SLAUGHTER HOUSE BASED EPIDEMIOLOGY AND ESTIMATION OF ECONOMIC LOSSES OF BOVINE FASCIOLIASIS IN TEHSIL SARGODHA

T. U. Rehman, M. N. Khan, M. S. Sajid and M. T. Javed*

Department of Parasitology, *Department of Pathology, University of Agriculture, Faisalabad, Pakistan

ABSTRACT: Present study was carried out to determine epidemiology of bovine fascioliasis and estimation of economic losses inferred by bovine fascioliasis in slaughter houses of tehsil Sargodha. Liver and fecal samples were collected from 146 cattle and 184 buffaloes. Livers were examined for the presence of any fluke while egg identification was done in fecal samples. Prevalence of *Fasciola* was found to be 25.75% in coprological examination while adult flukes were found in 43.63% livers. Significantly higher prevalence of fascioliasis was found in buffaloes as compared to cattle. Sensitivity and specificity of microscopy were calculated as 37.12% and 100% respectively, taking liver examination as gold standard. Different age categories were found to be significantly associated with risk of infection. However, sex was found to be non-significantly associated with the disease. Economic losses in terms of condemnation of infected livers caused by bovine fascioliasis in tehsil Sargodha were estimated to be 35697 USD (3141360 PKR). High value of economic losses suggested the adoption of suitable measures for the control of disease.

Key words: Fascioliasis, epidemiology, slaughter house, economic losses, bovines

INTRODUCTION

Fascioliasis in an economically important helminth infection which is caused by two species of genus *Fasciola* namely *Fasciola (F.) hepatica* and *F.gigantica*. It is a parasite of domestic animals, wild animals and human but is most important in cattle and sheep (Soulsby, 2006). Fascioliasis is one of the most prevalent helminth diseases throughout the world (Okewole *et al*., 2000). Number of grazing animals at the risk of fascioliasis exceeds 700 million and among human population over 180 million people are at the risk of infection (Mas-Coma *et al*., 2009). Distribution of both species of *Fasciola* depends on the ecology of snails of genus *Lymnaea* (L) which serves as intermediate host of the parasite.

Bovine fascioliasis has global geographical distribution. Its prevalence ranges from 1.15% to 80% (Ibarra *et al*., 1998; Holland *et al*., 2000; Mannan *et al*., 2001; Cringoli *et al*., 2002; Turn *et al*., 2004; Phiri *et al*., 2005; Pfukenyi *et al*., 2006; Kleiman *et al*., 2007; Oyeduntan *et al*., 2008; Nonga *et al*., 2009; Abunna *et al*., 2010; Duscher *et al*., 2011 & Ozung *et al*., 2011).

Fascioliasis is a major constraint in development of livestock industry causing huge economic losses. It causes reduction in productivity of animal in terms of lowered growth rate, meat and milk production, fertility, feed efficiency and draught power (Asrat, 2004). Condemnation of infected livers and cost of control measures are other sources of economic loss. It has been estimated that economic losses due to fascioliasis reached upto US$ 2 billion per year worldwide (Mas-Coma *et al*., 2009).

Bovine fascioliasis is endemic in bovines (Maqbool*et al*., 2002; Khan *et al*., 2009) of study area. (Durrani *et al.,* 2007) found 30% prevalence of fascioliasis in bovines of district Lahore. (Akhtar *et al*.,2012) investigated that 13.39% and 12.50% sheep and goats of Dera Ismail Khan were infected with *F. hepatica*. Another trematodal disease, Schistosomiasis, has also been reported in buffaloes of district Sargodha by (Arshad*et al.,* 2011). Climate and unhygienic measures are the key factors responsible for higher prevalence of the disease in study area. Economic losses conferred by bovine fascioliasis have been estimated by various researchers in different countries of world (Biu *et al*., 2006; Sothoeun *et al*., 2006; Mwabonimana *et al*., 2009; Abunna *et al*., 2010 and Tsegaye *et al*., 2011). (Khan *et al*., 2009) has reported a gain benefit cost ratio of 3.9 after treatment of infected cattle with some fasciolicide while investigating increase in milk quantity and quality. But no studies have been conducted in Pakistan for estimation of losses directly caused by bovine fascioliasis resulting in condemnation of infected livers. Estimation of economic losses may help in adopting control measures (Khan *et al*., 2009).

MATERIALS AND METHODS

Collection of liver and fecal samples: Collection of liver and fecal samples (10g) was performed in slaughter house of tehsil Sargodha at Jhal Chakian for three months from August 2011 to October 2011. First of all, animals brought to slaughter house were tagged with number. Tagging was done with help of ribbon (number was already written on ribbon with marker). Slaughter house

was visited twice a month and all the animals slaughtered were examined for presence of *Fasciola*. In this experiment, 146 cattle and 184 buffaloes were examined for presence of *Fasciola* in liver and eggs in fecal samples. In month of August, September and October 70, 67 and 47 buffaloes were examined respectively while 53, 49 and 44 cattle were examined respectively. Complete liver examination was done. Fecal samples of same animals were collected and preserved in 10% formalin.

