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Original Article

Comparative analysis of gut parasites of cattle slaughtered in Odo-Eran and Fatai Atere abattoirs in Lagos State, Nigeria

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Abstract

Cattle is one of the most domesticated livestock in Nigeria, but its production and consumption is affected by parasitic pathogens. This cross-sectional study was carried out to compare the gut parasites of cattle slaughtered in two abattoirs in Lagos State, Nigeria. Faecal samples obtained directly from the rectum of 132 slaughtered cattle were analyzed using formol-ether concentration technique. Out of the 132 samples examined, a total of 69 were infected with an overall prevalence of 52.3%. Three GIT helminth parasites were isolated namely; *Fasciola sp*. (52.3%), *Strongyloides sp*. (30.4%) and *Eimeria sp*. (17.4%). In Fatai Atere and Odo-Eran abattoirs, female cattle were the most infected 21(35.5%) and 17(37.4%) respectively ($p=0.815$). Based on study location, parasitic prevalence was higher in Fatai Atere abattoir 59.1% than in Odo-Eran abattoir 45.5% ($p>0.05$). Age, funds (inadequate feeding and watering space), farmer education and poor ventilation/ overcrowding were found to be risk factors for GIT parasite infection among cattle in the study areas ($p<0.05$). This study suggested that helminth infection is endemic in the region and hence, routine treatment, adequate sanitation and good management practices should be adopted to mitigate cases of parasitic helminth infection of cattle in the study areas.

INTRODUCTION

Cattle are the most common type of large domesticated animals representing valuable assets in traditional agriculture and have remained an essential component of the agricultural sector of the Nigerian economy producing meat as a major product (Takeet *et al.,* 2016; Mary *et al.,* 2019). The historical mobile pastoralism or transhumance is the dominant system of cattle production in Nigeria (Kingsley *et al.,* 2013) where these animals are grazed on communal pastures throughout the year with little or no nutrient supplement, and fodder shortage being a major problem even in the rainy season (Dauda *et al.,* 2022).

Nigeria is known to be one of the leading

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countries in cattle production in sub-Saharan Africa where cattle contribute to about 12.7% of its Agricultural Gross Domestic Product (GDP) (FAO, 2016). Cattle industries in Nigeria provide a means of livelihood for a significant proportion of pastoral households and participants in the cattle value chain in the sub-humid and semi-arid ecological zones of Nigeria. Its production solely contributes 50% of the total meat which is one of the most important livestock products (FAO, 2016; Kubkomowa, 2017). Unfortunately, cattle are most times infected with gastrointestinal parasites especially helminths (Adeoti *et al.,* 2020).

Gastrointestinal helminth infections are recognized as a major constraint to livestock production throughout the tropics (Elele *et al*., 2013). Intestinal helminths are a worldwide problem for both small- and large-scale cattle farmers but its impact is greater in sub-Saharan Africa and Nigeria in particular. The gastro-intestinal helminths populate the gastro-intestinal tracts of cattle and other associated organs of gastro-intestinal tract (GIT). The most important predisposing factors of helminth infections are grazing habits (feeding on contaminated pastures and feeding or drinking from a contaminated water source), climate, nutritional deficiency, pasture management, immunological status, vector or presence of intermediate host and the number of infective larvae and eggs in the environment (Olubukola *et al,* 2014).

The parasites live in the host, receiving nourishment and protection while causing acute and chronic infections, disrupting the host nutrient absorption, causing reduced weight gain, reduced food conversion, abortion, infertility, reduced meat and milk production, weakness and diseases (Adedipe *et al*., 2014; Adeoti *et al.,* 2020). Cattle of all ages are affected by a diversity of GIT parasites and among these are the roundworms (nematodes), which are primarily parasites of the gastrointestinal tract, the liver fluke (trematodes), tapeworms (cestodes) in the small intestine, and single-celled protozoan parasites (coccidia) in the lower intestinal tract (Obi *et al.,* 2020). However, the effect of helminth infections is determined by a combination of factors, of which the varying susceptibility of the host species, the pathogenicity of the parasite species, the host/parasite interaction, and the infective dose are the most important (Babagana *et al*., 2016; Dogo *et al*., 2017).

