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Research Article

An Investigation of Gastrointestinal Helminths of Trade Cattle in Azare,Katagum Local Government Area, Bauchi State, North Eastern Nigeria

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ABSTRACT

Gastrointestinal (GIT)parasites continue to be a serious issue that lowers the efficiency and productivity output of cattle globally.The current study therefore sought to identify the main parasite in cattle in Azare and its surroundings as well as the overall epidemiology of GIT parasites.An abattoir survey was carried out to determine the prevalence of gastrointestinal parasitic helminthes among cattle slaughtered at Azare Town abattoir, located in Katagum Local Government Area of Bauchi State using simple faecal floatation and sedimentation methods. Identified parasitic helminths' ova include trematodes (39.1%), cestodes (18.8%) and nematodes (42.0%) which were detected in 69 samples giving an overall prevalence of 76.7%. The prevalence of helminthes to sex revealed 30 (75.0%) in malesand 39 (84.8%) in females. Among the different age categories, a higher prevalence of 90.0% was recorded among cattle greater than 5 years, 77.8%, 73.7%, 81.8% and 70% among cattle of 5 years, 4 years, 3 years and 2 years of age respectively. The white Fulani breed presented the highest infection rate of 97.8% compared to Sokoto Gudali(52.4%) and Red bororo (56.5%). Mixed infections of double (78.99%) and triple infection rates (21.1%) were recorded. The occurrence of *strongyloides*, *Fasciola* and *Schistosoma* ova are of significant public health importance considering their zoonotic nature. These findings reflect a growing burden of gastrointestinal parasite infections at abattoir level. Therefore, a proper management, improved hygiene and regular deworming practices should be institutionalized for prevention and control of parasitic infections in livestock.

Keywords: Epidemiology; Parasites; GIT; Cattle breeds; Azare; Bauchi State; Nigeria

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INTRODUCTION

Nigeria is one of the largest livestock producers in the Sub-Saharan Africa with population of 34.5 million goats, 22.1 million sheep and 13.9 million cattle (Alsan, 2013). The Nigeria livestock sector contributes 5.2% of the gross domestic products(GDP) while cattle production solely contributes 50% of the total Meat, with a larger proportion of these animals' population are largely concentrated in the northern region of the country (Alsan, 2013).

Despite the significant population of cattle in Nigeria, its output is low due to factors such as poor diet, ineffective reproduction, management problems, and livestock diseases (Alsan, 2013). One of the main

reasons for a decline in livestock productivity and output is internal parasite infection such as nematodes, cestodes, trematodes, and protozoa in cattle (Alsan, 2013). Due to decreased food intake, reduced fertility, decreased capacity for work, decreased production of meat and milk, and increased mortality rates during involuntary culling, parasitic illnesses typically result in decreased production and productivity (Rafiullah *et. al.,* 2011).

Cattle provide multiple socio-economic benefits both to the contribution of household proteins and income, however, frequent helminthiasis attacks resulting in high morbidity rates have remained a major challenge to cattle production (Perry, 2002).Gastrointestinal parasites are ubiquitous in Africa, common in both temperate and tropical countries where climate and many environmental factors provide near-perfect conditions for their survival and development (Perry, 2002).They are more prevalent in most geographical zones of Nigeria where sanitation is poor and the standard of living is low causing enormous economic losses due to the associated morbidity and mortality, thereby limiting cattle production in many areas of the country (Keyyu *et. al.,* 2006). The direct losses caused by these parasites are attributed to hyper- acuteness and death, premature slaughter and rejection of some parts at meat inspection whilst indirect losses include the reduction in productive potential such as decreased growth rate, weight loss, diarrhea, anorexia and sometimes anemia

A literature review of the last decade revealed a paucity of information on the prevalence of gastrointestinal helminths among cattle slaughtered in North-eastern Nigeria. This current study therefore aimed at examining the prevalence of gastrointestinal helminths of slaughtered cattle in Azare Abattoir,Bauchi State, Nigeria. This is with a view of providing a baseline epidemiological review on this group of parasites and other livestock diseases of economic and zoonotic importance in Nigeria.