Coprological examination: The presence of *Fasciola*eggs in fecal samples was evaluated by a sedimentation-flotation technique. Briefly, 4 g of feces was weighed, mixed in 200 ml water in a measuring cup and filtered 3 times through a tea sieve. The filtrate was allowed to stand for 30 min after which the sediment was collected in a test tube and centrifuged at 2000 rpm for 3 min. After centrifugation, the supernatant was removed; the sediment was suspended in zinc chloride and centrifuged at 1000 rpm for 3 min. Then, zinc chloride was added until a meniscus appeared on top of the test tube and the floating material was collected underneath acover slip that was allowed to stand on the test tube for 2 min. Finally, the samples were microscopically investigated under 100X magnification (Charlier*et al.*, 2008). Identification ofeggs and fluke was carried out using standard parasitological keys as described by Soulsby (2006).

Collection of information regarding associated determinants: Data regarding associated factors like age and sex was also collected on a predesigned questionnaire.

Estimation of economic losses: Economic losses caused by condemnation of infected livers due to bovine fascioliasis in slaughter houses of tehsil Sargodha were calculated by formula as described by Tsegaye*et al.* (2011). This was calculated by considering the overall prevalence of disease and price of liver in Sargodha market.

$LC = CSR \times LC_o \times P$

Where

LC = Losses due to liver condemnation

CSR = Average no. of animals slaughtered at abattoir during study period

LC_o = Average cost of one liver in Sargodha

P = Prevalence of the fascioliasis at the study abattoir

Statistical analyses: Prevalence was determined by following formula:

$$\text{Prevalence} = \frac{\text{Number of infected individuals}}{\text{Total number of sampled individuals}} \times 100$$

Data were statistically analyzed by Pearson Chi Square Test using SAS statistical software.

RESULTS

Prevalence: Prevalence of bovine fascioliasis in bovines in slaughter house was determined by liver and coprological examination (Table 1). Prevalence of fascioliasis was found to be 25.75% by coprological examination and 43.63% through postmortem examination by examining liver. Significantly higher prevalence was found in buffaloes as compared to cattle in both coprological (χ^2=25.312; P-value=0.0080) and liver examination (χ^2=17.453; P value=0.0001) (Table 1). By coprological examination, *Fasciola* eggs were detected in 29.89% (55/184) buffaloes and in 20.55% (30/146) cattle while double percentage in case of buffaloes (48.37%; 89/184) and cattle (37.67%; 55/146) were found infected during liver examination. Taking liver examination as gold standard, sensitivity and specificity of coprological examination was calculated as 37.12% and 100% respectively.

Table 1.Prevalence of fascioliasis in bovines in slaughter house of tehsil Sargodha

Test	Buffalo			Cattle			χ^2 (P value)
	Prevalence	Animals infected	Animals examined	Prevalence	Animals infected	Animals examined	
Coprologicalexamination	29.89	55	184	20.55	30	146	25.312 (0.0080)
Liver examination	48.37	89	184	37.67	55	146	17.453 (0.0001)

Associated determinants: Association of different categories of age and sex variables was studied among risk factors which can influence the prevalence of bovine fascioliasis in tehsil Sargodha. Age categories were found to be significantly associated (P-value=0.001) with the risk of disease. Although little higher prevalence was found in males (Fig. 1) but non-significant association in case of buffalo (χ^2=1.3461; P-value=0.1352) and cattle (χ^2=1.8934; P-value=0.3846) was found between sex categories and incidence of fascioliasis. Among four age categories, prevalence of *Fasciola*in livers of bovines was highest in >2-4 years age group in buffaloes (χ^2=19.76)

and cattle (χ^2=15.39) after which prevalence goes on decreasing gradually with advancement in age in descending order of >4-6years and >6 years respectively (Fig. 2). While least number of buffaloes and cattle were found infected with in age category of <2 years.

