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Prevalence of parasitic infections in slaughtered cattle from selected abattoirs in South Eastern States of Nigeria

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ABSTRACT: Cattle production is greatly constrained by parasitic infection, which hampers its welfare and productivity and poses a serious public health concern to the general populace. This study investigates the various cattle parasites and other study parameters. A total of eighty (80) faecal and blood samples were collected from cattle at selected abattoirs in both Anambra and Enugu State, Eastern Nigeria and analysed for haemoparasites and intestinal parasites using thick films and Stoll's technique, respectively, and their different body parts were also examined for the presence of ectoparasites. The Chi-square test was employed to determine the possible association between parasite prevalence, sexes, breed, locations, and predilection sites. The results from the study show that the highest prevalence for ectoparasites recovered was from *Amblyomma variegatum* with 38.80% (31/80) whereas among the intestinal parasites recovered from the study, *Trichostrongylus* spp had the highest prevalence of 41.30% (33/80). No haemoparasite was recovered from the cattle in this study. Prevalence according to sex revealed that female cattle with 80.6% showed a higher prevalence of intestinal parasites compared to their male counterparts with 69.4%, but without significant differences ($p<0.05$). Breed-specific prevalence revealed that the Red Fulani/Bororo and Sokoto Gudali recorded the highest prevalence of intestinal parasites (100.0%) while Red Bororo had the least prevalence of 25%. Statistical analysis showed significant differences ($p<0.05$, 0.017) in the prevalence in relation to the species breed. There was a significant difference ($p<0.05$, 0.012) in parasite prevalence among the abattoirs, with Amansea having 90% and Kwata with 80% recording the highest prevalence for intestinal parasites. The findings of this study demonstrate a high prevalence of intestinal and ectoparasitic infections in cattle, underscoring the need for routine meat inspection, improved abattoir management and parasite control practices, and the implementation of a sustainable Preventive One Health Intervention (POHI) to reduce the risk of zoonotic disease transmission and outbreaks.

Keywords: Abattoirs, cattle, ectoparasites, intestinal parasites, infestation.

INTRODUCTION

Livestock production constitutes a very important component of the agricultural economy of developing countries. They provide meat, milk, skin, fertiliser, fuel and draught power for farming (FAO, 2004). Cattle, which are the most prominent amongst Nigerian livestock, are estimated to be more than 19 million and are largely concentrated in the northern parts of the country (Agba and Aguh, 2020). The gains accruing from cattle production in Nigeria cannot be overstated as cattle constitute important sources of animal protein, raw materials, income, farm power, employment and organic manure (Obi *et al*., 2020; Sheridan *et al*., 2000).

However, profitability and efficiency in cattle/livestock production have greatly diminished due to parasitic infection. Parasitic infections, particularly gastrointestinal parasites, have debilitating effects on human and animal

health worldwide. Parasites appear to be cosmopolitan but are more common in tropical areas, aggravated by poor sanitation and low standard of living (Adedipe *et al*., 2014). Helminth infections of medical importance are mostly caused by nematodes (such as *Ostertagia ostertagi*, *Capillaria bovis*, *Trichuris trichura*, *Strongyloides papillosus*), Cestodes (such as *Moniezia benedeni*, *Taenia saginata*) and Trematodes (such as *Fasciola gigantica*, Amphistomes) in both man and animals (Joe-Ikechebelu *et al.,* 2022). The effect of parasitic infection on cattle is quite enormous. They pose a serious health threat and negatively impact livestock production through their associated morbidity, mortality, treatment and control costs (Obi *et al*., 2020; Umeanaeto *et al*., 2016). Other economic losses are poor work performance, involuntary culling, lower milk production, treatment costs and mortality in heavily parasitised animals (Dogo *et al*., 2017). The mature worms produce toxins that migrate to the red blood cells, which causes an unthrifty anaemic condition, while the immature worms migrate through the body tissues, opening the way for bacterial and fungi complication (Dogo *et al*., 2017). Factors that can influence the prevalence of gastrointestinal infection in livestock include age, sex, breed of the animal, management practices, local climatic attributes such as temperature, rainfall, humidity, vegetation nutritional deficiency, pasture management, immunological status, vector or presence of intermediate host and the number of infective larvae and eggs in the environment and also the parasite species themselves (Dogo *et al*., 2017). The prevalence and distribution of intestinal parasites among cattle have been reported earlier in Nigeria and Anambra State by several authors (Dogo *et al*., 2017; Obi *et al*., 2020; Adedipe *et al*., 2014; Adeoti *et al*., 2020; Ogbuefi *et al*., 2025).

