Trop. Anim. Hlth Prod. (1980) 12, 155–160

ECONOMIC IMPORTANCE OF BOVINE FASCIOLIASIS IN NIGERIA

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SUMMARY

An attempt was made to determine the annual economic losses due to bovine fascioliasis in Nigeria. The estimates were based on an average annual disease incidence of 2·5%, an assumed mortality rate of 1%, a total liver condemnation rate of 7%, a cattle population of 10 million and an annual slaughter rate of 10%.

When the annual cost of treating and controlling fascioliasis amounting to ₦30,000 was added to other costs, total annual loss due to fascioliasis was estimated at some ₦5 million.[3] The importance of fascioliasis as a major source of production loss in the animal industry in Nigeria is discussed.

INTRODUCTION

It is increasingly evident that parasitism represents a major drawback to development in the tropics. However, a proper evaluation of economic losses due to various individual parasitic diseases is lacking. The assessment of losses due to parasitic disease is of great relevance to many tropical countries where economic realities often determine the type and scope of control measures envisaged.

Attempts have been made to assess the economic importance of bovine fascioliasis (Ross, 1970; Antonenkov, 1974; Bitakaramire and Okao, 1975). For instance, in the United Kingdom, it is estimated that fascioliasis accounts for an annual loss of about £50 million in milk and meat production (ICI,1975). Although the importance of fascioliasis due to *Fasciola gigantica* on livestock production in Nigeria has been highlighted (Sewell, 1966; Dipeolu, 1975), proper economic evaluation of the disease has not been done. The difficulty of assessing economic losses due to chronic diseases is recognised. Hence the financial loss due to liver condemnation alone is often used in assessing losses due to fascioliasis (Hammond and Sewell, 1974). We have attempted to build a model for assessing economic losses due to bovine fascioliasis using other parameters which are often ignored. This simple model is based on available data and projected estimates.

METHOD OF ASSESSMENT

The economic losses due to bovine fascioliasis were assessed using a modification of the method of Antonenkov (1974) based on this formula:[4]

$$E_L = N_D(P_A.B_W) + N_s(C_L) + N_c(D_W.P_A) + (C_s + C_T) + M_c$$

where

E_L = Estimated annual economic loss due to fascioliasis in cattle.
B_W = Average body weight of Nigerian cattle in kg.

[3] ₦1 = £0·85.
[4] If data were available, the formula could also be used in deriving annual economic loss due to fascioliasis in other domestic animals and total economic loss (E_T) could then be estimated.

P_A = Average market price of 1 kg beef
N_D = Number of animals that die of fascioliasis
N_c = Total number of animals chronically affected by the disease
N_s = Total number of animals slaughtered annually and positive for hepatic fascioliasis.
D_w = Difference in weight between healthy and diseased cattle
C_L = Mean cost of liver condemned at slaughter
$C_T + C_s$ = Cost of treating and controlling fascioliasis
M_c = Miscellaneous costs

This formula is based on the established findings that fascioliasis leads to:

(i) Mortality in cattle directly in heavy infections or indirectly through predisposition to other diseases.
(ii) Chronic effects and, consequently, poor production performance.
(iii) Liver condemnation at slaughter.
(iv) Other effects (e.g. decrease in milk yield, decreased fertility, etc).

A. Mortality estimates

Fascioliasis occurs commonly as a chronic disease in cattle and the severity of the disease sometimes depends on the nutritional status of the host (Graber, 1971). However, acute losses have been recorded in cattle in East Africa (Coyle, 1958) and a herd mortality of between 25 and 30% was recorded in Northern Nigeria in heavy *F. gigantica* infections (Bogatko, 1975). Fascioliasis also predisposes to other infections, principally *Clostridium*, *Salmonella* and possibly blood parasites (reviewed by Ogunrinade, 1978). These indirect effects may additionally produce mortality. In the absence of mortality figures, we have assumed a low mortality rate of 1% of infected animals as a result of the direct and indirect effects of the disease. Total losses due to mortality ($N_D(P_A.B_w)$) then depend on the average carcass weight of Nigerian cattle estimated as 180 kg (FAO, 1966), the average market price of such cattle (₦350 or ₦1·94/kg[5]) and the mortality rate as assessed above.

B. Annual disease incidence and cattle population estimates

Varying reports on the local incidence of fascioliasis in Nigeria appear in the literature (Ogunrinade, 1978). For instance, Babalola and Schillhorn van Veen (1976) reported a mean of 31·7% in Bauchi, Northern Nigeria, while 68% was reported in Savannah and Sahel zones (National Veterinary Research Institute, Annual Report, 1978). One of us (A.O., unpublished) has done a 5 year analysis of recorded cases of fascioliasis in 12 major abattoirs spanning all the climatic zones of Nigeria and recorded a mean annual prevalence of 2·5%. We have based our estimates on this latter figure.