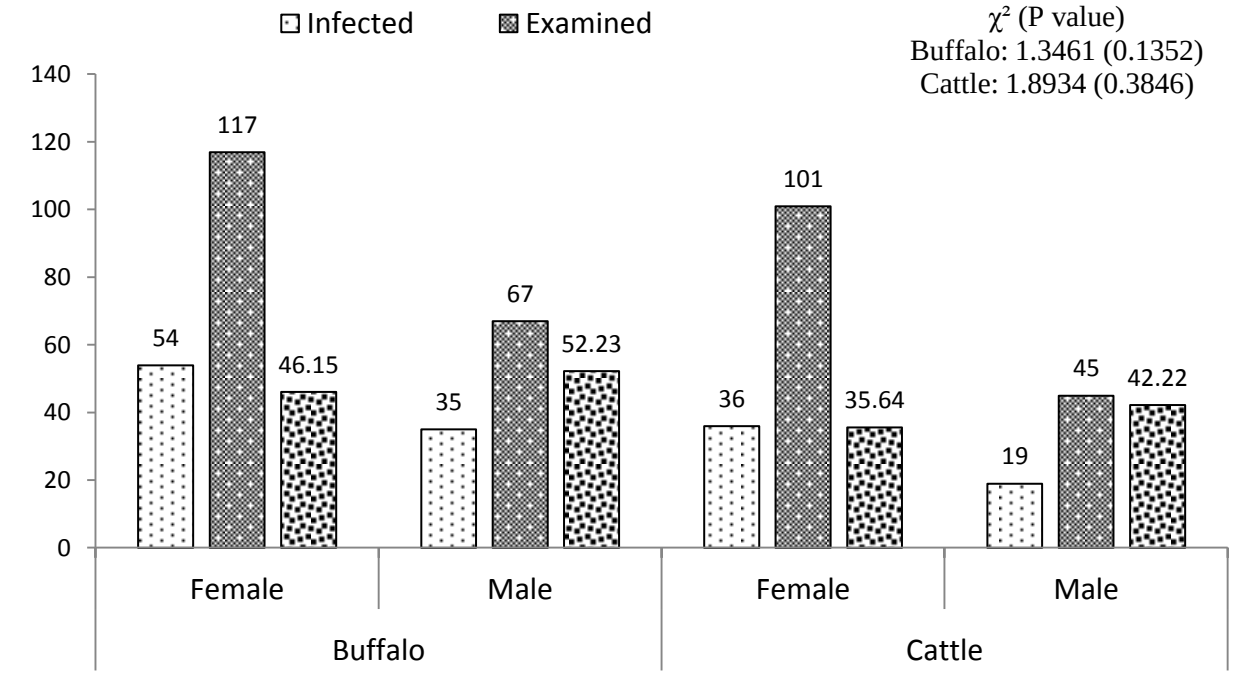

Fig. 1. Comparison of infection status in livers of cattle and buffaloes in sex categories

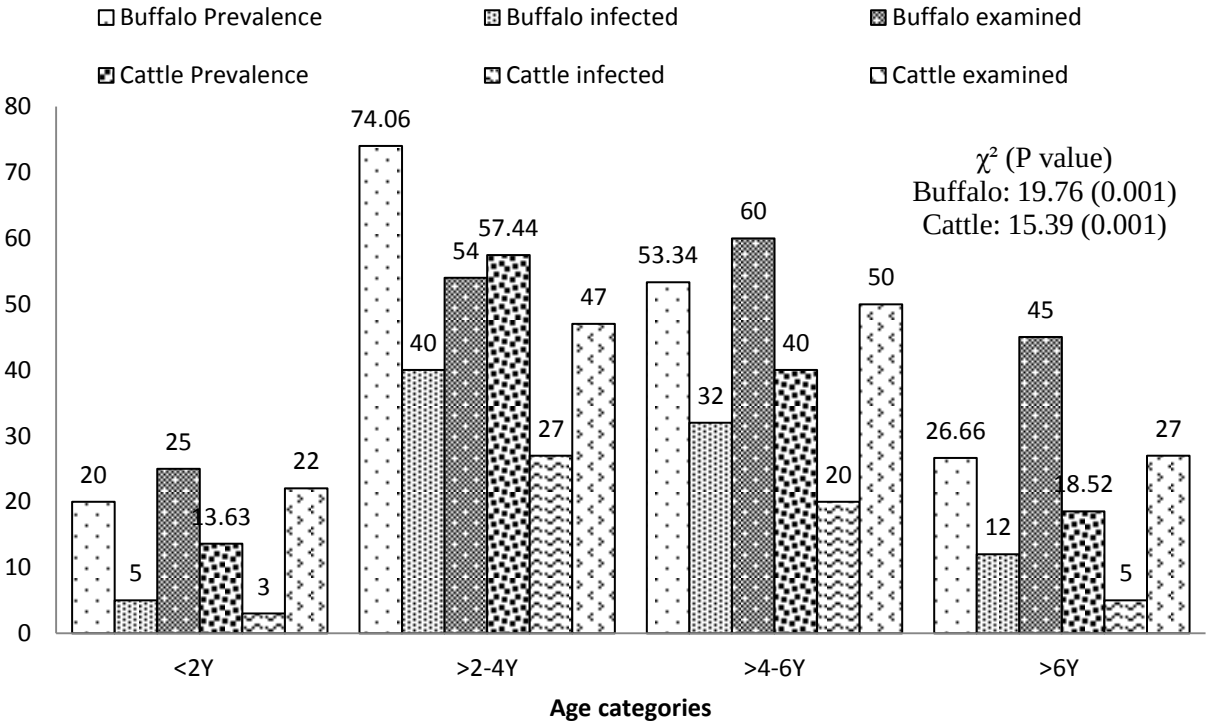

Fig. 2. Comparison of infection status in livers of cattle and buffaloes among different age categories.

