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Fascioliasis in cattle slaughtered in government and privately-owned abattoirs in Ikpoba/Okha LGA, Edo State, Nigeria

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Abstract

Fascioliasis is a common helminthes infection with Fasciolagigantica parasite in cattle raised in Nigeria, causing significant economic loss due to liver damage. The prevalence of Fasciolagigantica infection in cattle slaughtered in four abattoirs [government owned (GO) and three private (P1, P2, P3)] in Ikpoba/Okha LGA, Edo State, Nigeria, as well as the economic loss due to liver damage and condemnation, were studied over a 12-month period (February, 2020 – January, 2021). Of the 17941 livers examined, 1774 (9.89%) were infected (mean intensity, 12.45 parasites/infected liver). Of the infected livers, 1738 (9.69%) had light infection, while 36 (0.20%) were severely infected and condemned.The GO abattoir had the highest prevalence (18.14%), followed by the P1 (8.65%), P3 (3.44%), and P2 (2.14%) abattoirs. The differences in infection prevalence were highly significant (P<0.001). Throughout the survey, the GO abattoir had the highest monthly prevalence of fascioliasis, followed by P1, which had high infection in nine of the 12 months surveyed. There was no significant difference (p>0.05) in seasonal infection. The financial loss due to liver condemnation in the four abattoirs totaled ₦237,600.00, with the highest loss of ₦171,600.00 recorded in GO abattoir. This study found that fascioliasis is still prevalent in cattle raised in Nigeria. As a result, it is critical to ensure that cattle are raised in conditions that minimize infection risk while also providing adequate inspection and treatment of infected cattle to reduce liver damage and the attendant economic losses.

Keywords: *Fasciolagigantica*, prevalence, cattle, liver, Edo State

Running title: Seasonal prevalence of*Fasciolagigantica*infection and financial loss due to liver condemnation in cattle

Fasciolose chez les bovins abattus dans des abattoirs publics et privés à Ikpoba/Okha LGA, État d'Edo, Nigéria

Resume

La fasciolose est une infection helminthique courante due au parasite Fasciolagigantica chez les bovins élevés au Nigéria, entraînant des pertes économiques importantes dues à des lésions hépatiques. La prévalence de l'infection à Fasciolagigantica chez les bovins abattus dans quatre abattoirs [appartenant au gouvernement (GO) et trois privés (P1, P2, P3)] à Ikpoba/Okha LGA, État d'Edo, Nigeria, ainsi que la perte économique due aux lésions hépatiques et condamnation, ont été étudiés sur une période de 12 mois (février 2020 – janvier 2021). Sur les 17941 foies examinés, 1774 (9,89%) étaient infectés (intensité moyenne, 12,45 parasites/foie infecté). Parmi les foies infectés, 1738 (9,69%) avaient une infection légère, tandis que 36 (0,20%) étaient gravement infectés et condamnés. L'abattoir GO avait la prévalence la plus élevée (18,14%), suivi du P1 (8,65%), P3 (3,44 %), et P2 (2,14 %) abattoirs. Les différences de prévalence de l'infection étaient hautement significatives (P<0,001). Tout au long de l'enquête, l'abattoir GO avait la prévalence mensuelle la plus élevée de fasciolase, suivi de P1, qui avait une infection élevée au cours de neuf des 12 mois de l'enquête. Il n'y avait pas de différence significative (p>0,05) dans l'infection saisonnière. La perte financière due à la condamnation du foie dans les quatre abattoirs s'est élevée à ₦237,600,00, la perte la plus élevée de ₦171,600,00 enregistrée dans l'abattoir GO. Cette étude a révélé que la fasciolose est toujours répandue chez les bovins élevés au Nigeria. Par conséquent, il est essentiel de veiller à ce que les bovins soient élevés dans des conditions qui minimisent le risque d'infection tout en assurant une inspection et un

traitement adéquats des bovins infectés afin de réduire les dommages au foie et les pertes économiques qui en découlent.

