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RESEARCH PAPER

# FASCIOLIASIS IN CATTLE: A SURVEY OF ABATTOIRS IN EGOR, IKPOBA- OKHA AND OREDO LOCAL GOVERNMENT AREAS OF EDO STATE, USING HISTOCHEMICAL TECHNIQUES

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## ABSTRACT

As meat consumption is on the increase worldwide, there are growing concerns about meat hygiene and safety since worldwide distribution of *Fasciolasis* is estimated at 90% in ruminants. The fact that animals susceptible to *Fasciola* infection are usually reservoir hosts for *Fasciola* species is also a cause for concern. This study therefore, is aimed at determining the prevalence of *Fascioliasis* in abattoirs located within some selected Local Government Areas of Benin City, Nigeria. A total of 180 cattle found within the confines of 3 abattoirs in the respective LGAs were examined. Consequently, 9 abattoirs were investigated for Liver flukes (*Fasciola hepatica* and *Fasciola gigantica*), bringing the overall number of cattle examined to 540. The screening exercise was carried out between the 15th day of August and 2nd of December, 2012, using standard histochemical techniques. The results showed that of the 540 cattle examined, 11.5% were infected. The distribution shows that cattle slaughtered at Ikpoba Okha LGA abattoirs had the highest infection rate of 5.74%, followed by abattoirs from Egor (3.33%) and Oredo (2.44%), suggesting that there exist differences in the hygienic status of abattoirs, as well as the mode of feeding and water consumption.

***Keywords:*** **Abattoir, Fascioliasis, Egor, Ikpoba Okha and Oredo Local Government Areas.**

## INTRODUCTION

The major source of animal protein is livestock and their products, but parasitism remains one of the main constraints limiting livestock productions. In fact, *Fascioliasis* caused by *Fasciola hepatica* and *Fasciola gigantica* is regarded as one of the most important parasitic diseases in the world and as meat consumption is on the increase worldwide to cover for protein demands, there are growing concerns and challenges about meat hygiene and safety. The worldwide distribution of animal *Fascioliasis* in ruminants has been estimated at 90% in some countries (Spithill *et al.*, 1999), while human *Fascioliasis* is now considered to be an important food/ plant borne parasitic disease with a wide latitudinal, longitudinal and altitudinal distribution worldwide (Mas-Coma *et al.*, 2005). Usually, animals susceptible to *Fasciola* infection serve as reservoir hosts for *Fasciola* species. The animal species include: cattle, sheep, goats, buffaloes, donkeys, pigs and several wild animal species (WHO 2007).

*Fasciolosis* is an important parasitic food borne disease, responsible for significant public health problems and substantial economic losses to the livestock industry. *Fasciolosis* gained attention not only due to its prevalence and economic significance to animal stock in all continents (Mungube *et al*., 2006; Schweizer *et al*., 2005), but also due to its zoonotic aspect. Statistically, diseases and infections that are naturally transmitted between vertebrate animals and humans (zoonoses) account for 60% of all infectious disease pathogens and 75% of all emerging pathogens

(WHO 2010; Woolhouse and Gaunt, 2007). Recent reports suggest however, that human *Fascioliasis* is an emerging/re-emerging parasitic disease as studies in Vietnam shows that *Fasciola gigantica* is the dominating species, while an "intermediate *Fasciola* species" or "*F. hepatica*-like fluke", has been reported in humans, cattle and buffaloes (Le *et al*., 2007; 2008).

Indeed, the economic loss caused by bovine *Fascioliasis* in cattle slaughtered in abattoirs has been the subject of several studies for years and have been estimated globally to be at least US$ 3.2 billion annually, due to reduction of weight gain, draught capacity, fertility and lactation (Charlier *et al.,* 2008). *F. hepatica* infects more than 300 million cattle and 250 million sheep worldwide, and together with *F. gigantica*, it causes significant economic losses to global agriculture, which has been estimated to be more than US$ 3.2 billion annually, mainly through loss of productivity, such as reduction of milk and meat yields (Mas-Coma *et al.*, 2005; Charlier *et al*., 2007).

