Economic Assessment of Bovine Fasciolosis in Some Selected Abattoirs of Adamawa State, Nigeria

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Abstract

Some aspects of economic assessment of bovine Fasciolosis were conducted in some selected abattoirs of Adamawa state in North-eastern Nigeria (Yola, Mubi and Numan) using examination of liver of slaughtered cattle for a period of one year. A total of 3015 cattle were examined by post-mortem liver inspection for infection with Fasciola species. In all 657 (21.79%) of the animals were infected with Fasciola gigantica the only species encountered during the study. There was a significant difference (P<0.05) between the number of Fasciolosis cases that occurred in the dry season and that of wet season. The economic loss encountered due to condemnation of infected liver or proportional to the level of infection for one year in this study was more than $9121 (₦1.4M) per annum. It was observed that bovine fasciolosis is an obstacle to livestock production and development in Adamawa state and Nigeria. The results of this study suggest that Fasciola infection is endemic and occur in high prevalence with enormous economic loss in cattle slaughtered at Adamawa state abattoirs, Nigeria. There is a need for the control of this chronic parasitic disease whose prevalence rate is on the rise in Adamawa state. Regular and / or strategic anthelmintic medication coupled with improved animal management practice will help to control the disease in the area.

Key words: Economic Assessment, Bovine Fasciolosis, Adamawa State, Abattoirs, Nigeria

Introduction

Fasciolosis is a parasitic disease of cattle, buffaloes, sheep, goats horses and human of all ages which is caused by liver flukes (Armour, 1975). Fasciola a trematode belonging to the sub-class Digenea, which is commonly known as liver fluke that infect the biliary ducts (Ramajo et al., 2001). There are two most common species of Fasciola responsible for wide spread morbidity and mortality in ruminants (Soulsby, 1982). These are Fasciola gigantica found in the tropics and sub tropics and Fasciola hepatica which is found in the temperate zones. Losos (1995) reported that F. gigantica predominates in Africa and it is usually transmitted by a snail of the genus Lymnae which gets to the definitive or final host following the ingestion of the metacercariae during grazing on vegetation. Tropical Fasciolosis caused by infection with F. gigantica is regarded as one of the most important single helminth infections of ruminants in Asia and Africa (Roberts and Suhardono, 1996). Together with major nematode infections, Fasciolosis is a
significant constraint on the productivity of domestic ruminants throughout Asia, South-East Asia and Africa and is thus a significant impediment to global food production (Fabiyi, 1987). Studies so far conducted on fasciolosis in Nigeria were mostly based on coprological examinations and abattoir surveys Schillhorn van Veen et al 1980; Ogunrinade et al 1981; Fabiyi,1987; Nwosu and Srivastava 1993. Information is scarce on the situation in the Sudan savannah / semi arid north eastern Nigeria, an area known to produce over 30% of the cattle population in the country (Nwosu and Srivastava,1993, Umar et al., 2009). The only available studies on the economic importance of bovine fascioliasis in the semi arid north eastern Nigeria are the reports by Nwosu and Srivastava (1993), Ahmed et al. (1994) and Umar et. al. (2009) whose studies were conducted in Maiduguri, Borno State and Jalingo Taraba State, Nigeria. Losses associated with Fasciolosis include total condemnation of infected liver or partial condemnation through trimming of the affected parts of the liver, which reduces the volume of the liver sold. These losses are considerable, although they vary from one part of the country to another depending on Fasciolosis pressure, which is dependent on prevailing climatic conditions. Few studies in Nigeria have attempted to estimate the annual Fasciolosis slaughter losses through liver condemnation. There are other indirect losses such as lowered weight gain, poor feed utilization and poor quality of meat and milk processes, some of these are hard to quantify. Slaughter surveys have been widely conducted in some sub-Saharan African countries including Nigeria to estimate the prevalence and the economic significance of Fasciolosis in various ruminant production systems (Alonge and Fasami, 1979; Ogunrinade and Ogunrinade, 1980; Phiri et al., 2005; Mungube et al., 2006)

This study was therefore conducted to assess the economic losses associated with Fasciola infection in cattle slaughtered at some selected abattoirs of Adamawa state, Nigeria.