This study aims at assessing the ectoparasite infestation and parasitic infection in cattle slaughtered at selected abattoirs in eastern states of Nigeria, thereby contributing to the existing knowledge by providing information to fill up the gaps in the study and data available on the parasitic infection of cattle from selected abattoirs in both Anambra and Enugu States of Eastern Nigeria. Understanding the prevalence and diversity of these parasites is essential for implementing effective control and prevention measures to safeguard both animal and public health.

MATERIALS AND METHODS

Study area

The study was conducted in selected abattoirs in Anambra State and Ugwuoba abattoir in Enugu State, South-Eastern Nigeria, which is situated within latitudes 5.8500°N to 7.0675°N and longitudes 6.3427°E to 7.2926°E (Figure 1). According to the 2022 census data provided by the National Population Commission of Nigeria, Anambra State has an approximate population of 5 million residents, making it one of the densely populated states in the country. The selected abattoirs included:

a. Amansea in Awka North (Latitude: 6.2950°N, Longitude: 7.0180°E)
b. Ugwuoba in Enugu (longitude 7°09′15″ East and latitude 6°16′07″ North).
c. Kwata in Awka South (Latitude: 6.2080°N, Longitude: 7.0763°E), and
d. Nkwelle in Oyi Local Government Area (Latitude: 6°51’27” N, Longitude: 7.0386°E).

Amansea is within the Awka capital territory and is bounded to the South by Awka town, to the North by Mamu River, Ebenebe town, to the West by Mgbakwu and to the East by Ezinato/Ubibia stream. The town is within the rainforest region of Nigeria with an annual rainfall of 1000-1500mm. Ugwuoba is in the Oji River local government area of Enugu State, but lies at the boundary between Anambra and Enugu State. It is located along Enugu-Onitsha Express Road, near Ezu River and harbours a major cattle market known as Gariki, where Hausa/Fulani cattle herders reside. It is about 15 km from Awka, the capital of Anambra State. Ugwuoba is located on top of a hill and lies within the rainforest region of Nigeria with 1000 - 1500 mm rainfall annually (Williams *et al*., 2017). Nkwelle is one of the five towns in the Oyi Local Government Area, which is a suburb of Onitsha. Due to their location and large number of animals slaughtered, these abattoirs serve as major sources of meat consumed by the teeming population of the surrounding local government area.

Sample collection for the diagnosis of parasitic infections

According to the method described by Dogo *et al*. (2017), the samples were collected between sampling period/duration of three months (November 2023 to January 2024) at time ranges of between 6:00 am and 8:00 am. A simple random sampling method for examination (ensuring a representative sample across different age groups and sexes) was used to select cattle, which were screened at antemortem in accordance with ethical guidelines and proper handling procedures. A total of eighty cattle were sampled (20 from each market). Fresh faecal samples were collected from the rectum of freshly slaughtered cattle into a well-labelled universal specimen container containing 10% formalin as preservative. For each animal screened, parameters such as the sex, age and breed were recorded. The sampling size technique used for the study was:

$$n_0 = \frac{Z^2 P(1-P)}{d^2}$$

Where: $Z = 1.96$(95% confidence level), $P = 0.30$(estimated prevalence), $1 - P = 0.70$, $d = 0.05$(5% margin of error).