*Fascioliasis* or liver rot is caused by either *Fasciola gigantica* or *Fasciola hepatica* (Le *et al.*, 2008; WHO 2007; Le *et al*., 2005). The liver and bile ducts of man and domestic animals are inhibited by flukes of the family Fasciolidae (WHO 2007). However, some authors have reported flukes in slaughter animals that resembles *F. hepatica, F. gigantica* and intermediate forms (Le *et al*., 2008; Dang *et al*., 2005). The *Fasciolidae* include several species of the genera *Fasciola* and *Fascioloidis*, which are very important liver parasites of cattle, sheep and goats (Le *et al*., 2008; WHO 2007,). A wide variety of wild animals including, deer, rabbit, hare, may also get infested with *Fasciola* spp., and become major reservoir host populations that contribute significantly to the worldwide dissemination of the parasite (WHO, 2007).

*Fasciola* is not frequently parasitic in man but it can infect man from improperly cooked livers. The *Fasciolidae* are large liver-like flukes with branched reproductive organs and usually branched ceca also, including a small coiled uterus lying entirely in front of the sex glands. The eggs are very large - the cercariae, which have long simple tails and encyst on water vegetation (WHO 2007, Radostits *et al*., 2007; Saba and Korkmaz, 2005). The larger proportion of these animals' population are however largely concentrated in the northern region of the country than the southern region. Specifically, about 90 percent of the country's cattle population and 70 percent of the sheep and goat populations are concentrated in northern regions of the country.

Cattle get infested normally in the rainy season, but in the dry season, the herdsmen migrate in search of water and grazing such that thousands of cattle often converge on the few ponds that fail to dry up. In such locations, snail intermediate host are found and they reinforce the *Fasciola* infestation already obtained by the cattle during the rainy season (Lawal-Adebowale 2012; Adedokun, 2008). This study therefore, was under-taken to determine the prevalence of *Fascioliasis* in cattle slaughtered in abattoirs within the three Local Government areas in Benin City, Edo State, Nigeria.

## MATERIALS AND METHODS

**Study Area:** Three (3) abattoirs each in Egor, Ikpoba Okha, and Oredo Local Government areas within Benin metropolis were visited for this study. All the locations are motorable and easily accessible by beef consumers and traders who buy and sell beef products.

**Cattle:** A total of 180 cattle found within the confines of 3 abattoirs in the respective LGAs were screened. Overall, five hundred and forty (540) cattle comprising 480 males and 60 females were selected at random and examined (postmortem) between the month of April and October 2012. All the cattle examined comprised traded cattle from northern Nigeria, which are normally transported by road and sometimes allowed to graze from one neighboring town to another.

**Sample collection:** Excised samples of the liver were randomly collected from different abattoirs within the early hours of 6:30 – 8.00am into a sterile universal container containing 10% buffered neutral formalin for preservation. Adult and juvenile flukes were placed in a container containing normal saline before fixing in formalin. All the samples collected were transported to the laboratory for macroscopic (gross) and microscopic examination.

**Macroscopic (Gross) examination:** The surface and the substance of the livers were examined for liver cirrhosis and the bile ducts were incised to check for the presence of liver fluke -*Fasciola hepatica* or *F. gigantica*.

**Microscopic (Histological) examination:** After macroscopic examination, the tissues were processed in an automatic tissue processor for dehydration, clearing, impregnation (using molten paraffin wax) and automatic tissue

embedding machine for the embedding process. Sections of the tissues were obtained using the hertz rotary microtome (Cambridge mode). Staining of the sections was according to haematoxylin and eosin staining technique as described by Bancroft and Marilyn (2002).

**RESULTS**

Table 1 shows the prevalence rate of *Fascioliasis* in the selected abattoirs visited. Out of the 540 cattle examined, 62 (11.5%) were infected. From the results Aduwawa I, Aduwawa II and Ikpoba slope abattoirs had the highest infection rate of 31 (51.6%). This was followed by Asoro, Ugbioko and Technical road abattoirs, which had an infection rate of 18 (30%), while Isonoroh, Ewah I, and Ewah II abattoirs, had the lowest infection rate of 13 (21.7%).

Table 2 shows the overall infection percentage (%) rate per local Government Area. Most cattle harboring parasites were located in Ikpoba Okha (31; 5.74%), compared to those in Egor (18; 3.33%) and Oredo (13; 2.41%) local Government Areas. In relation to sex however, Table 3 show that 56 (10.4%) male cattle out of the 480 cattle, were infected while 6 (1.1%) out of the 60 female cattle were infected.

