

Original Article

Economic loss from liver condemnation due to Fasciolosis in slaughtered ruminants in Maiduguri abattoir, Borno State, Nigeria

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ABSTRACT

Objective: The study was conducted to evaluate economic loss from liver condemnation due to Fasciolosis in slaughtered ruminants in Maiduguri abattoir, Borno State, Nigeria.

Materials and methods: Three hundred (300) livers each of cattle, sheep and goats slaughtered were randomly selected and examined for the presence of *Fasciola* flukes. The infected livers were weighed and economic value in Nigerian Naira (₦) and US Dollar (US\$) were assessed.

Results: An overall economic loss of ₦602,400.00 (1,882.50 US\$) per annum was incurred during the period under study from a total of 753 kg of liver condemned. Total of 428 kg and 325 kg of liver were condemned during dry and rainy seasons respectively, resulting in higher economic loss of (₦342,400.00; 1,070 US\$) in dry season and (₦260,000.00; 812.50 US\$) during rainy season. More liver were condemned in the adult cattle (372 kg) than in adult sheep (117 kg) and goats (108 kg) during the period of this study.

Conclusion: Ruminant fasciolosis is endemic in Maiduguri, and high economic loss for the farmers and butchers are reported in this study. Strengthening and developing better control methods of fasciolosis in ruminants in Borno State is suggested.

KEYWORDS

Abattoir, Economic loss, Fasciolosis, Maiduguri, Ruminants

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INTRODUCTION

Fasciolosis is an important helminthic infection of ruminants recognised worldwide caused by liver fluke species of the genus *Fasciola* and is among the most ignored zoonotic disease ([Khoramian et al., 2014](#)). *F. gigantica* and *F. hepatica* are the most important liver fluke in the tropics and temperate regions most frequently reported to causing ruminants fasciolosis ([Maje et al., 2015](#)). Fasciolosis is prevalent in Nigeria and is of high economic significance especially in northern Nigeria where stagnant water, lakes, dams and ponds are used as watering and grazing areas more especially during dry season ([Magaji et al., 2014](#)).

The parasite can be transmitted from animal to human by human consumption of infected improperly cooked liver and from human to human through ingestion of contaminated faeces. Animals become infected through consumption of infected or contaminated feed, water and pasture ([Magaji et al., 2014](#); [Ejeh et al., 2015](#)). Adult fasciola flukes living in the bile duct release eggs into the intestine, which are then passed through the host's stool during defaecation into still water. These eggs hatch in the water and develop through three larval stages namely; miracidia, cercariae and metacercariae. First stage, free swimming miracidia which infect snails and they develop into cercariae. The second, also free-swimming, cercariae stage of the parasite are released from the snail and get attached to fresh water plants as third stage resting encysted metacercariae. Humans or animals that eat or ingest such plants with encysted metacercariae, or drink water that is contaminated with these cysts, can become infected with the parasite ([Ejeh et al., 2015](#)).

Fasciolosis due to *F. gigantica* is accountable for major economic losses to farmers as a result of poor weight gain, carcass quality, reduced milk output, cost of therapy and mortality as well as condemnation of diseased livers in most abattoirs in Nigeria ([Mbaya et al., 2010](#); [Ardo et al., 2013](#); [Yahaya and Tyav, 2014](#); [Usip et al., 2014](#); [Ejeh et al., 2015](#)). Losses associated with fasciolosis include whole and/or partial condemnation of diseased liver as a result of trimming of the affected parts of the liver, which reduces the quantity of the liver sold. These losses are thought to be considerable, although may differ from one part of the country to another depending on fasciolosis pressure, which is dependent on prevailing climatic conditions. These two fasciolids species causes major economic loss, approximate to be more than \$200 per annum to agriculture worldwide ([Elmonir et al., 2015](#); [Maje et al., 2015](#)). Some studies in Nigeria have attempted to assess the annual losses through liver condemnation as a result of fasciolosis. Although there are other indirect

economic losses such as poor weight gain, feed utilization and quality of meat and milk processes, which are difficult to quantify ([Ardo et al., 2013](#); [Uduak, 2014](#); [Oladele-Bukola and Odetokun, 2014](#)).

Studies so far conducted on fasciolosis in Nigeria were mostly based on cross-sectional study, coprological examinations and abattoir surveys ([Oladele-Bukola and Odetokun, 2014](#); [Magaji et al., 2014](#); [Uduak, 2014](#); [Usip et al., 2014](#); [Ejeh et al., 2015](#)). Information is scarce on recent economic assessment of fasciolosis in ruminants in the Sahel savannah region, north eastern Nigeria, an area known to produce over 40% of the cattle population in the country ([Umar et al., 2009](#)). The existing studies on the economic losses of fasciolosis in cattle, sheep and goats in the north eastern Nigeria are reported by the following authors ([Umar et al., 2009](#); [Obadijah, 2010](#); [Mbaya et al., 2010](#); [Ardo et al., 2013](#)) whose studies were conducted in Maiduguri, Borno State, Jalingo, Taraba State, and some selected cities in Adamawa State, Nigeria. Recently, there is as such dearth of information on economic losses from condemnation of livers as a result of *Fasciolosis* in slaughtered ruminants in Maiduguri abattoir. The present investigation was conducted to determine the economic loss associated with fasciolosis in slaughtered ruminants in Maiduguri abattoir, Borno State, Nigeria.

