Prevalence of Liver Condemnation Due to Fascioliasis in Slaughtered Cattle and It’s Financial Losses at Kano Old Abattoir, Nigeria

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Abstract

A total of 6,933 cattle slaughtered at Kano old abattoir during the wet season month of July, 2014 were examined during post mortem meat inspection in order to determine the prevalence of liver condemnation in weight (kg) due to fascioliasis and its financial losses in naira (N) equivalent. Data were obtained by macroscopic examination, palpation and incision of each liver for size, consistency, dilatation of the bile ducts, sinus tract due to immature fluke migration, fibrous tissue formation, immature and matured flukes in the liver and bile duct, respectively. Liver with less or severe damage were partially or totally condemned. The condemned liver from each slaughtered cattle were collected in polythene bags and weighed individually using Camry premium® scale while the financial value was estimated in naira using the current market price of N1,200 per kilogram of liver sold in the Kano meat market. A prevalence of 1.2% from 80 (31 and 49 partially and totally condemned livers respectively) condemned livers out of 6,933 cattle examined was obtained. The total weight of both partially and totally condemned liver tissues was 295.8 kg which translated into financial losses of N354,960 only. The result from this study showed that, fascioliasis is one of the causes of financial losses in the livestock production sector in the study area.

Keywords: Condemned liver, fascioliasis, financial loss, kano old abattoir, naira.
Introduction

Meat derived from cattle, sheep and goats provides major sources of animal protein for the population of Kano State and Nigeria in general. These ruminants incidentally serve as definitive hosts to the parasitic helminthes trematode of the family, Fasciolidae, commonly known as liver flukes. There are various species of these genera but the economically important ones are Fasciola gigantica in the tropics and Fasciola hepatica in the temperate region (Ikeme and Obioha, 1973).

Among the edible organs (meat) in the ruminants, liver is one of the most desired and expensive organ in the Kano metropolitan meat market. It is delicious and contains a lot of proteins and mineral ions good for the human health when consumed.

The immature liver flukes causes damage to the liver parenchyma leading to necrosis and fibrosis such that, if the affected animal is salvaged, the liver may be partially or totally condemn during post-mortem meat inspection depending on the severity of the damage, hence financial loss to the owner.

The damaged liver of the affected animal before slaughter affects the metabolic function of the liver leading to impaired energy supply to the affected animal and if not treated or salvaged may lead to death (Fabiyi and Adeleye, 1982). Indeed, most analysis of global impact of fascioliasis focuses on the economic impact caused by infections of domesticated herd/flock animals. Depending on the disease prevalence in a herd, these losses can be significant. The direct economic impact of fasciola infection is increased condemnation of liver meat, but the far more damaging effects are decreased animal productivity, lower calf birth weight, and reduced growth rate amongst other factors in affected animals (Kaplan, 2001; Njeruh, 2004 and Hillver, 2005).

The global losses in cattle productivity due to fascioliasis were estimated at over US$3.2 billion per annum during the last decade (Spithill et al., 1999). In Nigeria, the first incidence of fascioliasis was reported by Burke, (1939) when about 3000 goats died of the disease in the then Borno province, north-eastern Nigeria. In a South-Western State of Nigeria, a gross total liver loss of 8.292 kg was observed with about 75% loss of value in 29.952 kg of partially condemned liver tissues in a single abattoir over a three-year period (World Bank, 2006). Estimating that each of the 36 states and the Federal Capital Territory will record similar losses in at least one abattoir per state, this will translate to huge loss of resources (US$ 5,762,010) for the country. These enormous losses are especially important for a low-income food-deficient country (LIFDC) like Nigeria (World Bank, 2006).

In a study conducted at the Maiduguri abattoir of Borno State, Nigeria on slaughtered cattle, Biu et al., (2006) reported about 1, 290 kg condemnable weight of liver from 250 cattle valued at N 451, 720.50k due to fascioliasis.