In Nigeria, over 90% of the cattle populations are kept under the traditional postural husbandry of Fulani herders, occupying Central and Northern parts of the country (Nwosu *et al.,* 2017). Under this system, cattle are extensively grazed in pastoral and forest areas, exposing them to potential infestation by several tick and insect species (Pam *et al.,* 2013; Nwanta *et al*., 2018). These parasites are known to be a major constraint to cattle's well-being and productive performance (Olubukola *et al,* 2014). Even though mortality of animals due to parasitic diseases may not be alarming at times but their indirect effects on livestock productivity and their zoonotic impact on human health are considerably greater (Ekong *et al.,* 2012; Squire *et al.,* 2013; Nwosu *et al.,* 2017). Indirect losses associated with these infections include the reduction in productive potential such as decreased growth rate, weight loss, diarrhea, anorexia, and sometimes anaemia (Olabode *et al.,* 2014; Sultan *et al.,* 2016; Nwosu *et al.,* 2017; Adeoti *et al.,* 2020). The large amount of beef consumed on a daily basis in the study area is of concern since

meat infection can lead to illness and potential disease outbreaks in humans. Hence, knowledge of the intestinal parasites of cattle is of great importance in every region as it can aid in health policy making and interventions. Therefore, this study was carried out to comparatively assess the gastrointestinal parasites of cattle slaughtered in two abattoirs in Lagos State.

MATERIALS AND METHODS

Study Area

This study was carried out in Odo-Eran and Fatai Atere abattoir all situated in Mushin Local Government Area of Lagos State, Nigeria. Fatai Atere abattoir lies on latitude 6°32'36.96" and longitude 3°21'0.36". Mushin LGA has an estimated population of 1,321,517 as per the Abstract of Local Government Statistics. The geographical coordinates of the area are latitude $6^0$36'38"N and longitude $3^0$17'45"E. t is predominantly a densely populated residential area with inadequate sanitation and low-quality housing. These abattoirs (Odo-Eran and Fatai Atere) are known to be visited by large number of individuals both buyers and sellers. However, these facilities are often unclean, with unsatisfactory conditions evident outside and within the slaughtering areas.

Ethical Approval

This study was approved by the Animal Care and Use Research Ethics Committee of the College of Medicine, University of Lagos, Nigeria. The ethical approval letter was assigned with the reference number CMUL/ACUREC/06/24/1500.

Collection of Samples

Visits were made to the abattoirs for one month as early as 5 - 6am during the ante mortem inspection. The following processes were carried out as outlined below:

1. Each of the animal was given an identification number, and age, sex, breed and origin of the animals were noted as described by Ambachew and Yitagel (2015). Age and sex of the cattle were determined by observing their genitals and dentition, respectively;

2. The breeds of cattle examined comprised White Fulani, Sokoto Gudali, Red Bororo and Muturu breeds;
   a. The White Fulani breed is characterized by its predominantly white coat, black skin, and specific physical traits like medium to long lyre-shaped horns. They have well-developed thoracic humps, a long head, and strong necks.
   b. Red Bororo cattle have a red coat and long, lyre-shaped horns, being well-suited for long-distance travel in pastoral systems. They are more resistant to certain diseases and widely spread across Nigeria.
   c. Sokoto Gudeli, with various coat colours, possess shorter horns and a deeper body than White Fulani. They are hardy in arid environments and prized for their beef and milk
   d. Muturu cattle, the smallest breed, feature black and white patches and are known for their cultural significance rather than commercial use.
3. Slaughtered animals were subjected to post mortem (PM) examination as described by Musawa *et al*. (2021). Stool samples were collected from a total of 132 randomly selected cattle of different breeds, sex and ages at the point of slaughter using spatula and hand gloves. Approximately 3g of the samples were collected directly from the

rectum of the slaughtered cattle into well-labelled, clean and sterile specimen bottles and arranged in a sample box containing icepacks to slow the rate of deterioration according to the method described by Cringoli *et al*. (2010). The samples were taken to the laboratory for preparation and parasitological examination.

Determination of Risk Factors

Information on various risk factors considered in this study comprising unreliable rainfall, ectoparasite infestation, poor transportation system, education status, inadequate drug usage, inadequate feeding and watering space, market and storage facilities, poor ventilation/ overcrowding, cattle breed and sanitary conditions were obtained by administering structured questionnaires to the cattle dealers or rearers.

Parasitological Examination

Macroscopic

The faecal samples were initially examined macroscopically for their consistency (water content) as watery, loose, and soft or formed and then categorized as either diarrheic or non-diarrheic.