Gross examination revealed that infected liver was enlarged with thick capsule. Adult and young flukes were seen in the bile ducts of 62 livers out of the 540 cattle examined. Liver cirrhosis was reported only in three cattle. Microscopic examination revealed the presence of these flukes embedded between the liver tissues. Hemorrhagic patches and white necrotic foci of abcessiation were visible. The cut section of the surface of cattle liver with *Fasciolasis* showed thickened dilated migratory tracks and calcareous bile ducts containing different sizes of adult flukes as seen in the Figures.

**Table I. Prevalence rate of *Fascioliasis* in selected Abattoirs within the three local Governments**

| Local Govt. Area | Abattoirs Visited | No. of liver samples examined | No. of liver samples infected | Prevalence rate (%) |
|---|---|---|---|---|
| **OREDO** | Isonoroh | 60 | 3 | 5% |
| | Ewah I | 60 | 6 | 10% |
| | Ewah II | 60 | 4 | 6.7% |
| **EGOR** | Asoro | 60 | 7 | 11.7% |
| | Evbotubu | 60 | 5 | 8.3% |
| | Technical | 60 | 6 | 10% |
| **IKPOBA - OKHA** | Aduwawa I | 60 | 11 | 18.3% |
| | Aduwawa II | 60 | 12 | 20% |
| | Ikpoba slope | 60 | 8 | 13.3% |
| **Total** | | **540** | **62** | **103** |

**Table 2. Prevalence rate (%) per Local Government Area**

| Local Govt. Area | No. of Abattoirs Visited | No. of liver Samples examined | No. of liver samples infected | Prevalence rate (%) |
|---|---|---|---|---|
| **EGOR** | 3 | 180 | 18 | 3.33 |
| **IKPOBA-OKHA** | 3 | 180 | 31 | 5.74 |
| **OREDO** | 3 | 180 | 13 | 2.41 |
| **TOTAL** | **9** | **540** | **62** | **11.5** |

**Table 3. Prevalence rate of *Fascioliasis* in relation to sex**

| Sex | No. examined | No. infected | Prevalence rate (%) |
|---|---|---|---|
| **Male** | 480 | 56 | 10.4 |
| **Female** | 60 | 06 | 1.1 |
| **Total** | **540** | **62** | **11.5** |

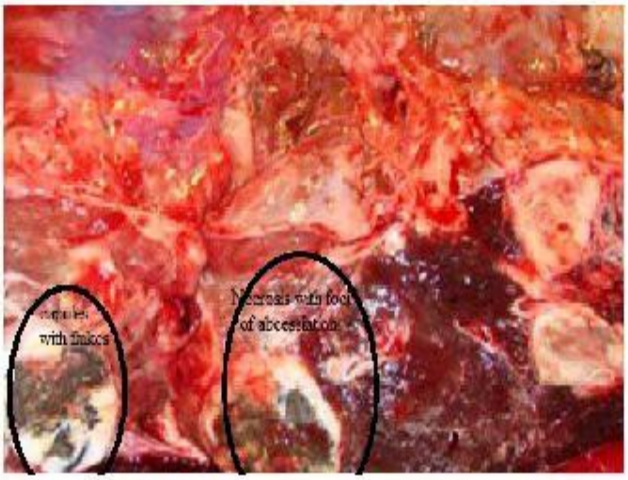

Fig 1: Showing fresh liver, transverse cut surface showing evidence of capsules with flukes and necrosis with foci of abcessiation

Fig II. Liver section shows F. hepatica (egg) with necrosis. (H&E)

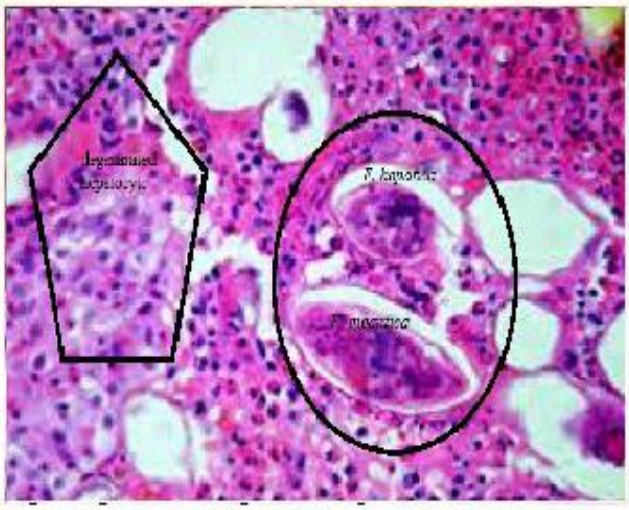

Fig III: Liver section infested with F. hepatica and F. gigantica, degenerated hepatocyte with hepatic sinusoid (H&E)