Mots-clés : Fasciolagigantica, prévalence, bovins, foie, État d'Edo

Introduction

Fascioliasis is aparasitic helminthes infection that most commonly affects domestic livestock (cattle and sheep), wild ruminants, and humans. The disease is significant in both veterinary and economic terms. It is a re-emerging and widespread zoonosis that affects the world's vast human population (Esteban *et al*., 2003; Mwabonimana*et al*., 2009). The disease's causative agents are two trematode species (*Fasciola hepatica* and *F. gigantica*) (Mas-Coma *et al*., 2005; Otubanjo, 2013). The known causative agent in the tropics is *Fasciolagigantica* (Ukoli, 1984; Otubanjo, 2013), whereas *F. hepatica* predominates in the cooler temperate region and high lands of the tropical and subtropical regions (Soulsby, 1982). These flukes live in, attack, and damage the livers of infected animals (Shaikh *et al*., 2007), and in rare cases, other organs. The liver is the largest organ in the body, and its functions are critical to animals. It is primarily responsible for bile production and excretion, blood detoxification and purification, fat, protein, and carbohydrate metabolism, enzyme activation, vitamin, glycogen, and mineral storage, drug, bilirubin, hormone, and cholesterol excretion, and synthesis of plasma proteins (albumin) and clotting factors, among other functions. Impeding these functions could have disastrous consequences for animal health.

Animals, particularly livestock, become infected with fascioliasis when they consume metacercaria alongside vegetation while grazing or when they consume suspended cysts in soil and detritus while drinking contaminated water (Ejah*et al*., 2015). Accidental ingestion of metacercariae-contaminated vegetables/water results in human infection.

Cattle are the most common domesticated livestock in Nigeria and the nomads' main source of income. The nomadic nature of cattle and their herders has accelerated the spread of diseases, particularly fascioliasis. Despite the fact that there has been a lot of research done on bovine fascioliasis in recent years (Odigie and Odigie, 2013; Aliyu*et al*., 2014; Liba*et al*., 2017), the need for continuous monitoring of the infection cannot be overstated. The purpose of this study is to investigate the prevalence of *F. gigantica* infection in cattle slaughtered in four abattoirs in Ikpoba/Okha LGA, Edo State, Nigeria, as well as the economic loss due to liver damage.

Materials and Methods

Study Area

This study was conducted in a government owned abattoir (latitude 6°20'56"N and longitude 5°38'47"E) and three privately-owned abattoirs: Private 1, latitude 6°21'07"N and longitude 5°38'39"E; Private 2, latitude 6°21'08"N and longitude 5°38'35"E; and Private 3, latitude 6°21'10"N and longitude 5°38'35 (February, 2020 – January, 2021). A large number of abattoirs in Benin City, including the government-owned abattoir, are located near or on the banks of the Ikpoba River in Ikpoba/Okha LGA, owing to easy access to water and the ease with which abattoir waste could be discharged into the water body (Ikhuoriah, 2021). These abattoirs provide beef products (meat and its allied) to Benin City's larger population. Except on Wednesdays, Sundays, and public holidays, the abattoirs were visited every day. Edo State has a tropical climate with two distinct seasons: wet (April to October) and dry (November to March). Between December and mid-February is the harmattan season. The temperature ranges between 23 and 30 degrees Celsius, with high humidity.

Examination of Liver

Cattle slaughtered in these abattoirs were mostly trade cattle brought in from Niger and northern Nigeria. For *F. gigantica* infection, the liver was inspected for 252 days using visual examination, palpation, and an incision along the side of the bile duct. Depending on the degree of infection, the livers were classified as healthy, lightly infected (not condemned), or heavily infected (condemned and unfit for human consumption).

Parasitological Examination

The parasites were isolated from the liver, counted, stored in 0.72% physiological saline solution, and then transported to the laboratory. The parasites were then flattened on microscope slides and fixed in 5% formal

saline solution for 30 minutes to an hour. Following that, the parasites were recovered and preserved in the same fixative. The preserved parasites were washed in several changes of tap water every 30 minutes for four hours and stained in a dilute solution of acetocamine for about 5-6 hours. To remove excess stain, the parasites were washed again in tap water for 10 to 15 minutes. The stained parasites were dehydrated in a series of increasing alcohol concentrations (30:50:70:90:100%). The dehydrated parasites were cleared in 50%:50% alcohol/xylene and then in absolute xylene. The parasites were then mounted on microscope slides with a few drops of Canada balsam. The mounted parasites were dried in the oven within fourteen days.