Laboratory Preparation

The Formol-ether concentration technique was used to analyze the samples. 1g of stool sample was emulsified in 4 ml of 10% formol saline in a test tube. The mixture was filtered into a test tube using a cloth gauge and 3-4 ml of diethyl ether was added and shaken vigorously and allowed to stand for two minutes. The mixture was then centrifuged at 1000 revolutions per minute (rpm) for 3 minutes. Using a glass rod, the faecal debris from the side of the tube was loosened and the tube inverted to pour off the supernatants. The tube was returned to its original upright position and the fluid from the side of the tube was allowed to drain to the bottom. The deposit was resuspended by tapping the bottom of the tube with the finger. With the aid of a Pasteur pipette, a drop of the sediment was applied on a microscope slide; covered with a cover slip and examined under the microscope using ×10 and ×40 objectives. Lugol's iodine was also used as a staining agent (Cheesbrough, 2006).

Data Analysis

Data obtained from this study were subjected to statistical analysis using SPSS version 25.0. Prevalence rates were calculated and expressed as percentages in tables. Chi-square test was used to determine the association between the risk factors studied and P>0.05 was considered significant. Parasites intensity was estimated using a model according to Dogo *et al*. (2017) as follows:

$$\text{Intensity} = \frac{\text{Total no of parasites recovered in cattle sample}}{\text{No cattle infected}}$$

RESULTS

Out of the total 132 cattle examined in this study, 69 were found to be infected with gut parasites with an overall infection prevalence of 52.3%. Female cattle recorded higher infection prevalence 54.3% than the male cattle with infection prevalence of 50.0%. The result of gender prevalence was not statistically significant (P<0.05) as shown in Table 1.

Table 1 : Prevalence of GIT Parasite Infection with respect to cattle gender

Sex	Number sampled	Number infected (%)	P-value
Female	70	38 (54.3)	0.152
Male	62	31 (50.0)	
Total	132	69 (52.3)	

no significant difference between variables (p>0.05)

Table 2 illustrates the age of the cattle examined in the study as gathered from the cattle sellers. Based on age categories, cattle from the age bracket of 2-5 years old had the highest number of 75 (56.8%), followed by 6-9 years old cattle with 48 (36.4%) while the least was cattle that were ≥10 years old 9 (6.8%). There was no significant difference ($p>0.05$) in the prevalence of infection among different age groups.

Table 2 : Prevalence of GIT parasites in cattle according to Age Groups

Age category	Frequency (N=132)	Percentage (%)	p-value
2-5	75	56.8	
6-9	48	36.4	0.063 ^{ns}
≥10	9	6.8	
Total	**132**	**100.0**	

Three helminth parasites namely; *Strongyloides sp*., *Fasciola sp*., and *Eimeria sp.* were found to be responsible for these infections. Out of these, *Fasciola sp.* was the most prevalent (52.3%) followed by *Strongyloides sp.* (30.4%) while *Eimeria sp.* was the least (17.4%) as shown in Table 3.

Table 3: Abundance of helminth intestinal parasites of cattle in the study area

Parasites	No. Recovered	Abundance (%)
Strongylodies sp.	21	30.4
Fasciola sp.	36	52.2
Eimeria sp	12	17.4
Total	**69**	**100**

Little above half of the cattle examined (51) representing 39% were Red Bororo, little above one third of the cattle (40) representing 30% and 37 (representing 28%) were White Fulani and Sokoto Gudali respectively, while only one fourth of the cattle (4) representing 3.0% were Muturu (Figure 1). The result presented in Figure 2 shows the number of cattle infected (47.7%) and the number that was uninfected (52.3%) via microscopic examination of the stool samples.