Estimates of cattle population in Nigeria vary from 9·6 million (National Livestock Development Committee, 1971) to 11·6 million produced by the FAO (Olubajo, 1976). However, the figure of 10 million appears acceptable for most estimates. In using the latter figure, we have assumed a stable cattle population whose slaughter or death is replaced by natural birth and the cattle trade with neighbouring countries.

C. Annual cattle slaughter rate and cost of liver condemnation

Data on annual cattle slaughter rates are not available but it is assumed that about 10% of the total cattle population are slaughtered annually (Olubajo, 1976).

[5] This price varies in different localities and according to market conditions.

Babalola and Schillhorn van Veen (1976) put the annual loss due to liver condemnation at Bauchi abattoir at ₦19,375 based on a liver weight of 4 kg, a market price of ₦1·07/kg. and the number of bovine livers condemned. However, our personal observations at the slaughter houses indicate that partial condemnation was usually the practice of meat inspectors when the liver was not severely affected. The rate of total liver condemnation has been assessed at 7% (National Veterinary Research Institute, Annual Report, 1978). Assuming that only 7% of the affected livers were totally condemned and that the rest were partially condemned at the rate of 1 kg per affected liver, total losses due to liver condemnation can be assessed using the formula[6]

$$N_s.C_L = 0{\cdot}07N_s(4.P_L) + 0{\cdot}93N_s(1.P_L)$$

where P_L is the average price of 1 kg liver (₦1.07)

D. Costs due to chronic disease

Experimental evidence on the effects of fascioliasis on weight gain in infected cattle is inconclusive as the effect probably depends on parasite load and stage of infection (Cawdery and Conway, 1971). Although it was reported that lightly or moderately affected cattle may show no obvious clinical effects (Hammond, 1965), food conversion efficiency is adversely affected (Duwell, 1955; Cawdery and Conway, 1971). Anthelmintic treatment of chronically infected cattle also resulted in improvement in weight gains and body conditions (Okao, 1973). Although naturally infected cattle may appear emaciated (Haroun and Hussein, 1975), other conditions (for instance malnutrition and intercurrent disease) are likely to make assessment of body weight losses due to specific diseases difficult. However, Ross (1970) estimated a loss of 1·6 lb body weight in infected and untreated cattle over a 3 week period. Cawdery and Conway (1971) also estimate a loss of between 8 and 28% in body weight in groups of animals exposed to light and heavy *Fasciola* worm burdens in a 6 month period. Sewell (1966) estimated that about 7 oz (0·198 kg) of body weight per fluke is lost annually as a result of *F. gigantica* infections in cattle with an average helminthic burden of 30 flukes per animal. In an abattoir study of 38 naturally infected cattle, the average helminthic burden was 42 with a range of 5 to 166 (Ogunrinade, unpublished). Based on the latter figures, total loss due to chronic fascioliasis can then be estimated using the formula

$$N_c(D_w.P_A) = N_c(0{\cdot}198 \times 42 \times ₦1{\cdot}94)$$

E. Annual cost of treating diseased animals and controlling disease

Questionnaires were sent to the Chief Veterinary Officers of all the 19 states of Nigeria to obtain data on the annual cost of treatment and control of fascioliasis.

F. Miscellaneous costs

Fascioliasis has been associated with a decrease in milk yield (Ross, 1970), decreased fertility (Cawdery, 1976) and poor carcass conformation (Needham, 1977). About 20% of total annual losses due to fascioliasis in Britain, amounting to £13 million are attributable to decreased milk yield (ICI, 1975). In Nigeria the dairy industry is relatively undeveloped and the role of helminthiasis on milk yield is un-

[6] Only some proportion of the affected animals will have livers condemned as a result of fascioliasis, since early infection or even mildly affected livers may be passed. However, the latter limitation does not apply to our estimates since our disease prevalence figures are based on liver condemnation rates.

known. However, these miscellaneous costs can be assessed at 5% of the total morbidity cost (D).

RESULTS

Total annual economic loss due to bovine fascioliasis as stated above is the sum of:

(i) Mortality cost $N_D(P_A \times B_W) = ₦2,500\ (350)$
$= ₦875,000$

(ii) Cost of liver condemnation $N_S.C_L = ₦1,750\ (4{\cdot}28) + ₦23,250\ (107) = ₦32,368$

(iii) Loss due to chronic effects $N_c(D_W \cdot P_A) = ₦250,000\ (8{\cdot}3556 \times 1{\cdot}94)$
$= ₦4,052,466$

(iv) Annual cost of controlling and treating disease $= ₦30,000$

(v) Miscellaneous cost (5% of (iii)) $= ₦202,623$

$E_L = (i) + (ii) + (iii) + (iv) + (v) = ₦5,192,457$

DISCUSSION

Although the difficulty of estimating actual economic losses due to individual parasitic disease is realised, this should not militate against an attempt to analyse the costs of these diseases. In fascioliasis the difficulty of assessment is enhanced by poly-parasitism which occurs in natural cases. Consequently the effects due to fascioliasis alone are difficult to assess and reliance on data from experimental models appears inevitable.