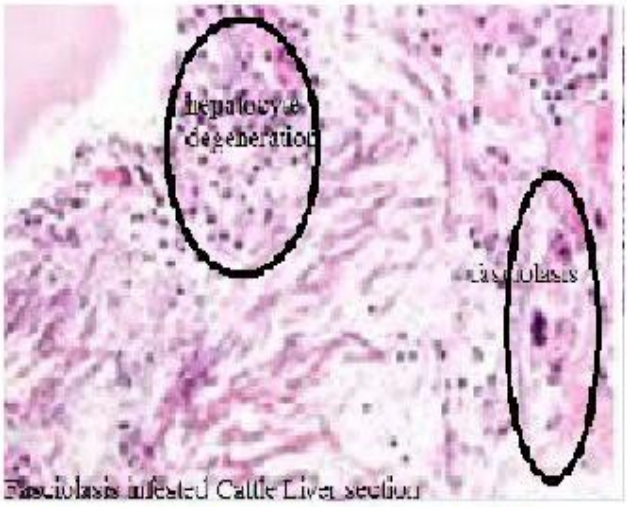


Fig IV. Infestation of Fascioliasis in liver section (H&E)

**DISCUSSION**

According to Erick *et al.* (2012), a slaughter house is a key component of the production and distribution chain for meat and as such, should be as hygienic as possible, in order to prevent the spread of both human and animal diseases, and to reduce economic losses due to premature spoilage of meat following contamination. Also, Biu *et al.* (2006) had stated that many abattoirs and slaughter slabs in developing countries are poorly constructed with poor slaughter and meat inspection facilities, as well as qualified meat inspectors. This obvious hygiene problem and inadequate meat inspection and clearance, always causes illness and disease (Erick *et al.*, 2012; Joshi *et al.*, 2003).

In the present study it was observed that the abattoir under study have poor hygienic conditions as shown in fig IX, X and XI. This has a huge public health implication as regards the possibilities of transmitting animal, human and environmentally derived pathogens to consumers. In fact, more than 100,000 people are affected annually by food borne infections, which in some cases, are caused by bad food hygiene in slaughter houses or in households (Tassew *et al.*, 2010).

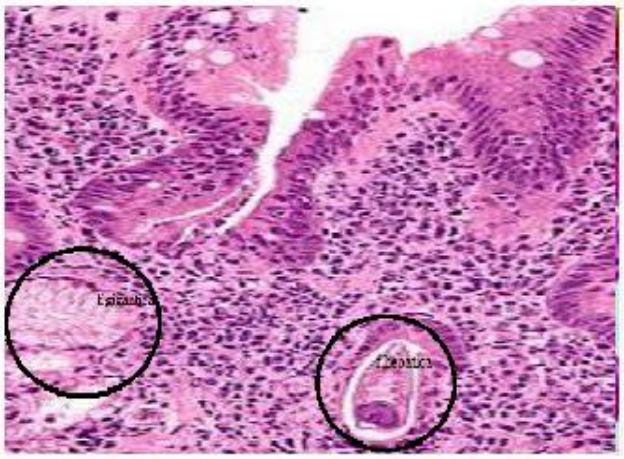

Fig V: section showing eggs of f. gigantica and f. hepatica (H&E)

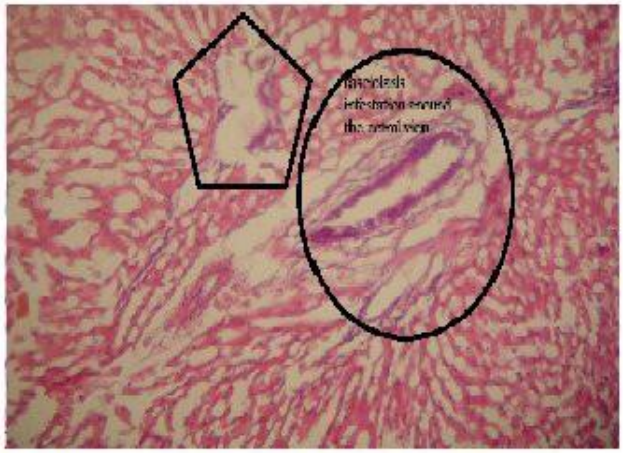

Fig VI: Liver section infested with fasciolasis around the central canal Leading to a congestive central vein (H&E).