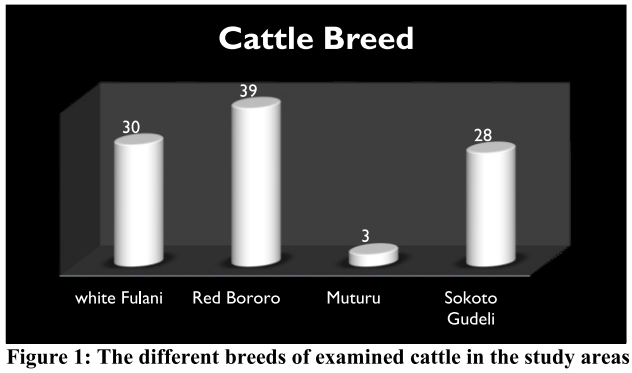

Figure 1: The different breeds of examined cattle in the study areas

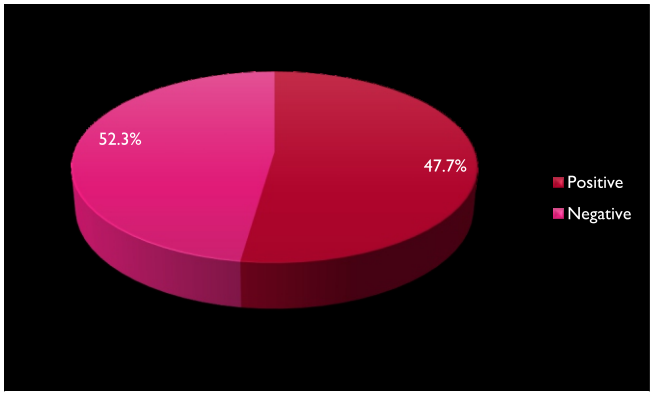

Figure 2: Microscopy results of cattle examined

Comparison of GIT Parasites Infection in the Different Study Location

The total cattle (n = 132) investigated in this study had a mean age of 6.40 ± 3.61 years in both sites. In Fatai Atere abattoir, female cattle had higher infection prevalence of 21 (35.5%) while males had lower prevalence of 18 (30.5%). Similarly, in Odo-Eran abattoir, female cattle also recorded the highest prevalence of 17 (37.4%) while male cattle had lower prevalence of 13 (28.6%). In terms of age distribution, 29 (49.1%) and 16 (35.3%) of the cattle aged 2-

5 years were highly infected in Fatai Atere and Odo-Eran abattoirs, respectively, followed by 11 (24.2%) and 18 (13.5%) for age 6-9 years, while the least infected were 2 (3.4%) and 3 (6.6%) for cattle older than 10 years. There was no significant difference in the prevalence of GIT parasite infection between male and female cattle in the different study areas (P=0.815) as shown in Table 4. However, it was also observed that cattle from 6 – 9 years and above 10 years tended to have lower parasite infection compared to cattle between the ages 2 - 5 years and the result was statistically significant (P=0.042). In terms of parasites abundance in the study sites, *Strongyloides sp*. was found to be highest in Odo-Eran abattoir with 12 (26.4%) while *Fasciola sp*. had the highest prevalence of 25 (42.3%) in Fatai Atere abattoir. On the other hand, *Eimeria* sp. was the most predominant gastrointestinal parasite with 7 (15.4%) in Odo-Eran abattoir. *Eimeria* sp. was found to have the lowest prevalence in both study locations compared to *Strongyloides* and *Fasciola sp*.

Table 4: Comparison of GIT parasite infection between the sampled areas

Variables	Fatai Atere Abattoir	Odo-Eran Abattoir	Total	p-value
	Number infected (%)			
Sex				
Male	18(30.5)	13(28.6)	31(44.9)	0.815
Female	21(35.5)	17(37.4)	38(55.1)	
Total	39(56.5)	30(43.5)	69(52.3)	
Age groups (years)				
2-5	29(49.1)	16(35.2)	45(65.2)	
6-9	8(13.5)	11(24.2)	19(27.5)	0.042
≥10	2(3.4)	3(6.6)	5(7.2)	
Parasite seen				
Strongylodies sp	9(15.2)	12(26.4)	21(30.4)	
Fasciola sp	25(42.3)	11(24.2)	36(52.2)	
Eimeria sp	5(8.5)	7(15.4)	12(17.4)	

Table 5: Comparison of the prevalence and intensity of infection in cattle in the sampled areas

Variables	Values	P-value
Number of Cattles Examined		
Fatai Atere Abattoir	66(50%)	
Odo-Eran	66(50%)	
Number of Cattles Infected		
Fatai Atere Abattoir	39(59.1%)	0.980
Odo-Eran	30(45.5%)	
Total No. of parasite recovered		
Fatai Atere Abattoir	109	
Odo-Eran	122	0.862
Prevalence (%)		
Fatai Atere Abattoir	59.1	0.635
Odo-Eran	45.5	
Intensity of Parasite		
Fatai Atere Abattoir	2.8	0.481
Odo-Eran	4.1	

ns: no significant difference between variables as determined by the Chi-Square test

The total number of infected cattle in Fatai Atere abattoir was found to be 39 (59.1%), while for Odo-eran was 30 (45.5%). Number of parasites were seen to be higher in Odo-eran (122) compared to Fatai Atere (109), while parasite intensity in this study was observed to be highest in Odo-eran. (Table 5). The result of parasitic infection prevalence and intensity in both areas showed no significant difference (p>0.05).

