from the butchers through oral interview and they were loosely classified as young (1-2 years) and adult (>2 years) cattle.

Laboratory analysis

The formol ether concentration technique was employed for analysing the faecal samples. By this method, with the aid of an applicator stick, 2 g of faeces was emulsified in 10 ml of 10% formol saline in a test tube. The suspension/emulsion was strained through a wire sieve of 40 mesh-size into a centrifuge tube. 3ml of ether was added and shaken vigorously. The mixture was placed in a centrifuge tube and subjected to centrifugation at 2,000 revolution per minutes (rpm) for 2 minutes. Upon stopping, the tube was carefully removed from the centrifuge and the supernatant was decanted leaving

the deposit at the bottom of the tube. The deposit, 0.05 ml was pipetted into a glass slide, covered with cover slip and was viewed under x10 objective of microscope [22]. Eggs were identified on the basis of their morphological features as described by [23]. The number of eggs and cyst present in 0.05 ml was quantified by multiplying by 100, representing the number of eggs/ cysts in 1g of faeces [24] (Stoll's method).

Data analysis

Prevalence of infections between sexes, age-groups and breeds of cattle examined was analysed statistically using *chi*-square (x^2) test while the intensity (epgf) of infection by gastrointestinal parasites identified was subjected to Analysis of Variance (ANOVA) using [25] multiple range test to separate difference in variables. The same ANOVA was used to compare the degree of intensity (GMI) of infections in the various sections of the gastrointestinal tract (GIT) of the cattle examined while *chi*-square (x^2) was employed to compare the prevalence of the GIT parasites in the different sections of the GIT.

Results

Out of the 508 faecal samples examined, 143 (28.1%) were positive for gastrointestinal helminth infections with an overall geometric mean intensity of 2.8 egg per gram of faeces (epg) (Table 1), while none of the cattle harboured any protozoan parasites.

Females showed a higher prevalence of 31.8% compared to males with a prevalence of 24.2% (Table 1). There was no statistically significant difference among bulls and cows examined ($p>0.05$).

Table 1. Overall prevalence and Geometric mean intensity of single and multiple gastrointestinal helminth infections among Cattle slaughtered at Minna Main Abattoir (n = 508).

Sex	No. examined	No +ve (%)	Prevalence	GMI (epgf)
Males	244	59	24.2	2.3
Females	264	84	31.8	3.3
Total	**508**	**143**	**28.1**	**2.8**

Key: No +ve = Number positive (infected), GMI = Geometric mean intensity (egg per gram of faeces).

Six species of helminth parasites were identified including *Paramphistomum* sp. with a prevalence of (8.9%), *Trichostrongylus* sp. (5.1%), *Taenia* sp. (1.8%), *Fasciola* sp. (8.1%), *Monieza* sp. (1.6%), *Oesophagostomum* sp. (0.8%) with a geometric mean intensity of 3.7, 2.3, 1.5, 3.9, 1.7, 1.2 epg of faeces respectively (Table 2).

Among age groups, higher prevalence of 33.4% was observed in adult animals compared to young animals (1-2 years) with a Prevalence of 20.0% (Table 3). There was statistically significant difference in the prevalence of infection among the age groups ($p<0.05$).

From this study, there was mixed infection characterised by one or more parasites with a prevalence of 1.8% (Table 4). Five mixed infections were identified. *Paramphistomum* sp. was more in mixed infection as compared to other parasites.

Higher prevalence of infection was recovered from abomasum (40.9%), while the least prevalence was recovered from caecum with a prevalence of 16.5% (Table 5).

Table 2. Prevalence (%) and geometric mean intensity (epgf) of single gastrointestinal helminth parasitic infections among Cattle by sex in Minna Main Abattoir, Niger State (n=508).

		Pa			Tr			Ta			Fa			Mo			Oe			Total		
Sex	No. ex	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)	No. +ve	PV (%)	GMI (epgf)
Males	244	20	8.2	2.8	16	6.6	2.4	3	1.2	2.2	12	4.9	1.9	2	0.8	1.0	2	0.8	1.4	55	22.5	2.4
Females	264	25	9.5	4.5	10	3.8	2.0	6	2.3	1.2	29	10.9	5.3	6	2.3	1.4	2	0.8	1.0	78	29.6	3.5
Total	**508**	**45**	**8.9**	**3.7**	**26**	**5.1**	**2.3**	**9**	**1.8**	**1.5**	**41**	**8.1**	**3.9**	**8**	**1.6**	**1.7**	**4**	**0.8**	**1.2**	**133**	**26.2**	**2.8**

Key: No. ex = number examined, Pa = *Paramphistomum* sp., Fa= *Fasciola* sp., Tr= *Trichostrongylus* sp., Ta= *Taenia* sp., Oe= *Oesophagostomum* sp., Mo= *Monieza* sp., No+ve = Number positive (infected), PV =Prevalence (%), GMI = Geometric mean intensity (egg per gram of faeces (epgf), (x^2 = 3.488, df=5, $p>0.05$).