The prevalence of Fasciola infection depends on several factors related to the biology of the vectors, biology of the parasite and the management of flocks and herds. A lot of prevalence studies have been carried out to investigate the level of spread of Fasciola infections in cattle. In Africa, Megard (1975) gave the prevalence rates in Kenya (33%), Sudan (37%), Cameroun (45%), Ethiopia (30-90%), Uganda (10%), Central African Republic (62%) and Rwanda (50%).

For instance Ferguson (1964), determined the prevalence of fascioliasis in Birnin-Kebbi, Maiduguri and Kaduna with prevalence rate as high as 43.56% in 1963. Babalola (1975) reported in Bauchi abattoir that a total of 14, 270 cattle from various markets in Bauchi and Borno States were examined for prevalence of bovine fascioliasis. The overall prevalence rate was 32.2% for cattle originating from Bauchi, Muson, Potiskum and Geidam areas. Babalola and Schillhom Van Veen (1976) reported the prevalence of fascioliasis in Zaria to be as high as 65.40%, while Ikeme and Obioha (1973) reported the prevalence of the parasite in slaughtered cattle in other parts of Nigeria as 39% and 31.7% respectively.

Egbe-Nwiyi and Chandrai, (1996) studied the prevalence of Fasciola gigantica infection in cattle and sheep in Borno State and reported that 150 of each species were examined in each of the seasons of the year. The prevalence observed was virtually high during the rainy season (41.30%).
Ogunrinade and Adegoke, (1980) in their research also reported that out of 1.2 million cattle slaughtered in Northern Nigeria, 30,000 or 2.5% were positive of fascioliasis, with the highest prevalence record at abattoirs situated in Northern Guinea Savannah being 5.55% while the lowest incidence found in Jos plateau was 0.88%. Specifically, Ekwunife and Eneanya (2006) studied and identify the presence of *Fasciola gigantica* in cattle slaughtered in Onitsha area of Anambra State with a prevalence rate of 10.51% from 166 out of 1,580 cattle slaughtered between November and December 2004. In Ikoma abattoir of Cross River State, Ozung, *et al.*, (2011) assessed and recorded the prevalence rate of 7.35% of fascioliasis from 1,020 cattle slaughtered between January 1995 and December 1999.

Opara (2005) in a study of population dynamics of *Fasciola gigantica* in cattle slaughtered in Uyo from January to December 2001 came out with 47.55% prevalence of fascioliasis. In all these reported prevalence, it was observed that the researchers paid less attention to the severity of damage to the liver by the parasites and its financial losses such that the rate of partial and totally condemned liver tissues were under reported. Although the presence of flukes in the liver tissues may not necessarily lead to liver condemnation, perhaps that could explain why the reported prevalence of fascioliasis were high in some of the study areas neglecting the degree of liver tissue gross damage, the rate of liver condemnation and its financial losses. The aim of this study was to conduct an abattoir survey of liver fluke infection in cattle slaughtered at Kano old abattoir in order to determine the prevalence of liver condemnation due to fascioliasis alone and to also estimate in monetary terms the financial losses in naira of the condemned liver tissues.

**Materials and Methods**

The area of the study was Kano old Abattoir located in Fagge local government area of Kano State, Nigeria.

### Sample Size Determination

The sample size was obtained using the formula by Thrusfield (1995): 

\[ n = \frac{z^2p (1-p)}{d^2} \]

Where: 
- \( n \) = required sample size, 
- \( z \) = standard deviation (1.96), 
- \( p \) = expected prevalence, 
- \( d^2 \) = desired absolute precision (0.01). 

A prevalence of 80.8% obtained from a study reported by Biu et al., (2006) was used in calculating \( n \): 

\[ n = (1.96)^2 \times (0.81 \times 1 - 0.81)^2 / (0.01)^2 = 5,922 \]

However, the sample size was increased to 6,933 in order to increase precision and to minimize error. This work was carried out over a four-week period in the month of July, 2014 (1<sup>st</sup> July – 28<sup>th</sup> July), during the early period of the rainy season. Daily visits at 6:00h before slaughter was made to the Kano old abattoir along I.B.B. Road in Fagge Local Government Area of Kano State. Some sources of the slaughtered cattle were obtained through series of interviews with the butchers and abattoir records. The average number of cattle slaughtered per day was 300 (from available records in the abattoir). The meat inspection was made possible through the cooperation of the abattoir staff.