Although not yet documented in Nigeria, human fasciolosis is now recognised as an emerging zoonosis by the World Health Organisation (WHO,1999). Research on the presence and significance of the disease in humans is advocated in Adamawa state and Nigeria as a whole.

Materials and Method

Study area

The study area was Adamawa State located on latitudes 09°14′N and Longitude 12°8′E. The State has a tropical climate, marked with two distinct seasons; wet season (May-October) and dry season (November to April). It has an average annual rainfall of 759mm with wettest months in July-September. The drier months of the year are January-March when relative humidity drops to 13%. Mubi, Ngurore, Ganye,
Song, Yola, Fufore, Lafia and Konkol are the major cattle markets where butchers purchase their animals for slaughter at Yola, Mubi and Numan abattoirs.

Adamawa State has a cattle population of over four (4) million (Adamawa, ADP, 2004) and cattle rearing is a major occupation of Adamawa people. Consumption of beef and milk is part of food habit and food preference of the population. Livestock production is one major source of State income. The land mass of each of the 21 Local Government Areas of the State is covered by ‘Fadama’ which predispose cattle to infestation particularly during the dry season.

This research was a descriptive cross-sectional survey that was carried out at Yola, Mubi and Numan abattoirs. These were chosen as sample sites because of efficiency and accuracy of ante mortem and postmortem examination conducted by resident Veterinary officers, volume of slaughter, location, accessibility and proximity as well as proper keeping of records. These slaughter houses make monthly and annual reports to the Adamawa state Ministry of Livestock and Nomadic Resettlement.

**Data collection**

The three abattoirs (Yola, Mubi and Numan) used in this study have an average slaughter of 30, 20 and 10 cattle per day respectively. Two visits per week were made to Yola abattoir and once a week for Mubi and Numan abattoirs. Fifteen (15) animals (not less than 50%) were sampled at Yola abattoir; ten (10) animals (not less than 50%) were examined in Mubi, while all animals slaughtered were examined at Numan abattoir. Weekly visits to abattoirs were made for one calendar year. Thus, a total of 3,000 (60 x 50) slaughtered cattle were examined out of 5,000 estimated total slaughter during the visit days.

Adamawa Gudali, White Fulani, Red Bororo and Sokoto Gudali are the breeds slaughtered at Yola, Mubi and Numan abattoirs.

**Estimation of economic loss**

Appropriate data were collected by using post-mortem examination of the organs infected by Fasciola. An interview was made with retailers of Liver from Yola, Mubi and Numan abattoirs to obtain information on the average price per kilogram of liver in the study area during the study period. The price of liver ranges from N900 – N1000 i.e $5.6 to $6.25 per kilogram (Average $6.25/kg). Abattoir survey was adopted to estimate the economic significance of Fasciolosis on post mortem meat inspection; a method with high accuracy (Thrusfield, 1995). Losses accruing as a result of condemnation of livers due to Fasciolosis were computed with the MS-Excel using the model as adopted by Mungube et al., 2006 as follows:
L = C_F x Liver weight (W_t) x Price/kg of liver; Where,

L = the loss made from condemning a bovine liver or part thereof;

C_F = the number of livers condemned because of Fasciolosis or proportional to the level of infection (up to ⅓, ⅔ or Full).

W_t = the approximate weight of liver in mature individual cattle depending on the breed of cattle, measured with a portable scale.

Price/kg of liver = the average selling price of bovine liver or part thereof.

Based on these calculations, the total cost of liver condemnation per day, per week, per month and per year was determined. A monetary value of up to ⅓, ⅔ and full liver condemnation were placed and calculated for during the study period.