MATERIALS AND METHODS

Ethical statement: Ethical approval was not applicable in this study because the liver samples were collected from slaughtered ruminants in the abattoir. However, consent from the abattoir authorities was taken prior collection of sample.

Study area: This study was carried out in Maiduguri abattoir, Borno State. The state is situated within the semi-arid zone of West Africa. It is located on latitude 11°05'N and longitude 13°05'E and at an elevation of 354m above sea level. It has total area of 72,609square kilometre. Borno State share borders with Adamawa State to the South, Gombe State to the West, Yobe State to the North-west, Republic of Cameroon to the East, Republic of Niger to the North and Chad Republic to the North-east. Borno State falls within the Sahel region of West Africa an area noted for great climatic and seasonal variations. The rainy season is characterized by a very short period which lasts for 3-4 months (June–September) and is preceded by a cool dry period (harmattan) (October–March) and a dry period (April–June). The livestock population within the state are: cattle (4,800,000), sheep (9,900,000) and goats

(15,720,000). The types of animals slaughtered in the abattoir daily and their approximate number are: cattle (85-100), sheep (80-100) and goats (90-110).

Data collection: The 900 livers of ruminants namely cattle (n=300), sheep (n=300) and goats (n=300) slaughtered at Maiduguri abattoir were selected randomly and examined grossly by palpation and dissection at the biliary tract for the presence of *Fasciola* flukes. The infected livers were weighed (in kilogram), using the Florham Park, NJ 07932 OHAUS USA scale and economic value in Nigerian Naira (₦) and US Dollar (US\$) were given.

Estimation of economic loss: The approximate cost of a liver per kilogram was determined through interviews with the butchers, meat traders and retailers at the abattoirs and meat shops. Total numbers of whole and/or parts of livers that were condemned as unfit for human consumption during meat inspection were recorded for each animal slaughtered and inspected in Maiduguri abattoirs in the course of this study.

Financial losses in Nigerian Naira (₦) and United States Dollar (US\$) as a result of liver condemnation from fasciolosis were calculated using the model as adopted by [Mungube et al. \(2006\)](#) as follows:

$L = C_f \times (W) \times P/\text{kg}$; Where,

L = loss from whole and/or partial liver condemnation;

C_f = number of livers condemned because of fasciolosis.

W = approximate weight of liver in mature individual cattle, sheep and goat depending measured with a portable scale.

P/kg = approximate selling price of a normal liver per kilogram.

Cost of each infested liver with *Fasciola* fluke was estimated per kilogram to be (₦800=2.5US\$) of an uncondemned liver). To obtained US Dollar (US\$) equivalence of Nigerian Naira (₦); we used Central Bank of Nigeria's exchange rate which at the time of this study stood at ₦320=1US\$ as at 30th June 2016 ([CBN, 2016](#)).

RESULTS AND DISCUSSION

Table 1 showed the seasonal financial assessment of liver condemnation due to fasciolosis in slaughtered ruminants in Maiduguri abattoir. An overall economic loss of ₦602,400.00 (1,882.5 US\$) per annum was incurred during the period in this study from totality of 753 kg of liver condemned. Total of 428 kg and 325 kg of liver were condemned during dry and rainy seasons respectively, resulting in higher economic loss (₦342,400.00; 1,070 US\$) in dry season as compared to rainy season (₦260,000.00; 812.5 US\$). More liver were condemned in the adult cattle (372 kg), than in adult

sheep (117 kg) and goats (108 kg) during the period of this study.

Fasciolosis is parasitic disease caused by trematode species *Fasciola hepatica* or *F. gigantica*. It was usually considered as an important veterinary disease because of the extensive production and economic loss due to this disease in livestock industry, more especially cattle, sheep and goats. Liver condemnations in abattoirs in most parts of the world including Maiduguri happens as a result of pathological conditions resulting from fasciolosis. The total number of liver condemned from June to October, 2015 marking as the rainy season and November to May, 2016 marking as the dry season were 753 kg.