Data Analysis

The prevalence and mean intensity of parasitic infection were calculated according to Anderson (1993). Prevalence was calculated as a percentage of the number of liver infected with *F. gigantica*parasite divided by the total number of liver examined. The mean intensity of infection refers to the number of parasites per liver (calculated only for the infected liver examined). Also calculated was the seasonal prevalence of *F. gigantica*infection. Microsoft Excel was used to create graphical data representations. The Chi-square goodness of fit test was used to determine whether there was a significant difference between variables. The economic loss caused by *F. gigantica* infection was calculated by multiplying the average weight of liver by the cost of liver per kilogram during the study by the number of cattle liver infected and condemned (Mwabonimana*et al*., 2009). The naira's US dollar equivalent was calculated using the Central Bank of Nigeria's official exchange rate as of February 2021 (₦390 = 1 USD).

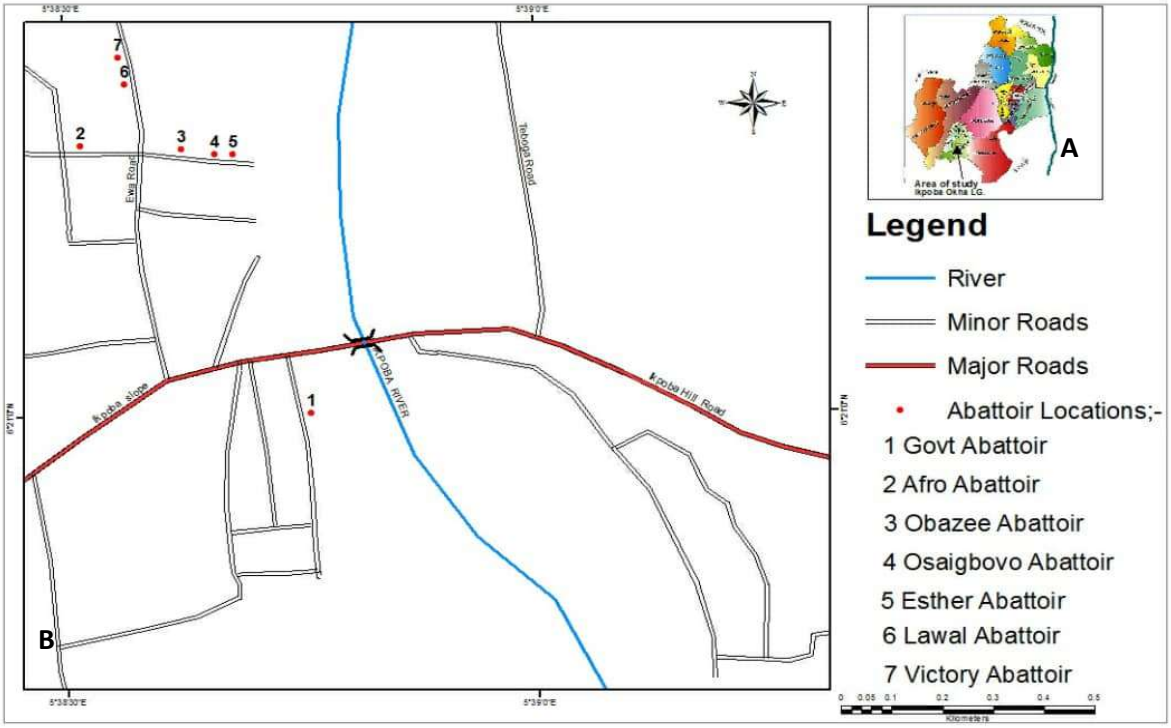

Fig. 1: Maps of Edo State and the study area showing sampled locations

Results

Fasciolagigantica infection in cattle liver

A total of 17941 livers from cattle slaughtered in four abattoirs [Government owned (GO), 6843; Private 1 (P1), 4302; Private 2 (P2), 5603; and Private 3 (P3), 1193] were examined for *F. gigantica* infection, with an overall prevalence of 9.89% (mean intensity, 12.45 parasites/infected liver). The highest prevalence of parasitic infection was recorded in cattle slaughtered at GO abattoir (18.14%), followed by P1 (8.65%) and P3 (3.44%)

abattoirs, and the lowest was recorded at P2 abattoir (2.14%), as shown in Table 1. These differences were highly significant (P<0.001). Private 1 had the highest mean parasite intensity of 23.06 parasites/infected liver. Infection intensities of 10.99, 9.58, and 7.41 were recorded in P2, GO, and P3 abattoirs, respectively.