Table 3. Prevalence (%) of gastrointestinal tract parasite of cattle slaughtered at Minna Main Abattoir based on age group

Age group (Yrs)	No. exa-mined	No. +ve	Pa PRV (%)	No. +ve	Tr PRV (%)	No. +ve	Ta PRV (%)	No. +ve	Fa PRV (%)	No. +ve	Mo PRV (%)	No. +ve	Oe PRV (%)	No. +ve	Mi PRV (%)	No. +ve	Total PRV (%)
1-2	200	10	5.0	6	3.0	5	2.5	8	4.0	4	2.0	2	1.0	3	1.5	40	20.0
>2	308	25	8.1	19	6.2	14	4.6	22	7.1	8	2.6	10	3.3	7	2.3	103	33.4
Total	**508**	**35**	**6.9**	**25**	**4.9**	**19**	**3.7**	**30**	**5.9**	**12**	**2.4**	**12**	**2.4**	**10**	**1.9**	**143**	**28.2**

Key: No.ex = Number examined, No. +ve = Number positive, Mi = Mixed infection, Pa = *Paramphistomum* sp., Fa= *Fasciola* sp., Tr = *Trichostrongylus* sp., Ta= *Taenia* sp., Oe= *Oesophagostomum* sp., Mo= *Monieza* sp., PRV = Prevalence (%), (x^2_{cal} = 19.023, *df* = 5.

Table 4. Prevalence (%) and Geometric mean intensity (epgf) of multiple gastrointestinal helminth infections of Cattle slaughtered at Minna Main Abattoir (n = 508).

Sex	No. exa-mined	Pa & Fa No.	PRV	GMI	Pa & Mo No.	PRV	GMI	Fa & Tr No.	PRV	GMI	Fa & Tr No.	PRV	GMI	Ta, Tr & Oe No.	PRV	GMI	Total No.	PRV	GMI
Males	244	2	0.8	1.0	1	0.4	1.9	1	0.4	1.0	–	–	–	–	–	–	4	1.6	1.2
Females	264	1	0.4	1.0	1	0.4	1.0	1	0.4	1.0	2	0.8	1.4	1	0.4	1.9	6	2.3	1.3
Total	**508**	**3**	**0.6**	**1.0**	**2**	**0.4**	**1.4**	**2**	**0.4**	**1.0**	**2**	**0.4**	**1.4**	**1**	**0.2**	**1.0**	**10**	**1.9**	**1.9**

Key : No. ex = Number examined, *Pa = Paramphistomum* sp., *Fa= Fasciola* sp., *Tr= Trichostrongylus* sp., *Ta= Taenia* sp., *Oe= Oesophagostomum* sp., *Mo= Monieza* sp., No +ve = Number positive (infected), PRV= Prevalence (%), GMI = Geometric mean intensity (egg per gram of faeces).

Table 5. Prevalence (%) and Geometric mean intensity (epgf) of Gastrointestinal tract parasites of cattle slaughtered at Minna Main abattoir isolated from different sections of the stomachs (n = 508).

Loca-tion	No. ex	No. +ve	Pa PV (%)	GM	No. +ve	Tr PV (%)	GM	No. +ve	Ta PV (%)	GM	No. +ve	Mo PV (%)	GM	No. +ve	Fa PV (%)	GM	No. +ve	Oe PV (%)	GM	No. +ve	Mi PV (%)	GM	Total No. +ve	PV (%)	GM (epg)
AB	127	13	10.2	5.9	9	7.1	4.5	6	4.7	2.3	4	3.2	2.2	12	9.5	2.1	4	3.2	4.2	6	2.4	1.3	52	40.9	3.2
LI	127	10	7.9	5.6	6	4.7	2.6	4	3.2	6.1	2	1.6	1.7	8	6.3	1.2	4	3.2	1.2	2	1.6	1.4	36	28.4	2.4
SI	127	11	8.7	2.3	5	3.9	4.7	5	3.9	4.7	2	1.6	4.5	5	3.9	2.9	3	2.4	2.7	2	1.6	1.0	34	26.8	3.0
Ca	127	5	3.9	2.4	4	3.2	1.3	3	2.4	2.9	2	1.6	4.9	4	3.2	1.2	2	1.6	1.4	–	–	–	21	16.5	1.8
Total	**508**	**39**	**7.7**	**3.9**	**24**	**4.7**	**3.2**	**18**	**3.5**	**3.4**	**10**	**1.9**	**2.4**	**29**	**5. 7**	**1.8**	**13**	**2.6**	**1.9**	**10**	**1.9**	**1.9**	**143**	**28.2**	**2.8**

Key : No. ex= Number examined, No.+ve=Number positive, PV= Prevalence (%), GM = Geometric mean intensity (egg per gram of faeces), Mi = Mixed infection,AB= Abomasum, LI= Large intestine, SI= Small intestine, *Pa = Paramphistomum* sp., *Fa= Fasciola* sp., *Tr= Trichostrongylus* sp., *Ta= Taenia* sp., *Oe= Oesophago stomum* sp., *Mo= Monieza* sp., PV=Percentage (%), (f_{cal}=1.20, *df*=5/18, p>0.05: Prev. p>0.05, x^2_{cal} = 1.769, *df* = 15).