### Some Sources of the Slaughtered Cattle

The cattle slaughtered in the abattoir were obtained from specific markets on specific days of the week.

<table>
<thead>
<tr>
<th>Market Days</th>
<th>Market Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>Getso (Kano State) and Shuwarin (Jigawa State)</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Sabuwa (Katsina State)</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Makarfi (Kaduna State)</td>
</tr>
<tr>
<td>Thursday</td>
<td>Giwa (Kaduna State) and Dankan-jiba (Katsina State)</td>
</tr>
<tr>
<td>Friday</td>
<td>Wudil (Kano State), Shema and Dayi (Katsina State)</td>
</tr>
<tr>
<td>Saturday</td>
<td>Danbatta (Kano State) and Anchau (Kaduna State)</td>
</tr>
<tr>
<td>Sunday</td>
<td>Kafur (Katsina State)</td>
</tr>
</tbody>
</table>
These areas ranged from lowland to highland and are mostly associated with Fadama farming system. The butchers usually buy large number of cattle according to their purchasing power from those markets; such that cattle from different sources can be slaughtered in a day by the same butcher.

Data were obtained by macroscopic examination of most livers according to Ramajo et al., (2001) in which the liver size, consistency, colour, dilatation of the bile ducts, presence of sinus tract due to migration of the immature flukes, fibrous tissue formation, presence of immature flukes in the liver parenchyma and mature flukes within the bile ducts were examined during the routine post-mortem meat inspection.

The liver was palpated and the biliary tracts milked for consistency and presence or absence of flukes respectively. Incisions were also made on the parietal surface of the liver and along the length of the bile ducts to observe fibrosis and presence or absence of flukes.

Liver with less severe damage were partially condemned by trimming off the affected portions and the remaining part was passed for human consumption, while the extensively damaged and cirrhotic liver were totally condemned. The partially and totally condemned livers from individual slaughtered cattle were placed in polythene bags and carefully labeled using marker and masking tape. The samples collected and labelled were later weighed in kilogram daily using Camry Premium® scale.

A market survey of the average prices of liver within Kano metropolis as at July, 2014 was estimated at ₦1, 200 per kilogram. This average price of the liver per kilogram was used in estimating the overall financial loss of all the partially and totally condemned liver at the end of the 4-week study period (Table 2).

The prevalence of condemned liver was determined by dividing the number of affected liver by the total number of all the liver examined and the result expressed in percentage.

### Results

In this study, the total number of cattle slaughtered over the 4-week survey was 6,933 out of which, 80 cattle were found to be infested with flukes. Table 2 below shows the outcome of the abattoir and market survey of condemned liver due to fascioliasis at Kano old abattoir:

<table>
<thead>
<tr>
<th>Weeks of the Study</th>
<th>No. of liver examined</th>
<th>No. of Cattle with Affected Liver</th>
<th>No. of Liver P-C</th>
<th>No. of Liver T-C</th>
<th>Total Weight of C-L (Kg)</th>
<th>Total Market Value of C-L (₦)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>1,833</td>
<td>24</td>
<td>8</td>
<td>16</td>
<td>77.9</td>
<td>93,480</td>
</tr>
<tr>
<td>2nd</td>
<td>1,869</td>
<td>20</td>
<td>9</td>
<td>11</td>
<td>65.4</td>
<td>78,480</td>
</tr>
<tr>
<td>3rd</td>
<td>1,713</td>
<td>21</td>
<td>9</td>
<td>12</td>
<td>88.6</td>
<td>106,320</td>
</tr>
<tr>
<td>4th</td>
<td>1,518</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td>63.9</td>
<td>76,680</td>
</tr>
<tr>
<td>Total</td>
<td>6,933</td>
<td>80</td>
<td>31</td>
<td>49</td>
<td>295.8</td>
<td>354,960</td>
</tr>
</tbody>
</table>

P-C (Partially Condemned), T-C (Totally Condemned), C-L (Condemned Liver), Kg (Kilogram), ₦ (Naira).