Table 1: Overall prevalence and mean intensity of *Fasciolagigantica* in cattle slaughtered in Government and private abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria

Abattoir	Number of liver examined	Number infected	Prevalence (%)	Number of parasites	Mean intensity
GO	6843	1241	18.14[c]	11893	9.58[a]
P1	4302	372	8.65[b]	8579	23.06[b]
P2	5603	120	2.14[a]	1319	10.99[a]
P3	1193	41	3.44[a]	304	7.41[a]
Total	17941	1774	9.89	22095	12.45
X^2			18.273		11.667
Df			3		3
P-Value			.000		.009
Sig*			P<0.001		P>0.005

Similar letters (superscripts) indicate values that are not significantly different from each other (p>0.05)

Monthly infection of F. gigantica

The monthly prevalence of *F. gigantica* infection in the four abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria is presented in Figure 2. Infection was recorded monthly in all four abattoirs throughout the period of survey except in P3 abattoir where infection was not recorded in April. The GO abattoir had the highest monthly prevalence of infection followed by P1 which had higher infection prevalence amongst the private abattoirs in nine months out of the 12 months surveyed. There were variations in monthly pattern of infection in cattle slaughtered in the different abattoirs. In GO abattoir incidence of fascioliasis was very high in the first month (February, 2020) of investigation but decreased gradually in the following months (March to May). It increased during the months of June and July; and decreased till the month of November. The incidence then roused sharply in December and January.

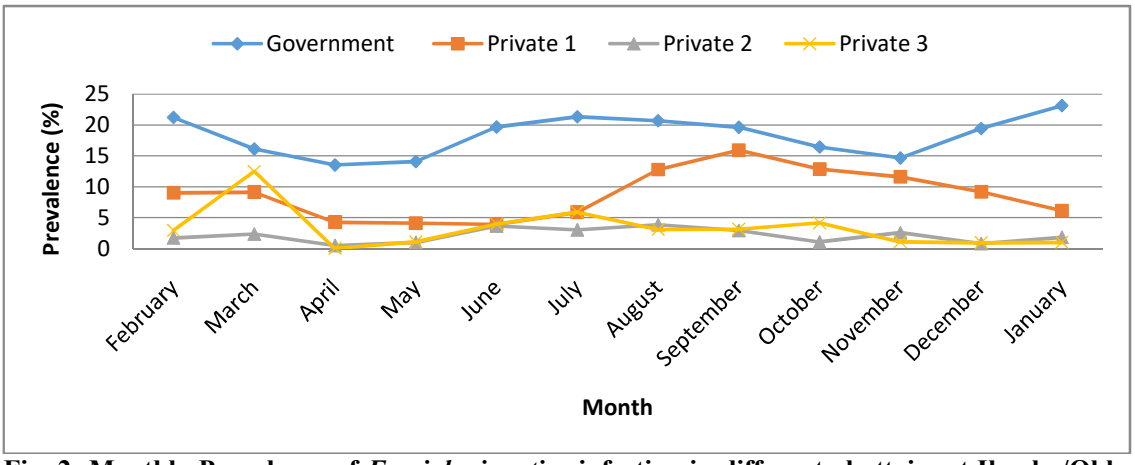

Fig. 2: Monthly Prevalence of *Fasciolagigantica* infection in different abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria

Table 2 and 3 show monthly prevalence, worm burden and mean intensity of *F. gigantica* infection in liver of cattle slaughtered in the abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria. In GO, the highest prevalence (23.17%) of parasitic infection was recorded in the month of January, 2021. This was followed by the month of July, 2020 (21.35%) and February (21.25%); while the least was recorded in the month of April (13.53%).