Discussion

The results of this study showed the presence of gastrointestinal helminth parasites in cattle slaughtered at Minna Main Abattoir with an overall prevalence of 28.1%. This study is comparable to the report of [26] who reported a prevalence of 26.3% in western Amhara, Ethiopia. This finding is similar to the work of [27] who recorded 34.9% prevalence of helminth parasites at Wukari abattoir, Taraba state. The prevalence in this study is higher than the work of [28] who recorded a prevalence of 6.9% in IIam province, western Iran. This prevalence in this study is lower than the findings of [29] who recorded a prevalence of 39.6% of helminth parasites in cattle in Ethiopia and lower than the work of [30] who recorded a prevalence of 62.0% in central Ethiopia. Also higher prevalence rate (74%) was recorded by [19], in Congo; and (58.5%) recorded by [20] in Delta State, Nigeria. The differences in prevalence could be due to differences in the most favourable environmental condition for the development of larvae and due to differences in climatic conditions that favour the development of parasites.

Females showed a higher prevalence of 31.8% compared to males with a prevalence of 24.2%. This report is similar to the findings of [31] which stated that females were more infected than their male counterparts. There was no significant difference between males and females ($p>0.05$). This may be due to an equal opportunity for infection when they were exposed to the parasites in communal grazing pasture.

Six species of gastrointestinal helminths were identified including *Paramphistomum* sp., *Trichostrongylus* sp., *Taenia* sp., *Fasciola* sp., *Monieza* sp., *and Oesophagostomum* sp. This agrees with the work of [32] which stated that the major pathogenic helminths recorded from their investigation were *Paramphistomes*, *Schistosomes*, *Trichostrongylus*, *Fasciola*, *Cooperia* among others. The highest prevalence (8.9%) was recorded for *Paramphistomum* sp. followed by *Fasciola* sp.(8.1%), *Trichostrongylus* sp. (5.1%), *Taenia* sp. (1.8%), *Monieza* sp.(1.6%) while the least prevalence was recorded for *Oesophagostomum* sp.with a prevalence of 0.8%. The prevalence of *Paramphistomum* sp. (8.9%) in this study is similar to the work of [29] who recorded a prevalence of 9.9% in Ethiopia. But lower than the work of [30] who recorded a prevalence of 18.4% in central Ethiopia. This may be due to differences in management systems, deworming practices and climatic changes that favour the survival of infective stage of the parasites and their intermediate hosts. The least prevalence of *Oesophagostomum* sp. (0.8%) recorded in this study is not comparable to the findings of 14.3% recorded by [27] in wukari Abattoir, Taraba State. Tremtodes were more prevalent in cattle while the least prevalence was nematodes. This agreed with [33] which stated that trematodes were more prevalent in cattle.

Among age groups, higher prevalence of 33.4% was observed in adult animals (>2 years) compared to young animals (1-2 years) with a Prevalence of 20.0%. There was statistically significant difference in the prevalence of infection among the age-groups ($p<0.05$). This supported the findings of [34] and [35] who reported a higher prevalence in adult animals compared to young animals. This finding showed disagreement with [36] and [37] who recorded a significantly higher worm burden in Younger animals than adults. Higher prevalence of parasitic infections in adult animals might be due to keeping them for a longer period of time in breeding and milk production purposes [34]. Moreover, stress like lactation, Pregnancy, nutritional deficiency might have accounted for higher prevalence in adult cattle [38].

From this study, there was mixed infection in cattle with a prevalence of 1.9%. The prevalence is lower than the work of [39] who recorded a prevalence of 41.2% in western Amhara Region, Ethiopia. The low level of mixed infection in this study may be attributed to the fact that the study was carried out during dry season and parasites are more abundant in rainy season compared to dry season. The mixed infection (Polyparasitism) identified include *Paramphistomum* sp. with *Fasciola* sp., *Paramphistomum* sp. With *Monieza* s., *Fasciola* sp. With *Trichostrongylus* sp., *Trichostrongylus* sp. *with Paramphistomum* sp. *and Taenia* sp., *Trichostrongylus* sp. With *Oesophagostomum* sp *as* tripple infection with a prevalence of 0.6, 0.4, 0.4, 0.4, 0.2 respectively.

Higher prevalence of infection was recovered from abomasum (40.9%), while the least prevalence was recovered from caecum with a prevalence of 16.5%. This could be as a result of availability of soluble food substances in the abomasum for the parasites to feed on. Even though the six GIT parasites isolated exhibited higher preference for abomasum as predilectic region, there was no statistical difference in their distribution in the sections of the GIT.

Conclusion

This study showed that gastrointestinal tract parasites were in active transmission in the study- area, and posed serious risk for human infections. However risk factors such as sex and age should be considered in planning control strategies.

Recommendations

There should be proper meat inspections and good record keeping of disease condition of animals in the abattoirs because the presence of these parasites indicates public health hazard.

There should be public enlightenment on the importance of proper hygienic conditions and the enlightenment should target consumers, butchers and owners.

Further extensive research on the prevalence of gastrointestinal tract parasites of cattle should be carried out in the study-area.

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