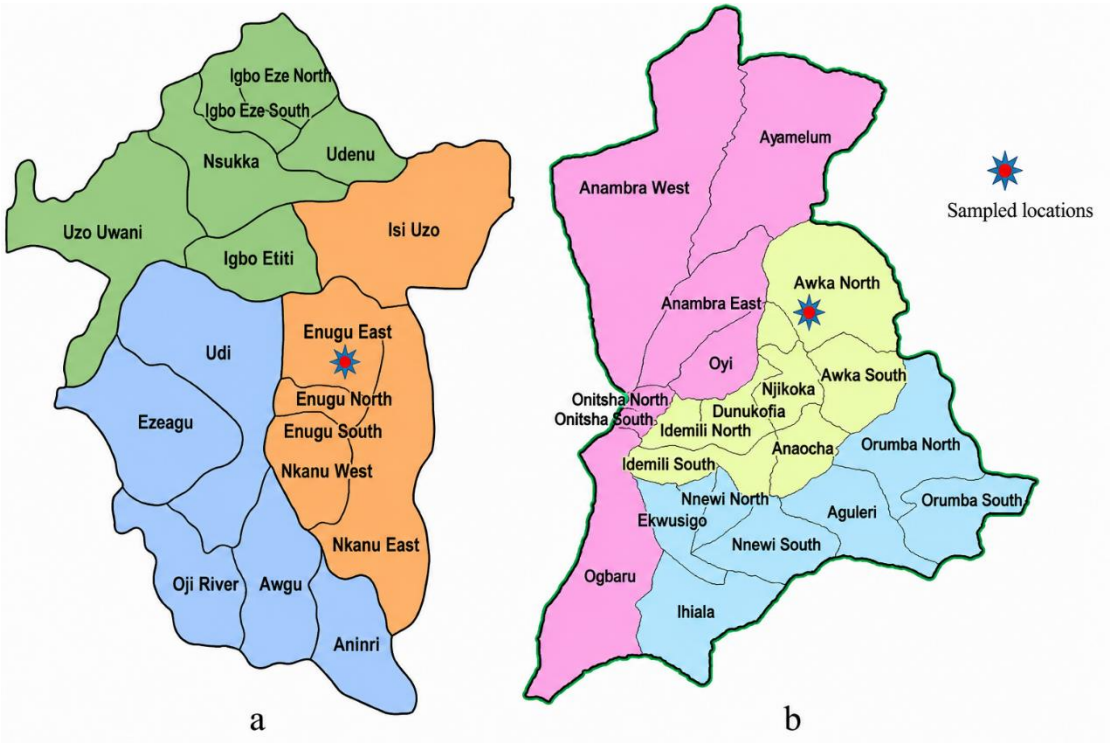

Figure 1. Map of Enugu and Anambra State Showing the studying area. *Source:* Department of Surveying and Geo-Informatics, Nnamdi Azikiwe University Awka, Anambra State (2025), Nigeria.

Step 1: Calculate the baseline sample size (n_0)

$$n_0 = \frac{(1.96)^2 \times 0.30(1-0.30)}{(0.05)^2} = \frac{3.8416 \times 0.30 \times 0.70}{0.0025}$$

$$= \frac{3.8416 \times 0.21}{0.0025} = \frac{0.806736}{0.0025} = 322.69$$

$$n_0 \approx 323$$

Step 2: Apply the finite population correction (FPC)

Since the study population is finite ($N = 80$), the adjusted sample size is calculated as:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Substituting the values:

$$n = \frac{322.69}{1+\frac{322.69-1}{80}} = \frac{322.69}{1+\frac{321.69}{80}} = \frac{322.69}{1+4.0211} = \frac{322.69}{5.0211} = 64.27$$

$$n \approx 64$$

Final sample size

The minimum required sample size for a finite population of 80 is:

$$\boxed{n = 64}$$

If you anticipate non-response, you can adjust the sample size. For example, assuming a 10% non-response rate:

$$n_{\text{adjusted}} = \frac{64}{1 - 0.10} = \frac{64}{0.90} = 71.1 \approx 71$$

Thus, the recommended sample size would be 71 participants if a 10% non-response rate is expected. Therefore, the sample size of 80 (20 from each study area) was adequate to detect statistically significant differences.

Blood collection for haemoparasites was done by means of jugular venipuncture; 2 ml of blood samples were collected from the cattle (Dogo *et al*., 2017). The blood sample was transferred into Ethylenediaminetetraacetic acid (EDTA) bottles to prevent blood clotting and was transported to the Parasitology Laboratory of Nnamdi Azikiwe Teaching Hospital, Nnewi, where they were processed immediately.

Physical screening and visual inspection of the head, neck and abdomen, trunk and tail were carried out. With the aid of bristle brushes, ectoparasites were dislodged carefully from the head, neck, abdomen, trunk, tail and leg regions onto white sheets of paper (Dogo *et al*., 2017). All detected ectoparasites were picked up with forceps and transferred into a universal plain bottle containing 10% formalin for identification. Each ectoparasite was then

affixed onto a glass slide and a cover slip to be viewed under the light microscope (x4 and x 10 objective lens) and identified using a guide by Soulsby (1982).

Laboratory examination of samples for the identification of parasites

Examination of faecal specimen was undertaken using Stoll's technique as described by Arora and Arora (2010) and formal-ether sedimentation methods as described by Umeanaeto *et al*. (2016). Eggs were identified on the basis of their morphological features as described by Soulsby (1982) and Umeanaeto *et al*. (2016). In Stoll's technique, an electronic weighing balance was utilised to determine the weight of the container. Subsequently, 3g of the stool sample was carefully added to the container, followed by the addition of 45ml of distilled water. The mixture was thoroughly stirred using an applicator stick for several minutes and then sieved into another clean container to eliminate debris. The resulting mixture was carefully poured, allowing only the residue to remain. A pipette was then employed to collect 0.5ml of the sieved stool sample residue. This collected material was placed onto a clean microscopic slide (approximately 2 drops), covered with a cover slip, and examined under the microscope using x10 objectives and x40 for confirmation.