However, these differences were not significant (P>0.05). The month of June had the highest mean intensity (MI) of 17.54±2.42 with worm burden (WB) of 1-200. A significant mean intensities were recorded among the months (P<0.05) in the GO (Table 2). The months of October, December and May had mean intensity of 15.36±2.15 (WB, 1-220), 14.55±1.53 (WB, 1-252) and 11.64±1.20 (WB, 1-200), respectively. The lowest mean intensity was recorded in February 4.17±3.49 (WB, 1-20).

Table 2: Monthly prevalence, worm burden and mean intensity of *Fasciolagigantica* infection in cattle slaughtered in Government owned abattoir at Ikpoba/Okha LGA, Edo State, Nigeria (February, 2020 - January, 2021)

Month	Number examined	Number infected	Prevalence (%)	Worm burden (min-max)	Number of parasite	Mean intensity±SD
February	513	109	21.25	1-20	455	4.17±3.49
March	695	112	16.12	1-40	534	4.77±2.50
April	547	74	13.53	1-15	324	4.38±1.47
May	554	78	14.08	1-200	908	11.64±1.20
June	503	99	19.68	1-220	1736	17.54±2.42
July	562	120	21.35	1-25	680	5.67±3.04
August	623	129	20.71	1-200	989	7.67±2.19
September	585	115	19.66	1-208	1335	11.61±2.37
October	541	89	16.45	1-220	1367	15.36±2.15
November	778	114	14.65	1-122	1046	9.18±1.53
December	437	85	19.45	1-252	1237	14.55±1.53
January	505	117	23.17	1-192	1282	10.96±2.15
Total	6843	1241	18.14		11893	9.58

In the privately-owned abattoirs (Table 3), P1 abattoir had the highest prevalence of parasitic infection (15.94%) during the month of September with mean intensity of 21.75±10.19 (WB, 5-54). This was followed by October and August with prevalence of 12.84% (MI, 21.40±8.17; WB, 10-42) and 12.77% (MI, 41.75±22.49; WB, 17-99), respectively. The least prevalence (PR) of 3.90% was recorded in June (MI, 38.07±23.68; WB, 5-72). In P2 abattoir, the highest prevalence of 4.3% was recorded in June (MI, 15.53±17.83; WB, 2-76), followed by August (PR., 3.84%; MI, 10.74±8.50; WB, 1-36). Private 3 had the highest infection prevalence (12.5%) in March (MI, 6.38±4.46; WB, 2-17), followed by July and October with prevalence of 5.88% (MI, 5.5±5.47; WB, 1-16) and 4.12% (MI, 4.25±2.63; WB, 2-7), respectively.

Table 3: Monthly prevalence, mean intensity and worm burden of *Fasciolagigantica* infection in cattle slaughtered in private abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria (February, 2020-January, 2021)

	P1 abattoir				P2 abattoir				P3 abattoir			
Feb	322	9.01	5-43	10.38±10.77	523	1.72	2-12	4.11±3.10	103	2.91	2-8	4.67±3.06
Mar	350	9.14	3-65	9.34±12.94	510	2.35	2-32	12.25±10.30	104	12.50	2-17	6.38±4.46
April	376	4.26	4-31	18.63±7.36	414	0.48	4-18	11.0±11.31	96	-	-	-
May	368	4.08	8-32	13.87±6.19	405	0.99	2-8	4.0±2.83	95	2.11	01	1.0
June	359	3.90	5-72	38.07±23.68	412	4.13	2-76	15.53±17.83	101	3.96	2-6	3.75±2.06
July	392	5.87	2-93	30.48±23.06	462	3.03	2-11	5.14±2.82	102	5.88	1-16	5.5±5.47
Aug	376	12.77	17-99	41.75±22.49	495	3.84	1-36	10.74±8.50	98	3.06	2-49	23.0±23.90
Sept.	345	15.94	5-54	21.75±10.19	478	2.93	2-43	9.86±10.61	96	3.13	2-19	11.0±8.54
Oct.	327	12.84	10-42	21.40±8.17	478	1.05	6-19	10.6±5.41	97	4.12	2-7	4.25±2.63
Nov.	336	11.61	5-55	21.44±11.98	471	2.55	6-25	13.08±5.94	94	1.06	13	13.0
Dec	392	9.18	2-56	19.17±10.08	512	0.78	6-23	15.75±7.09	106	0.94	1-27	27.0
Jan	359	6.41	10-59	26.70±13.31	443	1.81	11-32	18.25±8.61	101	0.99	01	1.0
Total	4302	8.65		23.06	5603	2.14		10.99	1193	3.44		7.65