MATERIALS &METHODS

Study Area

The study was conducted between February and June 2023 in Azare Town Abattoir, Katagum Local Government Area of Bauchi State, North-eastern Nigeria. Azare, which is the capital of Katagum Local Government Area of Bauchi state was created in 1978 by the Federal Government of Nigeria. It is located at latitude 11º 40' 16.19"and longitude 10º 11' 28.00"E (Google Earth, 2015) and covers more than 1,436km^2 of different land areas, with a majority of its inhabitants as peasant farmers, traders and herdsmen. Large numbers of cattle are slaughtered in this abattoir, which serves as a major source of meat for the indigenous population of the community and other surrounding Local Government Areas.

Study Population and Sampling Method

Cattle presented for slaughter at the Azare Town Abattoir were sourced from different locations, mostly from northern Nigerian and surrounding African countries. The cattle were sampled adopting the systematic random sampling method. The sex, age, and breed of the cattle were recorded. Breed identification was done based on morphological features while the appearance of external genitals formed the basis for sex differentiation.

Sample Collection

Fecal samples were collected from 90 cattle per rectum before slaughter into well-labeled sterile containers. The containers were placed in a flask containing ice packs before being transported to the Biology laboratory of BauchiState University for analysis. The floatation technique was carried out to detect nematode and cestodes eggs, while the sedimentation technique was employed to demonstrate trematode eggs. Parasite eggs were identified based on their morphological characteristics (Smith, 1976).

Laboratory Analysis

Simple floatation technique

This was carried out according to standard procedures described by Edosomwan and Ewarami, (2012). Faecal samples were homogenized in a test tube using a saturated NaCl solution. The tube was filled until a slight convex or oval shape was formed at the top. A cover slip was then placedfor 10 minutes on the surface of the solution after which it was removed and placed on a glass slide. Theslide was examined under low magnification (X10).

Sedimentation Method

This was carried out according to standard procedures described by Edosomwan (2012). About 3g of faecal sample was measured in a beaker, 50ml of water was poured into it and mixed thoroughly with a string device, the faecal suspension was filtered through a cheese cloth into another beaker and the filtered materials were poured into a test tube and allowed to sediment for 5min. The supernatant was removed carefully and the sediment was re-suspended in 50ml of water and allowed to sediment for 5min. The supernatant was discarded carefully and the sediment was stained by adding one drop of methylene blue, the sediment was transferred to a micro slide cover with a cover slide and mounted on a microscope for examination.

Identification of Parasites

The parasites observed were identified based on the morphological characteristics using the standard keys

(Smith, 1976). These standard classifications and identification of helminths are dependent on numerous factors including body shape, body cavity, body covering, digestive tubing, sex and type of attachment organs.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee of Bauchi State University, Azare (BSUA/REC/012) before the commencement of the study. Also, oral approvals and consents were obtained from the Veterinary Directorates of Azare Abattoir, Katagum Local Government Area before the study.

Data Analysis

Descriptive statistics was employed to determine the percentage and Chi-square distribution was employed to test for the significance or non-significance of the prevalence between breed, age, and sex of cattle involved in the study using SPSS software.

RESULTS

Overall Prevalence of Identified Helminths at Azare abbatoir

Out of 90 faecal samples examined, 69(76.7%) were positive for gastrointestinal helminth ova. Identified helminths include five trematodes(*Fasciola* spp., *Schistosoma bovis*, *Opisthorchis* spp., *Clonorchis sinensis* and *Dicrocilium dendriticum*), three cestodes(*Diphylobothrium latum*, *Taenia* spp. and *Hymenolepis dimunuta*) and six nematodes (*Ascaris lumbricoides*, *Haemonchus* spp., *Trichuris* spp., *Strongyloides* spp., *Toxocara vitoloruri* and *Ostertagia ostertagia*) (Table1). The results showed that trematodes had a 39.1% total prevalence whereas *Fasciola* spp. had a 37.0% prevalence followed by *Schistosoma bovis*(33.3%), *Opisthorchis* spp.(14.8%)**,** *Clonorchis sinensis*(11.1%) with the lowest prevalence in *Dicrocilium dendriticum*(3.7%). It follows that cestodes had an overall prevalence of 18.8% where *Taenia* spp.had the highest prevalence of 46.2%, followed by *Hymenolepis dimunuta* with 30.8% and the lowest prevalence in *Diphylobothrium latum*(23.1%). For the nematodes, the overall prevalence was 42.0% with the lowest prevalence in *Toxocara vitoloruri*(3.4%)and the highest being*Trichuris* spp. (31.0%) while *Strongyloides* spp. had 20.7%, *Ascaris lumbricoides* had 27.6%, *Haemoncus* spp. (10.3%) and *Ostertagia ostertagia* had 6.9% prevalence. This result implies that nematodes had a slightly higher prevalence in cattle slaughtered in Azare abattoir than trematodes and cestodes(Table 1).