For blood smear preparation, examination, and identification of haemoparasites, the Giemsa thick film method as described by Kamani *et al*. (2010) was employed for parasite screening. Two (2) microliters of blood were extracted from the EDTA bottle using a micro pipette. The collected blood was dropped onto a clean microscopic slide, and a thick smear was meticulously created. After air-drying for 10 minutes, the smear was stained using Giemsa stain and left for an additional 10 minutes before being washed off with distilled water. Subsequently, the prepared slide was examined under the microscope.

Whereas for ectoparasite preparation and morphological identification, the intestinal parasites were identified using a standard animal parasitology atlas as described by Soulsby (1982), Umeanaeto *et al*. (2016) and Agba and Aguh (2020). A combination of macroscopic and microscopic identification keys, as outlined by Soulsby (1982) and Taylor *et al*. (2007), was employed for the identification of ectoparasites. Each ectoparasite was affixed onto a glass slide covered with a cover slip, and viewed under the light microscope (x4 and x 10 objective lens). Various morphological features, including the length of the mouthparts (palps in relation to the basis capituli), presence or absence of eyes, presence or absence of festoons, colour or markings on the dorsal shield, and the shape and orientation of the anal groove, were considered during the identification process. For instance, *Anaplasma* were identified as purple to bluish intraerythrocytic inclusion bodies in 2-3 cells seen in the centre or marginal ends of the erythrocytes as described by Taylor *et al*. (2007).

Data analysis

All statistical analyses were conducted with Statistical Package for Social Sciences (SPSS) version 25. The significance level was set at $p<0.05$, which was used to compare and contrast collected data against the objectives of the study.

RESULTS AND DISCUSSION

From the study of the associated risk factors and parasitic infection in cattle slaughtered at selected abattoirs in eastern states of Nigeria, the overall prevalence of intestinal parasites in selected abattoirs in Anambra state shows that *Trichostrongylus* spp, with 41.3%, had the highest prevalence, while *Strongyle* spp and *Ascaris* spp, with 1.3% had the least prevalence, and it is significantly different as shown on Table 1. This prevalence is lower than the report of Obi *et al*. (2020) (75%) in Yola, but the same as that of Ogunjinmi *et al*. (2016) (41.6%) in Oyo State, and Paul *et al*. (2016) (44.2%) in Anambra State. Mild prevalence of intestinal parasites reported in the current study may be due to the advancements in management systems, like improved sanitation in the abattoirs and the education of the cattle rearers on the use of anthelminthic drugs.

As shown in Table 2, the prevalence of intestinal parasites in relation to the gender/sex of the cattle in selected abattoirs in Anambra and Enugu states showed a significant difference, where the female cattle with 80.6% prevalence are more infected than their male counterpart with 69.4%. It is observed that the slight difference may be due to the disparity in the abattoirs, as also reported by Regasa *et al*. (2015). This report is in line with the survey of Ndiaye *et al*. (2016), which may be because male cattle are more open to grazing arenas than their female counterparts. The prevalence of intestinal parasites in relation to the age of the cattle shows that age group 7-8 years, with a prevalence of 51% are more infected than age group 5-6 years, with 29%, although it is observed in the present study that statistically, there was no significant difference ($p>0.05$) in the prevalence of intestinal parasites in relation to the age of the cattle sampled.

The report of the abundance of ectoparasite infestation in relation to the age of cattle, as shown in Table 3, shows that age group 5-6 had the highest ectoparasite infestation of 48.3%, whereas age group 7-8 had the least ectoparasite infestation of 33.3%, although they were not significantly different. The abundance of ectoparasite infestation in relation to the breed of cattle shows that Sokoto Gudali recorded the highest abundance of 85.7%, followed by N'Dama with 66.7% abundance, whereas Red

Table 1. Overall prevalence of intestinal parasites in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