Prevalence (p) of condemned liver due fascioliasis in slaughtered cattle at Kano old abattoir

\[
p = \frac{\text{Number of all condemned livers}}{\text{Total cattle slaughtered and liver examined}} \times 100\%
\]

\[
(80 \times 100)/6,933 = 1.2\%
\]

Fasciola gigantica was the only liver fluke species observed in the study.
Discussion

A prevalence of 1.2% of condemned liver weighing 295.8kg valued at N354, 960.00k (1, 775 USD) due fascioliasis was obtained in this 4-week study which is quite low compared with a related study conducted at the Maiduguri abattoir on slaughtered cattle by Biu et al., (2006) where a prevalence of 80.8% for fascioliasis, hydatidosis and cysticercosis of which 539.41kg weighed of condemned liver valued at N188, 804.00k due to fascioliasis alone was recorded within the month of July, 2003. The high prevalence obtained in that study could be attributed to the presence of mixed infections. Although the weight of the condemned liver in that study was higher, yet the value of the condemned liver in naira was low. This could be attributed to the prevailing market price of the liver at that time.

Fetene and Addis, (2014) in Dangila Municipal Abattoir, Ethiopia also reported a prevalence of 30.21% of fascioliasis with condemned liver valued at 945, 270 Ethiopian birr (48,432 USD). The prevalence reported in this study was not the prevalence of condemned liver but of fasciola infection. The duration of the study and the country’s currency exchange rate to U.S Dollar may be responsible for the difference in the monetary value of the condemned liver reported.

Fasciola gigantica was the only liver fluke species recorded in our study. This may be associated with the existence of favourable ecological biotypes for Lymnae natalensis, the intermediate host of Fasciola gigantica in Nigeria. This may be explained by the fact that most of the cattle slaughtered during the period of the study came from high land and middle altitude zones. The duration of this study was another factor that may have influenced the amount of data obtained. Since the rainy season favours the survival of the intermediate host, water snails (Lymnae species) and the parasite (Okon and Enyenihi, 1977; Suarez and Busetti, 1995).

A total of 295.8kg of liver were condemned due to fascioliasis. If on the average each household in Kano consumes 1kg of liver per month, this means a total of 296 household in Kano will lack cattle liver as meat in their meals thereby reducing the amount of protein they will consume from this source. The sum of N354, 960 was presumably lost in July at Kano old abattoir from condemned liver (295.8kg) due to fascioliasis alone. If this amount of naira is extrapolated for each month of the year, it means N4, 259, 520 will be lost per annum due to fascioliasis alone.

Conclusion

A prevalence of 1.2% of liver condemnation due to fascioliasis alone in slaughtered cattle was observed during a 4-week study carried out in the wet season month of July, 2014 at Kano old abattoir. The financial losses caused by flukes resulting in liver condemnation amounted to N354, 960 only during the period of study.

Although the rate of infection is moderately low, the financial implications should not be overlooked. This is because, other losses caused by fascioliasis as a result of mortality, weight loss, decrease in milk production, decreased in fertility and loss of draught power were not considered in this study otherwise, the losses would have been more than it was reported.

Limitations of the Study

In addition to the length of the period of the study, which was considered too short for a comprehensive study to be carried out, the attachment of too much monetary value to the liver by the butchers naturally led to resistance for a thorough liver inspection and condemnation where the liver was affected. It was also difficult to identify the market source of each cattle at the point of slaughter because of the inadequate documentation and haphazard nature of the abattoir processes because the butchers were in a hurry to shunt some of the meat inspection procedures including documentation of each cattle before slaughter.

Recommendations

Routine deworming of cattle and chemotherapy against liver flukes may greatly reduce the amount of liver condemnation due to helminthes at slaughter and this may increase the income and protein of the butchers and households in Kano.
respectively. Proper documentation of cattle meant for slaughter at the Kano abattoir should be encouraged.

Acknowledgement

The authors are grateful to all the staff of Kano old abattoir for their cooperation which have significantly contributed to the success of this work.

References