Table 1: Overall Helminths Identified at the Abattoir in Azare

Helminths	Species	No. of positive samples	Prevalence (%)
Trematodes	*Fasciola* spp.	10	37.0
	Schistosoma bovis	9	33.3
	Opisthorchis spp.	4	14.8
	Clonorchis sinensis	3	11.1
	Dicrocilium dendriticum	1	3.7
Total		**27**	**39.1**
Cestodes	*Taenia* spp.	*6*	46.2
	Hymenolepis dimunuta	*4*	30.8
	Diphylobothrium latum	*3*	23.1
Total		**13**	**18.8**
Nematodes	*Ascaris lumbricoides*	8	27.6
	haemoncus spp.	3	10.3
	Trichuris spp.	9	31.0
	Strongyloides spp.	6	20.7
	Toxocara vitoloruri	1	3.4
	Ostertagia ostertagia	2	6.9
Total		**29**	**42.0**
Grand Total		**69**	**76.7**

Prevalence of Gastrointestinal Helminths according to Age Group of Slaughtered Cattle

Infection with gastrointestinal helminths was observed to increase with age of cattle, as the age category of2 years and below had prevalence (70.0%), 3 years had81.8%, 4 years had 73.7%, 5 years and above (77.8% and 90.0% respectively).Cattle of below 2 years and above 5 years had the least (70.0%) and highest (90.0%)

infection rate. Also, the prevalence rate is shown to be statistically highly significant with age categories of cattle P=0.001(P<0.05) (Table 2).

Prevalence of Gastrointestinal Helminths according to Gender of Cattle

The male cattle had a 75.0% prevalence of gastrointestinal helminths while their female counterpart had 84.8% of the valid study samples. This result revealed that female cattle have higher gastrointestinal helminths compared to the male cattle which was also highly statistically significant and P=0.0004; P<0.05 (Table 3).

Infection rate distribution of Gastrointestinal Helminths according to Cattle Breed

The white Fulani breed of cattle had the highest prevalence rate (97.8%), followed by Red Bororo breed(56.5%)while theSokotoGudalibreed had(52.5%) among cattle slaughtered at Azare abattoir. However, these prevalence were not statistically (P=0.072; P<0.05) (Table 4).

Prevalence of Mixed Infections among Slaughtered Cattle in Azare Abattoir

Table 5 indicated that double infection (78.9%) occurrence of gastrointestinal helminthes had higher prevalence rates as compared to the triple infection rate (21.1%) among cattle slaughtered at theAzare abattoir, However, this prevalence was statistically not significant (P=0.009; P<0.05) (Table 5).

Table 2: Prevalence of Gastrointestinal Helminths according to Age Group of Slaughtered Cattle at Azare Abattoir

Age	No. Examined	No. Positive	Percentage Positive (%)
2years	30	21	70.0
3 years	22	18	81.8
4 years	19	14	73.7
5 years	9	7	77.8
>5 years	10	9	90.0
Total	**90**	**69**	**76.7**

P=0.001 **significant at 0.05 degrees of freedom

Table 3: Prevalence of Gastrointestinal Helminths according to Gender of the Cattle

Sex	No. examined	No. positive	Percentage positive (%)
Male	44	30	75.0
Female	46	39	84.8
Total	**90**	**69**	**76.7**

P=0.0004 **significant at 0.05degrees of freedom

Table 4: Prevalence of Gastrointestinal Helminths according to Cattle Breed

Breed of Cattle	Number Examined	No. Infected	Percentage Positive (%)
White Fulani	46	45	97.8
SokotoGudali	21	11	52.4
Red Bororo	23	13	56.5
Total	**90**	**69**	**76.7**

P=0.072 **significant at 0.05 degrees of freedom

Table 5: Prevalence of Mixed Infections among Cattle Slaughtered at Azare Abattoir

Type of infection	Number positive	Percentage positive (%)
Double infection	15	78.9
Triple infection	4	21.1
Total	19	76.7