% Parasites	Amansea (n = 20)	Kwata (n = 20)	Nkwelle (n = 20)	Ugwuoba (n = 20)	Total (n = 80)	Chi-square	df	p Value
Number Positive	17 (85.0)	9 (45.0)	14 (70.0)	19 (95.0)	59 (73.8)	14.657	3	0.002*
Hookworms	8 (40.0)	4 (20.0)	5 (25.0)	0 (0.0)	17 (21.3)	9.785	3	0.020*
Schistosoma bovis	1 (5.0)	1 (5.0)	1 (5.0)	0 (0.0)	3 (3.8)	1.039	3	0.792ns
Taenia saginata	2 (10.0)	2 (10.0)	2 (10.0)	0 (0.0)	6 (7.5)	2.162	3	0.539ns
Trichostrongylus spp.	5 (25.0)	5 (25.0)	4 (20.0)	19 (95.0)	33 (41.3)	31.928	3	<0.001*
Strongyloides spp	3 (15.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.8)	9.351	3	0.025*
Fasciola spp	1 (5.0)	0 (0.0)	3 (15.0)	3 (15.0)	7 (8.8)	4.227	3	0.238*
Oesophagostomum spp	2 (10.0)	1 (5.0)	0 (0.0)	0 (0.0)	3 (3.8)	3.810	3	0.283ns
Toxocara vitulorum	0 (0.0)	1 (5.0)	1 (5.0)	0 (0.0)	2 (2.5)	2.051	3	0.562ns
Strongyle spp.	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (1.3)	3.038	3	0.386ns
Ascaris spp.	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (1.3)	3.038	3	0.386ns

Table 2. Prevalence of intestinal parasites in relation to gender/sex of the cattle in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

% Sex	Male (n = 49)	Female (n = 31)	Total (n = 80)	Chi-square	df	p Value
Number Positive	34 (69.4)	25 (80.6)	59 (73.8)	1.243	1	0.265ns
Hookworms	10 (20.4)	7 (22.6)	17 (21.3)	0.054	1	0.817ns
Schistosoma bovis	3 (6.1)	0 (0.0)	3 (3.8)	1.972	1	0.160ns
Taenia saginata	6 (12.2)	0 (0.0)	6 (7.5)	4.104	1	0.043*
Trichostrongylus spp.	13 (26.5)	20 (64.5)	33 (41.3)	11.305	1	0.001*
Strongyloides spp	2 (4.1)	1 (3.2)	3 (3.8)	0.039	1	0.844ns
Fasciola spp	4 (8.2)	3 (9.7)	7 (8.8)	0.055	1	0.815ns
Oesophagostomum spp	3 (6.1)	0 (0.0)	3 (3.8)	1.972	1	0.160ns
Toxocara vitulorum	1 (2.0)	1 (3.2)	2 (2.5)	0.109	1	0.741ns
Strongyle spp.	1 (2.0)	0 (0.0)	1 (1.3)	0.641	1	0.423ns
Ascaris spp.	1 (2.0)	0 (0.0)	1 (1.3)	0.641	1	0.423ns

Table 3. Prevalence of Intestinal parasites in relation to the age of the cattle in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

% Age Groups (Years)	5 to 6 years (n = 29)	7 to 8 years (n = 51)	Total (n = 80)	Chi-square	df	p Value
Number Positive	25 (86.2)	34 (66.7)	59 (73.8)	3.646	1	0.056ns
Hookworms	10 (34.5)	7 (13.7)	17 (21.3)	4.760	1	0.029*
Schistosoma bovis	1 (3.4)	2 (3.9)	3 (3.8)	0.011	1	0.915ns
Taenia saginata	2 (6.9)	4 (7.8)	6 (7.5)	0.024	1	0.877ns
Trichostrongylus spp.	15 (51.7)	18 (35.3)	33 (41.3)	2.059	1	0.151ns
Strongyloides spp.	2 (6.9)	1 (2.0)	3 (3.8)	1.248	1	0.264ns
Fasciola spp.	4 (13.8)	3 (5.9)	7 (8.8)	1.449	1	0.229ns
Oesophagostomum spp.	1 (3.4)	2 (3.9)	3 (3.8)	0.011	1	0.915ns
Toxocara vitulorum	1 (3.4)	1 (2.0)	2 (2.5)	0.168	1	0.682ns
Strongyle spp.	1 (3.4)	0 (0.0)	1 (1.3)	1.781	1	0.182ns
Ascaris spp.	1 (3.4)	0 (0.0)	1 (1.3)	1.781	1	0.182ns

Bororo had the least infestation of 6.7%, with a significant difference. This report contrasts the study done by Musa *et al*. (2014) where a greater predominance of ticks was recorded in Wadara, with 66.7% in Maiduguri and 66.1% in Kuri, Nigeria. The study result suggests that not an iota of these varieties remains absolutely irrepressible to tick infestation. Invariably, all the breeds remain louse-ridden in capricious echelons as was observed in various studies.