Government owned (GO), Private 1 (P1), Private 2 (P2), and Private 3 (P3)

Prevalence of healthy and infected liver in cattle slaughtered in the abattoirs

Of the 17941 livers examined in the four abattoirs, 16167 (90.11%) were not infected with *F. gigantica* and were considered healthy, 1738 (9.69%) had light infection while 36 (0.20%) were heavily infected and considered unfit for consumption (Table 4). Infected liver veins were enlarged and frequently formed calcified walls, making the liver larger than normal; livers were black/darker than normal, especially in severe infection. In GO abattoir, light infection was recorded in 1215 (17.76%) liver while 26 (0.38%) were heavily infected and condemned. The prevalence of lightly infected livers in P1, P2 and P3 abattoirs were 8.51%, 2.11% and 3.27%, respectively, while 0.14%, 0.04% and 0.17% liver also respectively were heavily infected (condemned) in P1, P2 and P3 abattoirs.

Table 4: Prevalence of healthy and infected liver in cattle slaughtered in Government and private abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria

Abattoir	No. of liver examined	No. of healthy liver	Prev. (%)	No. lightly infected but not condemned	Prev. (%)	No. heavily infected and condemned	Prev. (%)
GO	6843	5602	81.86	1215	17.76	26	0.36
P1	4302	3930	91.35	366	8.51	06	0.14
P2	5603	5483	97.86	118	2.11	02	0.04
P3	1193	1152	96.56	39	3.27	02	0.17
Total	17941	16167	90.11	1738	9.69	36	0.20
X^2			1.761		18.273		
Df			3		3		
P-value			.623		.000		
Sig.			P>0.05		P<0.001		

Seasonal prevalence of Fasciolagigantica infection and financial loss due to liver condemnation in cattle

A total of 10287 livers were examined in the abattoirs during the wet season and 1014 were infected with a prevalence of 9.83% while 7654 livers were examined during the dry season and 760 (9.93%) were infected. The difference was however not significant (p>0.05). In GO abattoir, out of the 3915 livers examined during the wet season, 704 (17.98%) were infected and 537 (18.34%) were infected of the 2928 livers examined during the dry season (Fig. 3 and Table 5). Infection prevalence recorded during the wet season in the privately-owned abattoirs were: P1, 8.38%; P2, 2.39% and P3, 3.21% while 9.04, 1.83 and 3.74% were respectively, recorded in P1, P2 and P3 abattoir during the dry season.

The total financial loss due to liver condemnation (198kg) in the four abattoirs in both seasons was ₦237,600.00 (609.23 USD). In the wet season, a financial loss of ₦165,000.00 (423.08 USD) was recorded due to condemnation of 137.5kg of liver while ₦72,600.00 (186.15 USD) was recorded during the dry season from 60.5kg of condemned liver. The highest loss of ₦118,800.00 and ₦52,800.00 respectively, during the wet and dry season was recorded in GO abattoir (Table 5). A loss of ₦33,000.00 was recorded in P1 during the wet season. Private abattoir 1 and 2 had losses of ₦6,600.00 each during the wet season. In the dry season, all the private abattoirs had losses of ₦6,600.00 each.