P=0.009 **significant at 0.05 degrees of freedom

Table 6: Prevalence of Mixed infections of gastrointestinal helminthes recorded from cattle slaughtered at Azare Abattoir

Mixed infections	No. of Occurrence	Prevalence (%)
Ascaris+Dicrocillium	1	1.1
Schistosoma+Fasciola	2	2.2
Ascaris+Trichuris+Taenia	4	4.4
Opisthorchi+Strongyloides	3	3.3
D.latum+schistosoma	2	2.2
Clonorchis+toxocara	1	1.1
Ostertagia+Haemonchus	2	2.2
Trichuris+ clonorchis	2	2.2
Clonorchis+D.latum+fasciolo	1	1.1
Taenia+schistosome	2	2.2
Trichuris+hymenolepis+Taenia	4	4.4
D.latum+ clonorchis	3	3.3
Trichuris+Taenia	1	1.1
Strongyloide+haemoncus	2	2.2
Toxocara+Ostertagia	2	2.2
Clornochis+hymenolepis+ascaris	1	1.1
Opisthorchis +trichuris	3	3.3
D.latum+ascaris+Ostertagia	2	2.2
Hymenolepis+Taenia	1	1.1
Total	**38**	**42.2**

DISCUSSION

The results of this study indicated that intestinal helminth parasites are endemic among cattle slaughtered at Azare abattoir in Katagum LGA, Northeastern Nigeria. The overall prevalence of 76.7% reported in the study area is very high compared to 3% prevalence reported by Ameen *et al*. (2015) in Ogbomosho, Oyo State Nigeria, 34.9% in Wudil local government area of Kano and among the cattle slaughtered at Wukari abattoir, Taraba State, Nigeria (Yuguda *et. al.,* 2018),50.4% in Abraka Delta State Nigeria (Lemy *et. al.,* 2017), 53.8% in Jos, Plateau State Nigeria (Pam *et. al.,* 2015), 57.6% in Aguata and Orumba South in Southeastern Nigeria (Obi *et. al.,* 2020), 47% in Ngorongoro district, Tanzania (Swai *et. al.,* 2006), 50.2% in Western Oromia, Ethiopia (Regassa *et. al.,* 2006), 62.1% of helminths in cattle from Port Harcourt, South-South, Nigeria (Yuguda *et. al.,* 2018) and in Umuahia South Local Government Area, Abia State, Nigeria (Okike-Osisiogu *et. al.,* 2016) while it is find comparable to the 73.3% prevalence reported among cattle in Bauchi State Nigeria (Yuguda *et. al.,* 2018), 74% in South Kivu Province, Congo (Bisimwa *et. al.,* 2014) but lower to 82.24% prevalence of intestinal parasite in cattle slaughtered in Aba, 95.5% prevalence in Southern Ghana(Squire *et. al.,* 2013). This could be due to the fact that most of the cattle slaughtered in the abattoir are sourced from local farmers/herdsmen and also there is little or no inspection carried out to ensure the cleanliness of the abattoirs or health status of cattle before being slaughtered, hence, the cattle owners and butchers kill any kind of cattle not minding their health condition and the implication of infected meat to the populace. The differences in the prevalence of intestinal helminthes parasite could also be traceable to possible reasons as the frequency of anthelmintic treatments of the cattle, availability of vectors, seasonal differences, climatic conditions of the different locations, livestock management system, diagnostic method utilized and number of samples examined amongst other factors (Obi *et. al.,* 2020).

Based on age of cattle, the older cattle had the highest prevalence (90.0%) of helminths parasite in this study. This finding contradicts the result of Omowaye *et al*. (2012), Zawua *et al.* (2016), Yuguda *et al*. (2018) who all reported high prevalence among younger cattle slaughtered at different abattoir. This could be due to the fact that the older cattle within this community are predominantly used in farming activities by the herdsmen, thereby exposing them to various source of infection. It could also be due to weaker immunity level due to poor nutritional and vaccination status. Age of cattle was found to influence significantly ($P<0.05$) the infection rates of the helminthic parasites within the study area.