As shown in Table 4, the prevalence of intestinal parasites in relation to breeds of cattle shows that Sokoto Gudali and Adamawa Gudali had 100% prevalence when compared with Red Bororo (80%), White Fulani (69.6%)

Table 4. Prevalence of Intestinal parasites in relation to breeds of cattle in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

% Breeds	White Fulani (n = 46)	Red Bororo (n = 15)	Sokoto Gudali (n = 7)	Adamawa Gudali (n = 5)	White Bokolo (n = 4)	N'Dama (n = 3)	Total (n = 80)	Chi-square	df	p Value
Number Positive	32 (69.6)	12 (80.0)	7 (100.0)	5 (100.0)	1 (25.0)	2 (66.7)	59 (73.8)	9.978	5	0.076ns
Hookworms	13 (28.3)	4 (26.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	17 (21.3)	6.741	5	0.241ns
Schistosoma bovis	3 (6.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.8)	2.304	5	0.806ns
Taenia saginata	3 (6.5)	3 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (7.5)	4.982	5	0.418ns
Trichostrongylus spp.	15 (32.6)	3 (20.0)	7 (100.0)	5 (100.0)	1 (25.0)	2 (66.7)	33 (41.3)	22.539	5	<0.001*
Strongyloides spp	3 (6.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.8)	2.304	5	0.806ns
Fasciola spp	0 (0.0)	4 (26.7)	2 (28.6)	1 (20.0)	0 (0.0)	0 (0.0)	7 (8.8)	15.35	5	0.009*
Oesophagostomum spp	2 (4.3)	1 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.8)	1.139	5	0.951ns
Toxocara vitulorum	2 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (2.5)	1.516	5	0.911ns
Strongyle spp.	1 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.3)	0.748	5	0.980ns
Ascaris spp.	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (25.0)	0 (0.0)	1 (1.3)	19.241	5	0.002*

Table 5. Abundance of Ectoparasites infestation in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

Sites/Location	Number Examined	*Amblyomma variegatum* (%)	*Hyalomma marginatum* (%)	*Rhipicephalus decoloratus* (%)	*Rhipicephalus microplus* (%)	*Hyalomma truncatum* (%)
Amansea	20	6 (30.0)	5 (25.0)	6 (30.0)	4 (20.0)	4 (20.0)
Kwata	20	6 (30.0)	5 (25.0)	6 (30.0)	5 (25.0)	3 (15.0)
Nkwelle	20	6 (30.0)	7 (35.0)	4 (20.0)	4 (20.0)	2 (10.0)
Ugwuoba	20	13 (65.0)	13 (65.0)	11 (55.0)	0 (0.0)	0 (0.0)
Total	**80**	**31 (38.8)**	**30 (37.5)**	**27 (33.8)**	**13 (16.3)**	**9 (11.3)**
Chi-square		7.742	9.173	5.982	5.419	4.382
df		3	3	3	3	3
p Value		0.052ns	0.027*	0.112ns	0.144ns	0.223ns

and N'Dama with 66.7% prevalence. The current study shows that there was a significant difference in the prevalence of intestinal parasites in relation to the breeds of cattle. This report contrasts the study done by Musa *et al*. (2014), where a greater predominance in Wadara, with 66.7% in Maiduguri and 66.1% in Kuri, Nigeria, was observed, although no breeds of cattle remain resistant to ticks' infestation, as was observed over a wide range of surveys done in the past.

The abundance of ectoparasite infestation in selected abattoirs in Enugu State, as shown in Table 5, shows that Ugwuoba had the highest with 65% abundance, followed by Amansea, Kwata and Nkwelle in Anambra State, which had 30% abundance with a significant difference. This could possibly be due to the disparities in availability and usage of chemicals targeted against ticks, as suggested by Nath *et al*. (2018). Also, the reason for the contrast in location could be owing in the direction of the dissimilarity in the region reportage of the study area and the agro-ecology attainable therein. The abundance of ectoparasite infestation in relation to the sex of cattle was significantly different where female cattle with 61.3% infestation were greater than that of their male counterpart with 24.5% infestation. This report is in contrast with the survey done by Opara and Ezeh (2011), who described that male cattle are supplementary verminous by ticks than their female counterparts

Table 6. Abundance of Ectoparasites infestation in relation to the predilection site of cattle in selected abattoirs in Anambra and Enugu State, Eastern Nigeria.