Table 6 shows all the risk factors of parasitic infection considered in this study. Poor transportation system, farmer education, funds (inadequate feeding and watering space) and Poor ventilation/Overcrowding were observed to be a risk factor for gut parasite in the study areas (P<0.05).

Table 6: Risk factors of GIT parasite infections in the study areas

Variable	Fatai Atere Abattoir	Odo-Eran	P-value
Unreliable rainfall			
Yes	45(68.2)	49 (74.2)	
No	21(31.8)	17 (25.8)	0.064
Ecto parasites infestation			
Yes	19(28.8)	23 (34.8)	
No	47(71.2)	43 (65.2)	0.901
Poor transportation system			
Yes	54(81.8)	61 (92.4)	
No	12(18.2)	5 (7.6)	0.057
Cattle dealer education			
Yes	59(89.4)	61 (92.4)	
No	7(10.6)	5(7.6)	0.056
Inadequate drug usage			
Yes	54(81.8)	61 (96.4)	
No	12(18.2)	5(7.6)	0.911
Funds (inadequate feeding and watering space)			
Yes	55(83.3)	52 78.8)	
No	11(16.7)	14 (21.2)	0.044
Market and Storage facilities			
Yes	56(84.8)	53 (80.3)	
No	10(15.2)	15 (22.7)	0.901
Poor ventilation/Over crowding			
Yes	57(86.4)	58 (87.9)	
No	9(13.6)	8 (12.1)	0.047
Breed			
White Fulani	21(31.8)	19(28.7))	
Red Bororo	19(28.8)	32 (48.5)	0.911
Muturu	4(6.1)	-	
Sokoto Gudali	22(33.3)	15(22.7)	
Sanitary condition			
Use of pesticide	-	2(3.0)	-
Use of soup and water	46(70)	35 (53.0)	
Only water	2(3.0)	-	
Cleaning and disposing of the waste dump regularly	4(6.1)	7(10.6)	0.440
Stagnant water/Drainage	3(4.5)	8(12.1)	

DISCUSSION

The finding of the current study revealed a high prevalence (52.3%) of GIT parasites among the cattle slaughtered for consumption in Fatai Atere and Odo-Eran Abattoirs in Lagos State, Nigeria. This finding indicated the endemic nature of gut parasites infection among cattle as well as the poor sanitary conditions in the study area. The overall prevalence reported in this study was higher than the 26.67% prevalence reported in Gwagwalada abattoir in the Federal Capital Territory, Nigeria by Obeta and Shaaba (2024) but it was similar to the 57.6% prevalence reported by Obi *et al*. (2020) in Aguata and Orumba South Local Government Area, southeastern Nigeria. However, this result was lower than the 88.0% infection prevalence also reported in different abattoirs in Anambra State, Nigeria by Ikeh *et al*. (2024).

Numerous studies conducted in different parts of the country have documented varying prevalence rates such as the 48.0, 74.3 and 32.34% reported in Zaria, Bauchi and North central Nigeria by Ieren *et al.* (2016), Yuguda *et al*. (2018) and Yatswako and Alhaji (2017) respectively. Elsewhere in Africa, Nyirenda (2019) had earlier reported prevalence rate of 64.4% in Mongu area of Zambia. The differences in the prevalence rates observed in the various regions could be attributed to poor management practices and sanitary conditions of the various study locations. The gut parasites identified from the study sites were all helminth parasites. Similar reports have been documented in different regions in Nigeria and beyond. According to Ikeh *et al*. (2024) the presence of these parasites in cattle is usually accompanied by grave consequences such as reduced productivity, damage to internal organs, transmission of diseases to consumers and economic loses.