The estimated economic losses from liver condemnations as a result of fasciolosis was due to detection of pathological lesions from cattle, sheep and goats were six hundred and two thousand, four hundred naira (₦602,400.00; 1,882.5 US\$). This amount may not be the true representation of the actual losses, since it does not include other indirect losses such as lungs, intestines and hide and skin condemnations but is considerably high. The economic loss from liver condemnation due to liver fluke infestation of ₦451,720.50 was reported in Maiduguri ([Biu et al., 2006](#)) even though lower than the present findings, it indicates that the economic loss of ruminant fasciolosis in the study area is in a rising stage. In Makurdi, [Ejeh et al. \(2015\)](#) reported 12,660 kg of condemned liver valued at ₦12,660,000.00 (79,251.60 US\$) in a 5-year prevalence study. The economic losses reported in this study were somewhat higher than those reported previously by ([Biu et al., 2006](#)) in Maiduguri. This could be due to the seasonal comparison conducted in the current study. A higher economic loss of ₦1.4 million was earlier reported in Adamawa State ([Ardo et al., 2013](#)). This higher economic losses compared to the results of the present study could be due to the variation in the number of seasons in the studies. Lower economic loss of ₦269,295.00 was reported in Port-Harcourt by ([Akpabio, 2014](#)).

The author attributed this lower prevalence and losses to the fact that most ruminants slaughtered in the southern part of Nigeria were purchased from the north and are mostly in good body condition. The rates of fasciolosis is higher in the northern part of Nigeria was due to extensive system of farming practiced by cattle rearers with little or no veterinary services rendered, there is poor control of diseases due to high cost of fasciolosis drugs, failure of farmers to strategically deworm their animals at the right period, and development of resistance to most commonly used anthelmintic drugs among other factors

Table 1. Seasonal Financial Assessment of Liver Condemned due to fasciolosis in Slaughtered Ruminants in Maiduguri Abattoir

Species	Rainy Season, 2015					Dry Season, 2016			
	Number Examined	Number Positive	Condemnable Liver (Kg)	Value in Naira(₦)	Value in Dollar (US\$)	Number Positive	Condemnable Liver (Kg)	Value in Naira (₦)	Value in Dollar (US\$)
Cattle									
Young	104	11	44	35200	110	9	36	28800	90
Adult	196	25	150	120000	375	37	222	177600	555
Sheep									
Young	210	9	18	14400	45	10	20	16000	50
Adult	90	18	54	43200	135	21	63	50400	157.5
Goats									
Young	114	7	14	11200	35	12	24	19200	60
Adult	186	15	45	36000	112.5	21	63	50400	157.5
Total	900	85	325	₦260000	812.5	110	428	₦342400	1070

There were significant differences in the financial assessment of condemned liver due to fasciolosis in Slaughtered Cattle, Sheep and Goats in Maiduguri Abattoir at P<0.05

also resulted in the high cases of fasciolosis in the liver of most ruminants that are slaughtered.

Similar economic losses resulting from fasciolosis have been documented in some other parts of the world; for example, an economic loss of 18000 US\$ per annum in Tanzania was reported by [Mwabonimana et al. \(2009\)](#) and 4000 US\$ per annum in Southern Ethiopia by [Abunna et al. \(2010\)](#). In Switzerland, about \$42.8 million losses was reported ([Schweitzer et al., 2005](#)); \$13,364.72 loss was reported by [Regassa et al. \(2012\)](#) in Central Ethiopia; \$16,800 was reported in Egypt ([Elmonir et al., 2015](#)) and \$41,784 was reported in Iran ([Khoramian et al., 2014](#)). In Turkey, [Sariozkan and Yalcin \(2011\)](#) reported an estimated loss caused by fasciolosis in beef and dairy industries between \$6.1-\$8.8 and \$28.9-\$42.6 million, respectively. The variations obtained could be due to the differences in geographical location, duration of study and number of animals sampled.

Fasciolosis posed a serious economic impact to farmers, butchers and the nation at large. Farmers and butchers are the ones at the receiving end and bear the burden of the economic losses directly because no means of compensation was in place for condemned edible organs or carcasses in Nigeria ([Ibironke and Fasina, 2010](#); [Ejeh et al., 2014](#); [Usip et al., 2014](#)).

It is worth to note that true sensible economic loss evaluation as a result of Fasciola infection is easier said than done and involve essential parameters such as mortality rates, chronic ailing effects and anthelmintic treatment costs due to disease; these parameters were not employed in this study. Therefore, the estimated economic loss recorded in this study are likely to be at variance with the true loss and should be carefully interpreted with caution.

CONCLUSION

Ruminant fasciolosis is endemic in Maiduguri and is the most important cause of liver condemnation in major abattoirs in Nigeria. High economic loss to farmers and the country are reported in this study. The need to strengthen and develop a better control method of fasciolosis in ruminants in Borno State is suggested.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHORS' CONTRIBUTION

JWL and NNA designed, planned and coordinated the study. JWL performed the abattoir sampling. Francis, MIF was actively involved in data analysis and manuscript write up. The authors read and agreed with the final version of the manuscript.

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