Predilection Site	Number Examined	*Amblyomma variegatum* (%)	*Hyalomma marginatum* (%)	*Rhipicephalus decoloratus* (%)	*Rhipicephalus microplus* (%)	*Hyalomma truncatum* (%)
Neck	16	4 (25.0)	9 (56.3)	6 (37.5)	4 (25.0)	2 (12.5)
Tail Region	9	4 (44.4)	3 (33.3)	1 (11.1)	2 (22.2)	2 (22.2)
belly	11	4 (36.4)	2 (18.2)	7 (63.6)	1 (9.1)	1 (9.1)
Ear	9	6 (66.7)	3 (33.3)	4 (44.4)	1 (11.1)	1 (11.1)
Scrotum	4	1 (25.0)	4 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Udder	13	2 (15.4)	3 (23.1)	6 (46.2)	2 (15.4)	0 (0.0)
Fore Limb	10	4 (40.0)	3 (30.0)	3 (30.0)	2 (20.0)	2 (20.0)
Head	8	6 (75.0)	3 (37.5)	0 (0.0)	1 (12.5)	1 (12.5)
Total	**80**	**31 (38.8)**	**30 (37.5)**	**27 (33.8)**	**13 (16.3)**	**9 (11.3)**
Chi-square		12.124	12.345	14.089	2.694	4.096
df		7	7	7	7	7
p Value		0.097ns	0.090ns	0.050*	0.912ns	0.769ns

because the former move from one place to another in search of food and are particularly used for farming activities.

As shown on Table 6, the report of the abundance of ectoparasite infestation in relation to the predilection site of cattle shows that there is significant different on the number of ticks recovered at the different predilection sites on the inspected cattle both on the neck, tail region, belly, ear, scrotum, udder, fore limb and head had varying ranges of tick infestation as reflected on Table 6. The observation supplementary ratifies that there is a significant difference in the tick sites of attachment ($p < 0.05$). The attachment of ticks on cattle, as was observed from the study, was exceedingly addicted to the favourite locations, as was also described in the study done by Ikpeze *et al*. (2015).

Conclusion and Recommendation

From the study, it is suggested that the different organs of government, including all stakeholders, and the public health sector should ensure the adequate provision of basic infrastructure and sanitary facilities in the slaughterhouses across Anambra and Enugu States of Southeastern Nigeria. Furthermore, there is need to also create awareness among farmers, vendors and consumers about safe cultivation, transportation, handling and consumption of fruits and vegetables. In addition, effective sensitisation and promotion of good personal hygiene culture should be made a top priority particularly in the study areas and across the southeastern states of Nigeria.

COMPETING INTEREST

The authors declare that they do not have any conflicts of interest.

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Apendix

Summary Table 1. Distribution of infection with GIPs based on the epidemiological variables of slaughtered cattle in selected abattoirs in Anambra and Enugu State, South Eastern Nigeria.

Variables	No. Examined	Postive (%)	95% CI (L-U)	Chi-square, df	P value
Location					
Amansea	20	17 (85.0%)			
Kwatta	20	9 (45.0%)			
Nkwelle	20	14 (70.0%)			
Ugwuoba	20	19 (95.0%)			
Total	80	59 (73.8%)	0.05	14.657[a]	0.002
Breed					
White Fulani	46	32 (69.6%)			
Red Bororo	15	12 (80.0%)			
Sokoto Gudali	7	7 (100%)			
Adamawa Gudali	5	5 (100%)			
White Bokolo	4	1 (25.0%)			
N'Dama	3	2 (66.7%)			
Total	80	59 (73.8%)	0.05	9.978[a]	0.076
Age					
5-6yrs	29	25 (86.2%)			
7-8yrs	51	34 (66.7%)			
Total	80	59 (73.8%)	0.05	3.646[a]	0.056
Gender					
Male	49	34 (69.4%)			
Female	31	25 (80.6%)			
Total	80	59 (73.8%)	0.05	1.243[a]	0.265

Summary Table 2. Distribution of helminth parasites based on the epidemiological variables of slaughtered cattle in selected abattoirs in Anambra and Enugu State, South Eastern Nigeria.

Variables	Positive (%)	Hookworms (%)	*Schistosoma bovis* (%)	df	P-value
Location					
Amansea	9	8 (88.9%)	1(11.1%)		
Kwatta	5	4(80.0%)	1(20.0%)		
Nkwelle	6	5(83.3%)	1(16.7%)		
Ugwuoba	0	0(0.0%)	0(0.0%)		
Sub-Total	20		Chi^2=0.218[a]	2	0.897
Breed					
White Fulani	16	13 (81.3%)	3(18.8%)		
Red Bororo	4	4 (100.0%)	0(0.0%)		
Sokoto Gudali	0	0(0%)	0(0%)		
Adamawa Gudali	0	0(0%)	0(0%)		
White Bokolo	0	0 (0%)	0 (0%)		
N'Dama	0	0 (0%)	0 (0%)		
Sub-Total	20	17	Chi^2=0.882	1	0.348
Age					
5-6yrs	11	10 (90.9%)	1 (9.1%)		
7-8yrs	9	7 (77.8%)	2 (22.2%)		
Sub-Total	20		Chi^2=0.669[a]	1	0.413
Gender					
Male	13	10 (76.9%)	3 (23.1%)		
Female	7	7 (100.0%)	0 (0.0%)		
Sub-Total	20	17	Chi^2=1.900[a]	1	0.168

Summary Table 3. Abundance of ectoparasites according to epidemiological variables of cattle in Anambra and Enugu State, South Eastern Nigeria.