Estimation of economic losses: Economic losses in terms of condemnation of infected livers caused by bovine fascioliasis in tehsil Sargodha were estimated to be 2975USD (261780 PKR). Prevalence of fascioliasis in bovines of tehsil Sargodha was determined as 43.63% while average cost of one bovine liver was Rs. 400during study period. Value of LC_o was taken as Rs. 200 because an average of half of liver per infected individual was condemned. Economic losses were calculated as under:

$LC = CSR \times LC_o \times P$

$LC= 3000 \times 200 \times 43.63\%$

LC=261780PKR(1 USD=88 PKR)

LC=2975USD

DISCUSSION

The study area has great geographical importance for fascioliasis. Boundaries of tehsil Sargodha are made by two rivers; River Jhelum and River Chenab. Alluvial deposits in soil of tehsil Sargodha results in stagnation of water which is important habitat of snail. Unhygienic measures adopted by farmers are another reason for high prevalence of fascioliasis in tehsil Sargodha (Khan *et al*., 2009). Higher overall infection rate (43.63%) was recorded in present survey in bovines slaughtered in tehsil Sargodha as compared to results of (Maqbool *et al*., 2002) who recorded 25.6% prevalence of fascioliosis in six districts of Punjab viz., Lahore, Gujranwala, Sheikhupura, Sargodah, Jhang and Faisalabad. Reasons for the increase in prevalence may include 1) Non-adoption of control measures. 2) No use of specific drug for treatment of fluke 3) Development of resistance against flukicides (personal communication).4) Indiscriminate animal trade.

Higher prevalence in buffaloes in comparison to cattle may be due to its swampy nature as the intermediate host; snail is aquatic in nature. (Abunna*et al*., 2010) estimated the sensitivity of fecal examination as 35% while taking postmortem liver examination as gold standard. Sensitivity of coproscopy was estimated to be 69% by (Rapsch*et al*.,2006). Sensitivity was improved by taking larger fecal samples (30g). Lower prevalence in coprological examination in present survey is indicative of lower sensitivity of this technique which is attributed to long prepatent period and intermittent shedding of eggs (Abunna*et al*., 2010). *Fasciola* eggs cannot be detected by coprological examination until 8-15 weeks after infection, by which *Fasciola* matures into adult and reaches bile duct (Hillyer1999; Sanchez-Andrade *et al*., 2000). Detection of *Fasciola* eggs in feces is also unreliable because of intermittent shedding of ova, depending on evacuation of gall bladder (Briskey, 1998).

Prevalence of fascioliasis was recorded to be highest in >2-4 years age group after which prevalence goes on decreasing gradually with advancement in age in descending order of >4-6years and >6 years respectively. While least number of buffaloes and cattle were found infected with in age category of <2 years. Lowest prevalence in animals of <2 years age may be attributed to less chances of acquiring infection due to short exposure as compared to older animals. Association of age found in present survey was in agreement with the results of (Anderson *et al*., 1999).Found fewer animals less than 2 years to be infected as compared to older animals. Similar observations were reported by (Keyyu *et al*. 2005) who associated higher infection rate in older animals with age and consequently longer exposure time.

Decrease in prevalence at age higher than 4 years is due to the fact that cattle present resistance to challenge infection. (Hillyer *et al*.1996) stated that adult cattle are more resistant to reinfection or they may self-cure. There are some reports that resistance is not totally immunologically based. Rather it is suggested that hepatic fibrosis resulting from primary infection may be the reason for resistance to reinfection (Mulcahy *et al.*, 1999).

Both sexes were found equally susceptible in present survey. These results are in agreement with those of (Maqbool*et al*. 2002, Khan *et al*. (2009) also did not found statistical association between sex and incidence of disease.

Economic losses due to bovine fascioliasis were recorded as 18000 USD/ annum in Tanzania by (Mwabonimana *et al*. 2009) and 4000 USD/ annum in Southern Ethiopia by (Abunna *et al*. 2010).Economic losses measured in present study (2975 USD) are high enough to suggest adoption of suitable measures for the control of disease.

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