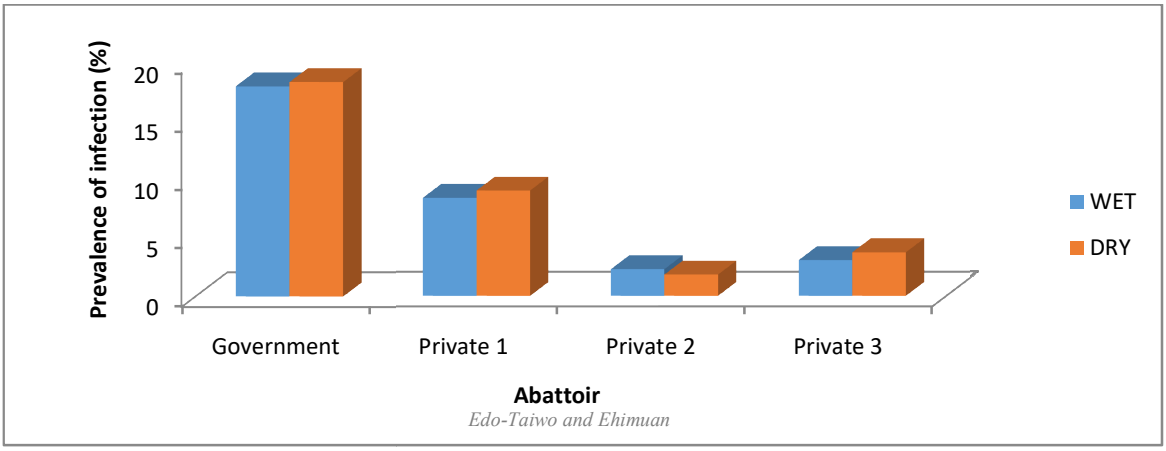

Fig. 3: Overall seasonal prevalence of *Fasciolagigantica* infection in government and private abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria

Table 5: Seasonal prevalence of *Fasciolagigantica* infection and financial loss due to liver condemnation in cattle slaughtered abattoirs at Ikpoba/Okha LGA, Edo State, Nigeria

Abattoir	Wet					Dry				
	No. examined	No. infected	Prev. (%)	condemned liver (kg)	Estimated loss (Naira)	No. examined	No. infected	Prev. (%)	condemned liver (kg)	Estimated loss (Naira)
GO	3915	704	17.98	99.0	118800	2928	537	18.34	44.0	52800
P1	2543	213	8.38	27.5	33000	1759	159	9.04	5.5	6600
P2	3144	75	2.39	5.5	6600	2459	45	1.83	5.5	6600
P3	685	22	3.21	5.5	6600	508	19	3.74	5.5	6600
Total	10287	1014	9.83	137.5	165000	7654	760	9.93	60.5	72600
USD					423.08					186.15

Discussion

This research revealed fascioliasis disease in cattle slaughtered in Edo State, irrespective of the fact that all of the cattle appeared physically fit during premortem examination. Infection with *Fasciolagigantica* was found in 1738 (9.89%) of the cattle slaughtered in all of the abattoirs under investigation, including government and privately owned abattoirs. The vast majority of cattle slaughtered in these abattoirs, however, were not raised in the state. They were trade cattle brought into the state by cattle dealers from Nigeria's northern region. These cattle were most likely infected prior to purchase because quarantine measures are usually inadequate to check the health and well-being of these cattle or even the herders (Nwankwo*et al*., 2019a). The cattle are subjected to long distance trekking, hash conditions, and unsatisfactory livestock management due to the headers' nomadic nature. These frequently make the animal susceptible to diseases, including parasitic infections. Furthermore, cattle are usually starved during migration, so they congregate at any available water source on the way to graze/drink. If such a body of water is contaminated with *Fasciola*metacercaria, the entire herd becomes infected. It is not surprising, then, that the incidence of *F. gigantica* infection was recorded in cattle slaughtered in the four abattoirs.

When compared to the reports of Abraham and Jude (2014), Adewunmi*et al*. (2017), Yatswako and Alhaji (2017), and Liba*et al*. (2018), who similarly investigated bovine fascioliasis for lengthy period of time (11 to 12 months duration); the overall prevalence of *F. gigantica* infection (9.89%) recorded in this study was low. These authors, however, examined fewer samples than the current study, which examined a large number (17941) of cattle livers. A prevalence of 44.8% was recorded by Abraham and Jude (2014) from 400 cattle investigated in Calabar; while Adewunmi*et al*. (2017), Yatswako and Alhaji

(2017) and Liba*et al*. (2018) respectively, reported prevalence of 15.14%, 32.34% and 13.67% in cattle from Ekiti and Niger States, and Maiduguri also respectively. The higher prevalence of infection reported by these other authors could be due to the fewer number of samples investigated in addition to the methods employed for investigation. It is most likely that there were more liver infected with *Fasciola*parasites which were not detected in our investigation. Adewunmi*et al*. (2017) observed that there were livers without visible fluke infestation which were found infected when histological analysis was employed in Ekiti State. It is also possible that most of the cattle investigated in our study have been treated before slaughtering hence the low infection prevalence.

