Parasite Epidemiology and Control 2 (2017) 27–34

Contents lists available at ScienceDirect

Parasite Epidemiology and Control

journal homepage: www.elsevier.com/locate/parepi

Financial loss estimation of bovine fasciolosis in slaughtered cattle in South Africa

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ARTICLE INFO

Keywords:
Abattoir
Cattle
Economic loss
Food safety
Fasciola
Liver condemnation
South Africa

ABSTRACT

South Africa's livestock population is rapidly evolving and consequently will require sustained epidemiological surveillance to detect and prevent diseases which contribute to a decrease in livestock productivity, public health risk and food wastage. *Fasciola* infection is one of the commonest diseases affecting livestock health and a significant portion of meat and offal's are declared unfit for human consumption. This study assessed the prevalence and monetary losses associated with *Fasciola* infection at three abattoirs in Eastern Cape Province. A retrospective data of all slaughtered cattle were obtained from Department of Rural Development and Agrarian Reform (DRDAR) from 2010–2012. A prospective abattoir survey was conducted between July 2013 and June 2014 to determine the prevalence and financial loss due to fasciolosis.

The highest prevalence was in December and January (23%) while the lowest prevalence was recorded in May and June (5%). Annual prevalence of *Fasciola* at abattoirs AB1, were (3.2%, 2.2% and 2.0%), AB2 (6.4%, 4.6% and 3.5%), AB3 (14.4%, 6.9% and 9.5%) for year 2010, 2011 and 2012 respectively. The total financial loss due to *Fasciola* infection during the active survey of the three abattoirs was ZAR 44, 930 (3456.2 USD). A breakdown of this figure shows that whole liver condemnation was ZAR 25, 230 (2, 357 USD), and partial liver condemnation was ZAR 19, 700 (1515.4 USD).

The present study reveals the economic loss due to liver condemnation from *Fasciola* infection and provides regional baseline information regarding the prevalence of *Fasciola* in cattle at three abattoirs.

1. Introduction

Fasciola is a trematode predominantly found in ruminants (cattle, buffalo, sheep, and goats), but can also infect humans (Ashrafi and Mas-Coma, 2014). The infection is cosmopolitan with *Fasciola hepatica* and *Fasciola gigantica* being the most prominent cause of fasciolosis. Despite evidence of lack of proper documentation of disease burden in livestock, in the tropics, *Fasciola* infection is regarded as the most important parasitic disease in ruminant with prevalence ranging from 25 to 100% (Toet et al., 2014; Torgerson and Macpherson, 2011; Tsegaye et al., 2011). Infection in livestock usually leads to reduced growth, poor production of meat and milk. Other complications of *Fasciola* infection are reduced fertility, abortion in late stages of pregnancy, anemia and mortality. In dairy cattle, reduction in milk yield, due to infection with Fasciola Spp. is between 3.8% to 15.2% while global production losses exceed US$3 billion/year (Bekele et al., 2010; Elliott et al., 2015; Jean-Richard et al., 2014; Martínez-Pérez et al., 2012; Terefe et al.,

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http://dx.doi.org/10.1016/j.parepi.2017.10.001
Received 31 July 2017; Received in revised form 4 October 2017; Accepted 11 October 2017
Available online 12 October 2017

2012; Toet et al., 2014). The parasite activity damages the liver and leads it condemnation. When the trematode reaches the bile ducts and attains sexual maturity, some parasite eggs migrate to liver parenchyma causing severe eosinophilic and granulomatous inflammatory responses (Buffoni et al., 2010; Martínez-Pérez et al., 2012; Molina-Hernández et al., 2015; Zafra et al., 2010). Several studies have shown that it is at this stage that most pathological damage starts to occur. (Keyyu et al., 2006; Khan et al., 2010; Sánchez-Andrade et al., 2002; Tsotetsi and Mbati, 2003).

This infection is a major veterinary disease and has recently been shown as a significant public health problem (Ashrafi and Mas-Coma, 2014; Mas-Coma et al., 2005). Human disease has been reported in five continents and about 2.4 million person are infected in 61 countries and much more are at risk of the infection (Molina-Hernández et al., 2015; Torgerson and Macpherson, 2011). In South Africa, three cases had previously been in 1964, and two new cases recently reported in the Western Cape Province (Black et al., 2013).