Based on sex, the overall prevalence of intestinal helminth parasites were high among females (84.8%)

than the male (75.0%) which showed that female cattle were more exposed to infection than males. This finding is consistent with the result of Zawua *et al*. (2016), 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 and in contrast with those of Olajide *et al*., (2017), Bisimwa *et al*. (2014) in South Kivu Province of Congo and Yuguda *et al*. (2018) in Bauchi State of Nigeria. The high prevalence rates observed in females could be attributed to the fact that more females were sampled than the males and also this could be due to chance. Though Adedipe *et al.* (2014) found that both female and male cattle have higher chances of being infected with intestinal parasites, however, sex was found to influence significantly (P<0.05) the prevalence of intestinal helminth parasites in the study area and contradicts the result of previous studies as reported by Obi *et al*., (2020).

White Fulani breed of cattle recorded the highest overall prevalence of gastrointestinal helminthes (97.8%), followed by Red Bororo breed which had 56.5% prevalence of the gastrointestinal helminthes while Sokoto gudali breed of cattle had the least prevalence of 52.5% among cattle slaughtered at Azare abattoir. The great 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, cattle breed showed no significant influence (P<0.05) with the prevalence of intestinal helminth parasites. This finding conflicts the report of Bisimwa *et al*. (2014) of which exotic breed of cattle were found to be 4.6 times more likely to be infected with intestinal helminthic parasites in Congo. The reports of Regassa *et al.,* (2006) in Ethiopia, Squire *et al*. (2013) in Ghana, Yuguda *et al*. (2018) and Obi *et al*. (2020) in Aguata and Orumba South LGA, Southeastern, Nigeria which showed insignificant association between breed and the prevalence of intestinal helminthic parasites was found to be consistent with the result of the current study.

The identified intestinal helminth ova in the study area were nematodes (42.0%)(*Ascaris lumbricoides*(27.6%), *Haemonchus* spp. (10.3%), *Trichuris* spp. (31.0%), *Strongyloides* spp. (20.7%), *Toxocara vitoloruri*(3.4%) and *Ostertagia ostertagia* (6.9%), Cestodes(18.8%) (*Diphylobothrium latum*(23.1%), and *Taenia* spp. (46.2%), *Hymenolepis dimunuta*(30.8%) and trematodes(39.1%)(*Fasciola* spp. (37.0%), *Schistosoma bovis*(33.3%), Opisthorchis spp.(14.8%), C*lonorchis sinensis*(11.1%) and *Dicrocilium dendriticum* (3.7%). Similar findings have been reported by several authors in many parts of Nigeria and Africa as a whole (Regassa[16, 18-19, 23-24] *et. al.,* 2006).The occurrence of *Strongyloides* spp., *Fasciola* spp. and *Schistosoma bovis* ova are of significant public health importance considering their zoonotic nature (Karshima, 2018).

Mixed infections indicated by the occurrence of two or more parasites were common without single infection reported in this study. The occurrence of double infection (78.9%) was more than that of triple infection (21.1%). Most common among the mixed infections is the co-infection of *Ascaris*+ *Trichuris*+ *Taenia* (4.4%) and *Trichuris + Hymenolepis + Taenia* (4.4%). Squire *et al*. (2006), Obi *et al.,* (2020) made similar observations concerning mixed infections. However, Oluwole *et al*. (2016) and Yuguda *et al*. (2018) reported *Fasciola* spp. to be the highest prevalent helminthic parasites in Oyo and Bauchi State, Nigeria respectively. This contradicts the findings of this study as *Taenia* spp. had the highest percentage of occurrence. The variations in the prevalence of the parasites and the occurrence of mixed infections could be attributed to the opportunity of exposure of the cattle to the infective stages and vectors of these parasites, suitable conditions that favor the breeding of certain parasites and their vectors as these animals are from diverse sources.

CONCLUSION

In conclusion, cattle slaughtered at Azare town abattoir are affected by a variety of intestinal helminthic parasites including zoonotic helminthes with a slightly high prevalence rate which can limit and constrain cattle production in the area. The prevalence was significantly associated with age and gender of cattle slaughtered, with high occurrences of *Taenia spp.* and zoonotic parasites (*Strongyloides* spp*., Schistosoma* spp. and *Fasciola* spp.) of public health significance. Further studies should be carried out covering a wider scope, areas, size and longer duration of study employing molecular diagnostic procedures. This was not done due to financial constraints. Thus, there is therefore a need for public enlightenment on the zoonotic importance of helminthic parasites, the need for routine anthelmintic treatment, regular inspection of abattoirs should be enforced to reduce/prevent cross infection or spread of such helminthes, improved hygiene and adoption of

good management practices to reduce parasitic burden and increase productivity.

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