There was a great disparity in the prevalence of parasitic infection recorded in the four abattoirs ($p<0.001$). The GO abattoir had a significantly higher prevalence (18.14%) compared to the privately-owned abattoirs. Likewise, the prevalence (8.65%) recorded in P1 was significantly different from other abattoirs (Table 1). Although, there was variation in the prevalence recorded in P2 (2.14%) and P3 (3.44%), this was however not significant ($p>0.05$). This discrepancy could be due to the better and effective liver inspection at the GO abattoir. One veterinary doctor was usually assigned to the GO abattoir unlike in the private abattoirs where only one doctor had to oversee a number of abattoirs daily. The higher prevalence recorded inthe GO abattoir could also be as a result of the large number of cattle slaughtered in the abattoir. Comparatively, higher prevalence of bovine fascioliasis was recorded in GO and P1 abattoirs than the retrospective and prospective prevalence report by Oladele-Bukola and Odetokun (2014) at Ibadan municipal abattoir. Retrospectively, Oladele-Bukola and Odetokun (2014) recorded an overall prevalence of 2.31% (1.57% to 5.68%) over a period of 11 years and a prospective prevalence of 3.86%, during a four month investigation. This variation could be due to better husbandry management given to the cattle examined by these authors. It could also be due to the high level of hygiene practiced in the abattoir. However, the prevalence of fascioliasis recorded in the various abattoirs was low (GO, 18.14%; P1, 8.65%, P2, 2.14%; P3, 3.44%) unlike the report of Magaji*et al*. (2014) where a prevalence of 27.68% was recorded in Sokoto State. Nwankwo*et al*. (2019a and b) also reported higher prevalence of 24% and 18.17%, respectively from Enugu State.

In this study more cattle were infected during the dry season compared to the wet season in all the abattoirs with the exception of the P2 abattoir. Nevertheless, this difference was insignificant ($p>0.05$). This further buttressed the fact that these cattle were probably infected in the north before being brought to the south. Similar observation has been made by Oladele-Bukola and Odetokun (2014) who reported higher prevalence of 2.58% during the dry season than what was recorded in wet season (2.07%). Liba*et al*. (2018) also recorded higher infection prevalence during the dry season (15.3%) compared to the wet season (12%) though not significant ($p>0.05$). There is shortage of available grazing site during the dry season and animals wander about in search of water and vegetation. They converge at any available water body which probably harbor snail intermediate host (*Lymneanatalensis*) of the parasite and invariably the metacercaria. Cattle become infected when they ingest these infective larvae along with vegetation during grazing. The irrigation system of farming practiced in the northern part of Nigeria whereby stagnant water is used in watering farms during the dry season facilitates the spread of diseases especially water borne diseases such as fascioliasis to farm animals. Farm animals are predisposed to infection whenever they drink or graze in such location. *Fasciolagigantica* infection in cattle is usually high during the wet season because the snail intermediate host (*Lymnaeanatalensis*) of the parasite is usually active and breeds during this season (Oso *et al*., 2023). Wet season is also favorable to the development of *Fasciola* eggs and the miracidium which needs water medium to swim and locate the intermediate host. It is also possible that the dilution factor occasioned by rains is responsible for the lower prevalence of infection recorded during the wet season.

The financial loss due to the condemnation of 198kg of liver in this study was ₦237,600.00 (609.23 USD). This was however low when compared to the loss of ₦438,900.00 from the condemnation of 438.9kg of liver recorded by Nwankwo*et al*. (2019a); and Nwankwo*et al*.

(2019b) who recorded financial loss of 512,050.00 naira due to bovine fascioliasis in Nsukka, Enugu. Though there was no significant difference in prevalence of infection due to season, more loss (₦165,000.00) due to liver condemnation as a result of fascioliasis was incurred during the wet season than the dry season (₦72,600.00).

Conclusion

Fascioliasis is still a frequent occurrence in cattle slaughtered in Edo State, according to this study. Therefore, it is important that suitable measures are put in place to ensure that animals are treated before sales. More veterinarians should be stationed at cattle markets and abattoirs to conduct effective liver examinations, and severely contaminated liver should be eliminated without hesitation.

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