There are other challenges to *Fasciola* infection including the costs of treatment in high prevalence and endemic areas, and the risk of drug residues in food animal, parasites resistant to the frontline drug (triclabendazole). In South Africa, the average cost of treatment of fasciolosis per animal per is ZAR 15–20. The burden of the disease and cost treatment harms sustainable livestock production (Quayle et al., 2010). Global warming also significantly favour the replication of *Galba truncatula* (intermediate host) (Buffoni et al., 2010; Molina-Hernández et al., 2015). *Galba truncatula* and *Radix natalensis* have been reported in South Africa, and *R. natalensis* is regarded as the most common intermediate host of *F. gigantica* in the country. *Galba truncatula,* is also a good aestivator contributing to its geographical spread even in unfavorable clime (De Kock and Wolmarans, 2011; Kock et al., 2003).

Food safety concerns are compelling reasons for meat inspection and condemnation of infected liver. In this regard, the abattoir play a crucial role not only in the detection and elimination of unhealthy meat from the food chain, but also a source of useful epidemiological data (Alton et al., 2012; Blagojevic and Antic, 2014; Phiri, 2006; Soji et al., 2015; Thomas-Bachli et al., 2012). Reports on economic losses due to condemnation of *Fasciola* infected liver in South Africa are scanty. Nonetheless, elsewhere in Africa, studies have shown condemnation rates of 8–57% (Alawa et al., 2011; Fekadu et al., 2012; Mellau et al., 2011, 2010; Pfukenyi and Mukaratirwa, 2004; Phiri, 2006).

Therefore, this study aims to determine the prevalence of *Fasciola* and estimate financial loss associated with fasciolosis in slaughtered cattle in selected abattoirs in the Eastern Cape Province, South Africa.

2. Materials and methods

2.1. Ethical consideration

Ethical clearance number MUS071SJAJ01 was obtained from the University of Fort Hare research ethics committee before the commencement of field data collection. Official permission was obtained from the Department of Rural Development and Agrarian Reform (DRDAR) and participating abattoirs.

2.2. Description of study area, animal husbandry and selected abattoirs

Eastern Cape Province (ECP) is located at latitude 32° S and longitude 26° E in southeastern South Africa. It is the third most populated and rural Province with 63.4% of the population living in rural areas (Carabin et al., 2006). Cattle ownership and rearing are popular in the Province. Cattle population in South Africa is estimated to be above 14.1 million; about 3.2 million is in reared in the Eastern Cape representing about 22.6%. Semi-intensive breeding is widely applied by commercial farms whereas extensive management system is common among rural and smallholder farms. Three abattoirs (AB1, AB2, and AB3) were selected for this study (Fig. 1). AB1 and AB2 were high throughput abattoir located in East London and Queenstown respectively, while AB3 was a low throughput abattoir is located in Adelaide (Jaja et al., 2016). A low throughput abattoir slaughters between 3 and 21 animals per day while high throughput abattoir slaughters above 21 animals per day (MSA, 2000).

2.3. Study animals and design

The retrospective study of 78,728 cattle (AB1 = 62, 420, AB2 = 14, 719, AB3 = 1, 589) was extracted from abattoir records of 2010–2012 archived in the Department of Rural Development and Agrarian Reform (DRDAR). From these records, the number of liver condemned due to of *Fasciola* infection and the monetary loss was estimated. From same data, the annual and monthly prevalence of *Fasciola* was obtained for each abattoir (see Fig. 2).

The prospective study involving post-mortem meat inspection (PMMI) was carried out by International Meat Quality Assurance Service (IMQAS), qualified meat inspectors, who had undergone specialised training in meat inspection, processing, disease identification and pathology of farm animals. All animals included in this study were brought to the abattoir from nearby municipalities and districts. The inspectors carried out their work under occasional supervision by state veterinarians and officials of the Directorate of Veterinary public health. The meat inspectors routinely incise and visually inspect organs from slaughtered cattle for gross pathology. Infected livers were declared unfit for human consumption, hence are condemned. All rejected organs were recorded in standard data sheet approved by the Veterinary Public Health Department. Condemned livers were counted and weighed before disposal. A typical case sampling technique was adopted for the survey, this sampling method allows for the convenient examination of all liver and the purposeful selection of all livers grossly infected with *Fasciola*. The post-mortem meat inspection (PMMI) was carried out by the procedures outlined by the meat safety act of 2000 (MSA, 2000).