**Results**

Table 1 shows the distribution of infection level in various abattoirs. In Yola abattoir the livers of 173 (52.6%) were ⅓ infected, 109 (33.1%) were ⅔ infected and in 47 (14.3%) whole liver was condemned. In Numan, 47 (44.8%) were ⅓ infected, 35 (33.3%) were ⅔ and in 23 (21.9%) whole liver condemned. Where as in Mubi, 115 (51.6%) were ⅓ infected, 63 (28.3%) were ⅔ infected and in 45 (20.2%) whole liver condemned. Table 2 shows breed distribution of infection load. For Adamawa Gudali 116 (73%) ⅓, 39 (24.5%) were ⅔, and in 4 (2.5%) whole liver condemned. For White Fulani 58 (52%) ⅓, 42 (37.5%) were ⅔, and 12 (10.5%) whole liver condemned. Other breeds were Red Bororo 120 (37%) ⅓, 115 (35.5%) ⅔, and 89 (27.5%) whole liver condemned. For Sokoto Gudali 41 (66%) ⅓, 11 (17.8%) ⅔, and 10 (10.2%) whole liver condemned. Table 3 shows the seasonal distribution of infection load. In dry season 186 (46.6%) cases were ⅓ infected, 124 (48%) ⅔, and 89 (22.3%) whole liver condemned. While in wet season, 149 (57.8%) ⅓ infected, 83 (32.2%) ⅔ and 26 (10%) whole liver condemned. An overall seasonal prevalence of 399 (60.73%) cases were recorded during the dry season while 258 (39.27%) cases during the wet season. From the estimate of infection level, 51% of infected animals annually had ⅓ of their liver affected. Thirty one percent of infected cattle have ⅔ of their liver affected annually. Similarly 17.5% of infected cattle had the whole liver affected annually. The total economic loss encountered due to condemnation of infected liver or proportional to the level of infection for one year data in this study was more than $9121 (₦1.4M) per annum (Table 4).
Table 1: Distribution of infection level (load) in cattle slaughtered at Adamawa state abattoirs

<table>
<thead>
<tr>
<th>Location</th>
<th>Infection levels (proportion of Liver affected)</th>
<th>⅓</th>
<th>⅔</th>
<th>Whole</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yola</td>
<td>173(52.6%)</td>
<td>109(33.1%)</td>
<td>47(14.3%)</td>
<td>329</td>
<td></td>
</tr>
<tr>
<td>Mubi</td>
<td>115(51.6%)</td>
<td>63(28.3%)</td>
<td>45(20.20%)</td>
<td>223</td>
<td></td>
</tr>
<tr>
<td>Numan</td>
<td>47(44.8%)</td>
<td>35(33.3%)</td>
<td>23(21.9%)</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>335(51%)</strong></td>
<td><strong>207(31.5%)</strong></td>
<td><strong>115(17.5%)</strong></td>
<td><strong>657</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Breed prevalence of infection level (load) in cattle slaughtered at Adamawa state abattoirs.

<table>
<thead>
<tr>
<th>Breed</th>
<th>Infection Levels(proportion of Liver affected)</th>
<th>⅓</th>
<th>⅔</th>
<th>Whole</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Bororo</td>
<td>120(37%)</td>
<td>115(35.5%)</td>
<td>89(27.5%)</td>
<td>324</td>
<td></td>
</tr>
<tr>
<td>Adamawa Gudali</td>
<td>116(73%)</td>
<td>39(24.5%)</td>
<td>4(2.5%)</td>
<td>159</td>
<td></td>
</tr>
<tr>
<td>White Fulani</td>
<td>58(52%)</td>
<td>42(37.5%)</td>
<td>12(10.5%)</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>Sokoto Gudali</td>
<td>41(66%)</td>
<td>11(18%)</td>
<td>10(16%)</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>335(51%)</strong></td>
<td><strong>207(31.5%)</strong></td>
<td><strong>115(17.5%)</strong></td>
<td><strong>657</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Seasonal prevalence of infection level (load) in cattle slaughtered at Adamawa state abattoirs.