Economic losses due to mortality and chronic ill-effects are probably the most difficult to assess. Mortality estimates due to fascioliasis are not available. However, acute fascioliasis has been reported in goats and cattle in Nigeria (Henderson, 1937; Babalola and Schillhorn van Veen, 1976). A heavy parasite load is apparently capable of causing mortality as demonstrated in experimental infection of calves (Hammond and Sewell, 1974), in natural outbreaks of the disease (Bogatko, 1975) and following drought conditions (Babalola and Schillhorn van Veen, 1976). However, probably only a small percentage of diseased animals harbour such heavy parasite burdens. Individual variations also occur in the response of cattle to fascioliasis as indicated by weight gains (Hammond and Sewell, 1974).

Additionally, differences in weight gain may sometimes go unnoticed between infected and uninfected cattle because of individual differences in food intake. However since food conversion efficiency is decreased in the infected animals (Duwell, 1975) the relative increase in weight as a result of food intake is probably minimal. The extent of the decrease in weight probably also depends on parasite burden and duration of infection.

Liver condemnation is a well-known source of economic loss in fascioliasis. For instance up to 50% of livers were condemned due to chronic fascioliasis in some abattoirs in Tanzania (Hammond, 1965). Fascioliasis accounts for 94% of ljvers condemned in 10 abattoirs in Northern Nigeria leading to a loss of about ₦67,000 over a 2 year period (Alonge and Fasanmi, 1979). The practice of partial condemnation when livers are not severely affected limits the economic losses due to the disease.

Other production losses due to fascioliasis may be due to decreased milk yield, poor reproduction performance and poor carcass conformation. Specific chemotherapy often leads to better reproductive performance (Cawdery, 1976). The milk yield of indigenous cattle is low amounting to an average of 93 gallons per annum (FAO, 1966) and helminthiasis no doubt plays a role in reducing milk yield.

The annual output of the livestock industry in Nigeria is estimated at between ₦150 and ₦250 million. Therefore the current estimated annual loss of about ₦5 million represents a substantial loss in animal production in a country where only 7 g (or 13·2%) protein per caput daily is derived from animal sources (FAO, 1966). The estimated loss also represents about ₦0·50 per animal in the national herd.

Our estimates probably represent an underestimation of actual losses encountered as a result of fascioliasis even in the cattle industry. However, they give an indication of the annual losses due to bovine fascioliasis and emphasise the need for adequate control measures.

ACKNOWLEDGEMENT

We wish to express our appreciation to all the State Chief Veterinary Officers in Nigeria for answering the questionnaires sent. We also wish to thank Dr S. Oni of the Department of Agricultural Economics, University of Ibadan for his useful criticisms.

Accepted for publication August 1979

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IMPORTANCE ECONOMIQUE DE LA FASCIOLOSE BOVINE AU NIGERIA

Résumé—Un essai a été fait pour situer les pertes économiques dues à la fasciolose bovine au Nigeria. L'estimation a été basée sur une incidence moyenne annuelle de la maladie de 2,5 p. 100 avec une mortalité de 1 p. 100 et un taux de saisies de foies entiers de 7 p. 100 pour une population bovine de 10 millions de têtes dont 10 p. 100 d'abattues par an pour la consommation.

Lorsque le coût annuel du traitement et du contrôle de la maladie s'élevant à 30 000 ₦, est ajouté aux autres dépenses, le coût total des pertes dues à la fasciolose est estimé à 5 millions ₦.[1] L'importance de la fasciolose comme cause de pertes dans la production animale, en Nigeria, est discutée.

[1] ₦1 = £0·85.

IMPORTANCIA ECONOMICA DE LA FASCIOLASIS BOVINA EN NIGERIA

Resumen—Se hizo un ensayo para determinar las pérdidas económicas debidas a la fasciolasis bovina. Los estimativos se basaron en un promedio anual de la incidencia de la enfermedad del 2.5%, una tasa de mortalidad del 1%, una tasa de decomíso del 7%, una población bovina de 10.000 cabezas y una tasa de sacrificio del 10%.

Cuando el costo de tratamiento y control de fasciolasis (₦ 30.000) se sumó a otros costos, la pérdida global debida a fasciolasis se estimó en ₦ 5 millones.[1] Se comenta la importancia de la fasciolasis como una de las mayores fuentes de pérdidas en producción en la industria animal en Nigeria.

[1] ₦1 = £0.85.

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