Variables	No. Exam	*Amblyomma variegatum*	*Hyalomma marginatum*	*Rhipicephalus decoloratus*	*Rhipicephalus microplus*	*Hyalomma trancatum*	Chi square	Df	P value
Location									
Amansea	20	6 (24.0%)	5 (20.0%)	6 (24.0%)	4 (16.0%)	4 (16.0%)			
Kwatta	20	6 (24.0%)	5 (20.0%)	6 (24.0%)	5 (20.0%)	3 (12.0%)			
Nkwelle	20	6 (26.1%)	7 (30.4%)	4 (17.4%)	4 (17.4%)	2 (8.7%)			
Ugwuoba	20	13 (35.1%)	13 (35.1%)	11 (29.7%)	0 (0.0%)	0 (0.0%)			
Sub Total	80	31 (28.2%)	30 (27.3%)	27 (24.5%)	13 (11.8%)	9 (8.2%)	15.875[a]	12	0.197
Breeds									
White Fulani	46	18 (32.1%)	15 (26.8%)	8 (14.3%)	9 (16.1%)	6 (10.7%)			
Red Bororo	15	1 (5.9%)	4 (23.5%)	7 (41.2%)	3 (17.6%)	2 (11.8%)			
Sokoto Gudali	7	6 (42.9%)	4 (28.6%)	4 (28.6%)	0 (0.0%)	0 (0.0%)			
Adamawa Gudali	5	2 (18.2%)	5 (48.5%)	4 (36.4)	0 (0.0%)	0 (0.0%)			
White Bokolo	4	2 (33.3%)	0 (0.0)	2 (33.3%)	1 (16.7%)	1 (16.7%)			
N'Dama	3	2 (33.3%)	2 (33.3%)	2 (33.3%)	0 (0.0%)	0 (0.0%)			
Sub Total	80	31 (28.2%)	30 (27.3%)	27 (24.5%)	13 (11.8%)	9 (8.2%)	22.348[a]	20	0.332
Predilect									
Neck	16	4 (16.0%)	9 (36.0%)	6 (24.0%)	4 (16.0%)	2 (8.0%)			
Tail Region	9	4 (33.3%)	3 (25.0%)	1 (8.3%)	2 (16.7%)	2 (16.7%)			
belly	11	4 (26.7%)	2 (13.3%)	7 (46.7%)	1 (6.7%)	1 (6.7%)			
Ear	9	6 (40.0%)	3 (20.0%)	4 (26.7%)	1 (6.7%)	1 (6.7%)			
Scrotum	4	1 (20.0%)	4 (80.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)			
Udder	13	2 (15.4%)	3 (23.1%)	6 (46.2%)	2 (15.4%)	0 (0.0%)			
Fore Limb	10	4 (28.6%)	3 (21.4%)	3 (21.4%)	2 (14.3%)	2 (14.3%)			
Head	8	6 (54.5%)	3 (27.3%)	0 (0.0%)	1 (9.1%)	1 (9.1%)			
Sub Total	80	31 (28.2%)	30 (27.3%)	27 (24.5%)	13 (11.8%)	9 (8.2%)	29.388[a]	28	0.393
Sex									
Male	49	12 (19.4%)	16 (25.8%)	18 (29.0%)	11 (17.7%)	5 (8.1%)			
Female	31	19 (39.6%)	14 (29.2%)	9 (18.8%)	2 (4.2%)	4 (8.3%)			
Sub Total	80	31 (28.2%)	30 (27.3%)	27 (24.5%)	13 (11.8%)	9 (8.2%)	9.472[a]	4	0.051
Age									
5 to 6yrs	20	14 (37.8%)	7 (18.9%)	8 (21.6%)	3 (8.1%)	5 (13.5%)			
7 to 8yrs	51	17 (23.3%)	23 (31.5%)	19 (26.0%)	10 (13.7%)	4 (5.5%)			
Sub Total	80	31(28.2%)	30 (27.3%)	27 (24.5%)	13 (11.8%)	9 (8.2%)	6.052[a]	4	0.195