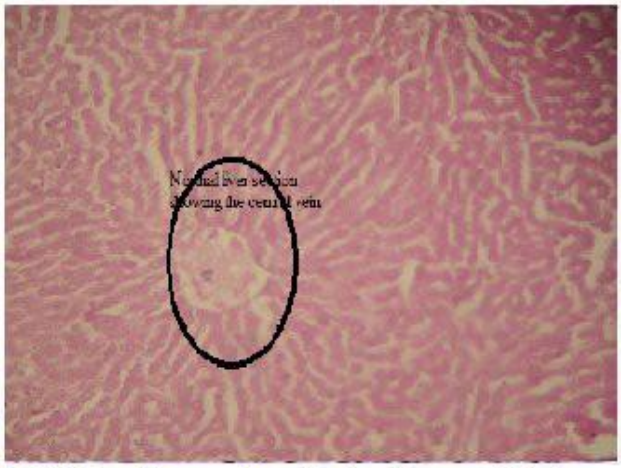

Fig VII: Normal liver section with all architecture still in place (H&E)

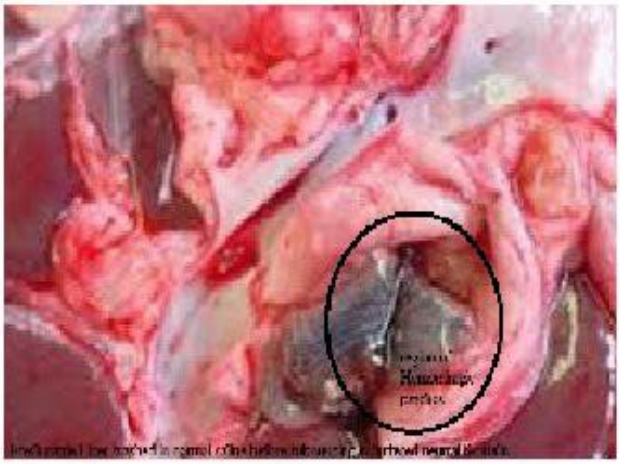

Fig VIII: Fresh cattle liver washed in normal saline before submerging in buffered neutral formalin

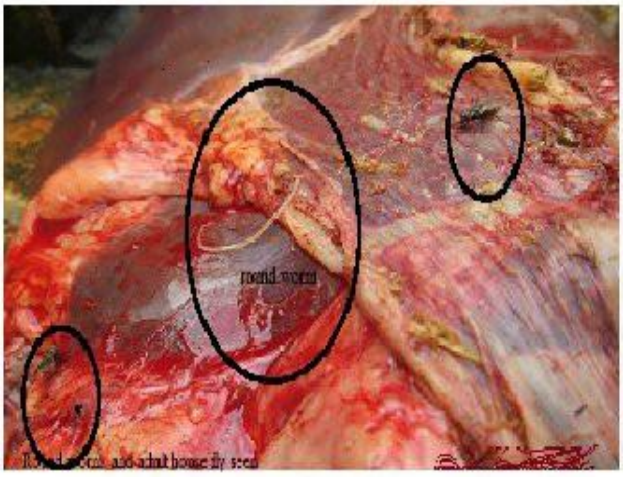

Fig IX: Round worm and adult fly seen at the site of investigation (Though not of primary interest)

Fig X: Normal Liver without sign of contamination, but surrounded with dirty, irritating and questionable hygienic environment.


**Fig XI: A private own abattoir with source of water supply considered as the best amongst all abattoir visited but was marked with dirty and unhygienic surroundings.**

Furthermore, Erick *et al.,* (2012) asserts that *Fascioliasis* is among the zoonotic reasons for organ condemnations and a leading cause of liver condemnations in slaughtered cattle. In Nigeria however, considering the weakness of her regulatory mechanisms, contaminated/ condemned organs are most likely to be sold to the general public. Therefore, humans are at a risk of infection when raw or undercooked beef harbouring a viable cyst is consumed (Ogunremi *et al.,* 2004). Infected individuals may remain asymptomatic for years, and the only symptom may be the spontaneous passage of proglottids. Nonspecific symptoms such as vague abdominal pain, nausea, vomiting, diarrhoea and weight loss can be present (Karanikas *et al.,* 2007).