Furthermore, the helminth parasites found in this study pose a huge threat to public health bearing in mind, their zoonotic potential. *Fasciola* sp (52.2%) were the predominant parasites identified in this study followed by *Strongyloides* sp (30.4%). *Eimeria* sp was the least reported helminth parasite in this study. This finding is in line with studies conducted by Suleiman *et al.* (2022) and Agba and Aguh (2020) that also reported similar parasites in their studies. However, in this study the prevalence of *Fasciola sp.* (52.2%), *Strongylodies* sp., (30.4%) and *Eimeria* sp., (17.4%), are much higher than the findings of Suleiman *et al*. (2022) where prevalence rates of 13.9, 8.3 and 7.4% were reported for *Eimeria*, *Strongyloides* and *Fasciola* eggs respectively among cattle slaughtered in selected abattoirs in Sokoto State. In contrast, studies conducted by Yuguda *et al*. (2018) and Binta *et al*. (2021) had earlier documented other intestinal parasites such as *Ascaris lumbricoides*, *Toxocara* sp., *Nematodirus*, *Ostertagia, Trichuris sp., Schistosoma bovis, Monezia expansa, Taenia saginata, Hymenolepis diminuta,* and *Haemonchus* contrary to findings of the present study. However, the presence of these gut parasites in this study could be as a result of favourable environmental conditions that helps in the survival and transmission of these parasites.

In the current study, prevalence was higher in female cattle than in male cattle although the difference obtained was not statistically significant. This report agreed with Pam *et al*. (2013) who stated that female animals having generally herded much longer for the purpose of breeding and milk production would certainly have prolonged

exposure to challenges of disease. This result disagreed with the work of Mahmud and Ahmad (2020) and Suleiman *et al.* (2022) that male cattle were more infected than females in Sokoto State, Northern Nigeria. This result is also contrary to the reports of Agba and Aguh (2020) and Adedipe *et al*. (2014) that both the male and female animals have equivalent chances of being infected with the parasites because both cattle are reared under the same local surroundings in Nigeria and are exposed to similar poor feeding, veterinary care and management practices. The implication of higher infection rate in females is that, mating and reproduction of new offspring may be hampered leading to extinction.

Furthermore, prevalence was found to be higher in the age bracket of 2 - 5 years compared to the other age grades. However, contrasting reports have been documented by Singh and Bello (2017) and Obeta and Shaaba (2024) that reported higher prevalence in different age groups other than that reported in this study. The higher prevalence of infection encountered in the 2 - 5 years age group might be attributed to lack of protective immunity, lack of nutritional supplementation and/or lack of use of anthelmintic drugs by resource-poor small cattle farmers there by exposing these cattle in their first grazing season immediately after weaning to grazing areas and water points with a heavy parasitic load (Kemal and Terefe, 2013; Sharma and Busang, 2013).

The breed prevalence in this study showed that the Red Bororo had the highest prevalence of 28.8 and 48.5% for Fatai Atere Abattoir and Odo-Eran abattoir, respectively which is in conformity with the finding of Adedipe *et al.* (2014). On the contrary, Pam *et al*. (2013) had documented White Fulani with the highest prevalence of 24.53% followed by Red Fulani with 21.70% in Plateau State. Obeta and Shaaba (2024) also reported highest infection prevalence in Sokoto Gudali contrary to the findings of this study. The variation in the prevalence among the breeds could be attributed to management system, as most of these parasites are known to adapt well even under harsh condition and their elimination is difficult which threatens the food security where ever they appear (Singh and Bello, 2017). This could also be attributed to the existence of favourable environmental factors that are favorable for parasitic infection (Yuguda *et al.,* 2018). The prevalence of these parasites (*Fasciola* sp, *Strongyloides* and *Eimeria* sp) was much in certain breed because, most breed are likely to get parasites or how certain breeds immune system react during an infection. In terms of location, the current study revealed higher prevalence in Fatai Atere abattoir compared to Odo-Eran abattoir. Although the results were not statistically significant, but it suggested location-based prevalence. This view is shared by Obi *et al.* (2020) that also reported higher infection prevalence among trade cattle in Orumba south (67.1%) compared to Aguata (52.9%) areas. The varying prevalence observed in different abattoirs could be due to inadequate sanitary conditions, poor handling practices, and virulent nature of parasites in the different locations. Findings from butchers and cattle owners at the sampling areas revealed that most of the cattle were brought in from the Northern part of the country.

CONCLUSION

The finding of the present study showed that the gut parasites were prevalent in varying magnitude among cattle

slaughtered in some abattoirs in the study areas. Factors such as funds (inadequate feeding and watering space), farmer education, age and Poor ventilation/Overcrowding were found to significantly influence the prevalence of infection among the cattle. It is, therefore, recommended that cattle owners should be enlightened by relevant health agencies on the use of chemotherapy, adequate sanitary conditions, good management practices as well as the importance of ranching so as to improve health of these cattle and to also reduce the prevalence of zoonotic infections among human population.

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