<table>
<thead>
<tr>
<th>Season</th>
<th>Infection levels (Proportion of Liver affected)</th>
<th>⅓</th>
<th>⅔</th>
<th>Whole</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>186(46.6%)</td>
<td>124(48.3%)</td>
<td>89(22.3%)</td>
<td>399(60.7%)</td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td>149(57.8%)</td>
<td>83(32.2%)</td>
<td>26(10.0%)</td>
<td>258(39.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>335(51%)</strong></td>
<td><strong>207(31.5%)</strong></td>
<td><strong>115(17.5%)</strong></td>
<td><strong>657</strong></td>
<td></td>
</tr>
</tbody>
</table>

χ² = 7.82, p < 0.05

Table 4: Estimation of economic loss due to proportional infection of the livers

<table>
<thead>
<tr>
<th>Proportion</th>
<th>No. infected</th>
<th>weight condemned (kg)</th>
<th>Economic loss ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3</td>
<td>335</td>
<td>446.67</td>
<td>2791.69</td>
</tr>
<tr>
<td>2/3</td>
<td>207</td>
<td>552.00</td>
<td>3454.31</td>
</tr>
<tr>
<td>Whole</td>
<td>115</td>
<td>460.00</td>
<td>2875.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>657</strong></td>
<td><strong>1,458.67</strong></td>
<td><strong>9121.00</strong></td>
</tr>
</tbody>
</table>

Note: 1- Approximate weight of a matured bovine liver is 4kg; 2 – Selling price of liver per kg (average) is $6.25/kg; $1 = N160

Discussion

During the period of the study, an estimated 1,458.67kg of bovine liver was condemned. These constitute significant loss of animal protein for the population. The estimated economic loss due to condemnation of infected liver or proportional to the level of liver infection was more than N1.4 million ($9121) for one year. Umar et al. (2009) estimated a total loss due to Fascioliasis at N5, 433, 400 in Jalingo abattoir
between January 2003 and December 2007. Similar report by Ahmed et al. (1994) estimated a total loss due to Fascioliasis in Maiduguri abattoir at ₦191, 300:00 between January 1982 and December 1987. Ogunrinade and Ogunrinade (1980) in a comprehensive study on bovine Fascioliasis in Nigeria estimated an annual loss of over 5 million naira due to bovine Fascioliasis and interpreted this to represent a loss of 0.50 naira per animal in the national herd. In the same year Fabiyi et al. (1980) found that ₦32,421,200:00 was loss due to liver fluke infections in bovine, ovine and caprine. Fabiyi (1987) also estimated over US$40 million economic loss due to bovine Fascioliasis in Nigeria. Such variations are usually attributed to difference in climatic conditions, methods of animal husbandry and diagnostic methods used in the study. Tadele and Wurku (2007) estimated an economic loss of 54,063.34 Ethiopian birr per annum at Jimma abattoir Ethiopia. Ngategize et al. (1993) also reported a total loss due to ovine Fascioliasis amounted to 48.4 million birr per year in Ethiopian highland sheep. In Kenya Kithuka et al. (2002) reported that the total economic loss incurred by the country between 1990-1999 (10 year period) as a result of infected liver was approximately US$2.6 million and the total annual losses during that period ranged from US$ 0.2-0.3 million. Four years after Mungube et al. (2006) reported a total loss through condemnation of infested livers in slaughtered animals by both F. gigantica and Stilesia hepatica in the semi-arid Kenya between 1989-2004 at US$72,272=00 (4,408,272 Kenyan shilling). In the US Malone et al. (1982) reported an annual direct loss due to liver condemnation at US$7.2 million assuming an average value of US$5 per liver in Golf-coast cattle while In Switzerland economic losses due to bovine Fasciolosis have been estimated at more than €50,000,000 per year (Schweitzer et al., 2005).

The paucity of abattoir and extensive (range) husbandry system of livestock management practiced in Nigeria general hindered adequate assessment of the economic losses associated with bovine Fasciolosis. However, the most obvious economic lost associated with bovine Fasciolosis is the liver condemnation at abattoirs during meat inspection. Therefore the present loss of about 1.5 million naira for some selected abattoirs appears relatively high. The figures presented in this study may present an under estimation of the actual financial losses associated with the disease in the area when the cost of morbidity, mortality, feed conversion rate, treatment and other control measures are included.

Conclusion

The findings in this study confirm that bovine Fasciolosis is an endemic disease in the study area and is an indication of the existence of favourable bionomics and ecological conditions for the survival, multiplication and spread of intermediate snail host and the parasite in that environment. There is a need not only to intensify and improve the control methods of Fasciolosis in livestock in Adamawa in order to minimize the economic losses but also educate the public so that they are aware of its importance.
Reference

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