Mas-Coma (2005) in his work named *Fascioliasis* and other plant-borne trematode zoonoses, reported that the prevalence of helminthes parasites in cattle is highest in the tropical rainforest as well as in the sub-tropical areas where annual rainfall is high. This high rainfall is known to favour the proliferation of snail, *Lymnacea natalensis* and *Lymnaea truncatula*, which are intermediate host of liver flukes. As metacercariae are able to attach to different substrates, it has been suggested that human contamination may occur when encysted metacercariae are swallowed with tainted vegetation (aquatic plants) or with animal products, such as raw or undercooked crustaceans (crayfish), squid, molluscs, or amphibians (frogs, tadpoles), as is the case in other species of the same family Gastrodiscidae (Mas-Coma *et al.,* 2005; Fried *et al.,* 2004). In this work, cattle during grazing, are also been contaminated when they swallow encysted metacercariae along riverine areas. From this study, abattoirs in Ikpoba Okha abattoirs recorded the highest infective rate of 31 (51.6%) followed by Egor abattoirs, while Oredo abattoirs recorded the least. Of interest, is the fact that virtually all abattoirs in Ikpoba Okha and Egor LGAs are located near the river and this may account for the higher prevalence rate of *Fascioliasis*. Also, since the cattle are left to graze on the field before slaughtering and their stool are washed into the river during slaughtering, the rivers are likely to harbor the snail intermediate host which produces metacercariae that encysts on water vegetation. Usually, cattle get infected when they are exposed to the infective form of the parasite. Thus, the swampy nature of abattoirs in Egor Local Government Area, may account for the high prevalence of *Fascioliasis* as compared to Oredo L.G.A., abattoirs located far away from such riverine or swampy environment.

In relation to sex, Hazzaz, *et al.,* (2010) had reported that the prevalence of *Fascioliasis* was higher in male cattle than in females and this is in agreement with the present study, unlike buffaloes and goats with higher prevalent rate amongst female cattle. Therefore, the high infection rate recorded in male cattle could be attributed to the fact that the males are usually slaughtered for consumption than the females, while the females are left for milk production as well as for reproduction in the ranch, promoting the herdsmen to feed them adequately with clean food (pastures) and good water to drink. The few ones likely to be infected are usually those that are no longer productive, because they are used for beef production and as such, much care and attention may not be given to them. Another factor responsible for the high prevalence rate in male cattle might be the fact that males cattle are usually taken around to graze and feed, thereby exposing them to infective parasites.

On the other hand, the overall prevalence of *Fasciolasis* (11.5%) observed in this study, is in line with the 24.3% prevalence rate reported by Berhe *et al*. (2009) in Northern Ethiopia, but much lower than that reported elsewhere in

Africa. Specifically, Yilma and Mesfin (2000) reported a 90.7% prevalence of *Fasciolasis* in cattle slaughtered at Gondar abattoir, while Tolosa and Tigre (2007) recorded a prevalence of 46.2% at Jimma abattoir. Phiri *et al*. (2005) in Zambia, and Pfukenyi and Mukaratirwa (2004) in Zimbabwe, reported 53.9% and 31.7% prevalence rate respectively. In addition, a prevalence rate of 14.0% has been observed in slaughter cattle at Wolaita Soddo abattoir (Abunna, *et al*. 2009) which is closely related to the rate observed in this study.

Nevertheless, *Fasciola* prevalence has been reported to vary over the years mainly due to variation in amount and pattern of rainfall while difference in prevalence among geographical locations is attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature (Kassaye *et al*., 2012; Mungube, 2006). Hence, the prevalence rate appears to decline over the years showing that the recommendations made by various researchers may have being taken into consideration by government or privately owned abattoirs owners in Nigeria.

In conclusion, the difference in feed and water quality in these abattoirs and their locations are apparently responsible for the variations in the prevalence rate of *Fascioliasis*. Thus, both male and female cattle should be given equal treatment by keeping them in a ranch and feeding them with clean food and water. In a situation where the above cannot be practiced, infected animals should be isolated and treated immediately with appropriate drugs, to prevent parasitic invasion and subsequent spread of the infection to other cattle. Livers should be properly cooked before eating; frying of liver without cooking will not kill some of the liver flukes. Cattle stool should not be washed into the river or any stagnant water nearby but should be buried in a deep pit.

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**AUTHOR(S) CONTRIBUTION**

Odigie, B.E.: Field collection of specimen at every location, Histological processing of the specimens collected, histochemical preparations and staining procedure of the entire work as well as the general preview of the manuscript. Odigie, J.O.: Contributed immensely to the overall write up of the manuscript, both microscopic and macroscopic identification of the two parasites seen.