

Epidemiological Survey of Bovine Fasciolosis in Bor County, Jonglei State, South Sudan

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Abstract: A cross-sectional study was carried out from November 2017 to March 2018 with the objectives of determining the prevalence and associated risk factors of bovine fasciolosis in Bor county, Jonglei State, South Sudan. From a total of 384 cattle examined in Bor county slaughter house, 19%(73/384) were found to be positive for fasciolosis by post mortem liver inspection. Prevalence based on Sex, showed 24% in female and 17.8% in male. Based on body condition score, 78.6% in poor, 48% in fair and 10% in good body condition. Based on breed, 33.3% in Ankole (exotic breed) and 18.8% in Nilotic (local breed). As for age, the findings showed 23% in old animal, 8.8% in adults and 7.4% in young animals. In the univariate analysis, sex (p -value=0.22), age (p -value=0.004) and body condition (p -value=0.000) showed a statistical significant association (p -value \leq 0.25) with bovine fasciolosis. Moreover, in the multivariate logistic regression old cattle (\geq 9 years) (OR=3.537, p -value=0.011) and cattle with fair (OR=3.774, p -value=0.000) or poor body condition (OR=36.046, p -value=0.000) showed statistically significant associations (p -value \leq 0.05) with bovine fasciolosis.

Key Words: Fasciolosis, Bovine, Epidemiology, Prevalence, Risk factors, Slaughter house, Bor, South Sudan.

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I. Introduction

Fasciolosis represents one of the most common liver parasitisms in humans and domestic ruminants and is present throughout the world where the climate conditions are suitable for snails (*Lymnaea*) the intermediate host of *Fasciolagigantica* and *Fasciola hepatica*. In domestic ruminants, adverse effects of acute or chronic fasciolosis include decreased fertility and increased veterinary cost [1].

The common causative agents are *Fasciola hepatica* and *Fasciolagigantica* which have di-heteroxenous life cycle [2].

The major endemic areas of *fasciolagigantica* are large tropical regions of Africa and many areas of Asia including India, Pakistan and Bangladesh [3]. The snail *Lymnaea natalensis*, the intermediate host of *Fasciolagigantica* commonly occur in Northern El-Gazira and southern Khartoum State [4]. Recent evidence has shown that bovine fasciolosis is endemic in swampy areas of Northern Bahr-el Ghazal, Jonglei, Lakes, and Central Equatoria State [5]. Therefore, the objectives of this study were, to estimate the prevalence of Bovine fasciolosis and to determine the associated risk factors with the disease.

II. Materials and Methods:

Study Area: Bor is the capital of Jonglei State in south Sudan. The town is situated on the east side of White Nile at the southern extent of the Sudd, South Sudan vast central wetlands, bordered by Ethiopia to east, eastern and central Equatoria to south, Unity and Lake State to the West. To the north of Jonglei lies the Upper Nile state. The Latitude and Longitude of the city is 6.21250°N 31.56083E° [6].

The topography of the land is generally flat and forms part of coastal plain. The mean annual rainfall ranging between 891mm to 790mm. The annual average temperature ranges from 27.3C⁰ to 30C⁰. The population of Bor county, according to the 2008 Population and Housing census is 16.716 people representing

2.7% of regional population. Agricultural activities in the area are prominent and they can be grouped into crop and livestock production, fishing, and agro processing [7].

Study design: Across sectional study was carried out from November 2017 to March 2018 to estimate an overall prevalence of Bovine fasciolosis and to determine the association of potential risk factors.

Sample Size: A sample size was calculated using the formula given by Thrusfield [8] with 95% confidence interval, 5% absolute level of precision and 50% expected prevalence.

$$n = 1.96^2 \times (1 - P_{exp}) / d^2 [8]$$

The calculated sample size for this study was 384 cattle.

Ante-mortem: All animals brought for slaughter were physically observed prior to slaughter and details about sex, breed, age and body condition were recorded.

Post-mortem: An active abattoir survey was conducted, based on cross sectional study during routine meat inspection on randomly selected cattle. During post mortem inspection, livers were palpated and incised according to routine meat inspection of FAO. All livers which had *Fasciola* were registered.

Questionnaire Survey: A pre-structured questionnaire was developed and pretested, and all information related to the study objectives were recorded. Data collected included age, breed, sex, body condition score and the results were categorized accordingly.

Statistical Analysis: The collected data were entered into a spread sheet program (Microsoft Excel 2010) and then coded. Coded data were inserted to SPSS version 23 for analysis. The data were analyzed by simple description statistics using frequency and cross tabulation. Univariate and multivariate analyses were used to estimate the statistical significance and strength of associations between potential risk factors and the prevalence of fasciolosis. In univariate analysis the Chi-square test was considered significant if it has a p-value ≤ 0.25 . All potential risk factors significant in the univariate analysis were subjected to further multivariate analysis where the significance level was set at p-value ≤ 0.05 .

III. Results

The result of this survey showed that out of 384 animals selected and slaughtered randomly, 73 were found to be infected with *Fasciola*, indicating an overall prevalence rate of 19% among slaughtered cattle in Bor county, Jonglei State South Sudan. The prevalence of bovine fasciolosis based on body condition score was: 78.6% in poor body condition, 48.6% in fair body score, and 10.3% in good body condition. Regarding distribution of bovine fasciolosis by sex, the rate of infection in females was 24.0%, and 17.8% in males. The distribution of the *Fasciola* infection according to the type of breeds in Bor County was 18.8% in Nilotic breed and 33.4% in Ankole breed. Infection rate of bovine fasciolosis according to age of cattle was 7.4% in animals aged 2-5 years, 8.8% in animals aged 6-8 years, and 23.1% in ≥ 9 years old. In the univariate analysis using Chi-square test, risk factors such as sex ($\chi^2=1.507$, p -value=0.220), age group ($\chi^2=10.847$, p -value=0.004), and body condition score ($\chi^2=101.183$, p -value=0.000) showed statistically significant association ($P \leq 0.25$) with the prevalence of bovine fasciolosis, while the breed didn't show statistically significant association ($\chi^2=0.812$, p -value=0.367) with the prevalence of infection (Table 1). In contrast, only 2 risk factors were found associated with the prevalence of bovine fasciolosis in the multivariate analysis. Animals aged 9 years or more (OR=3.537, 95% CI : 1.333 - 9.380, p -value=0.001) and animals with fair body condition score (OR=8.329, 95% CI: 3.774 - 18.381, p -value=0.000) as well as animals with poor body condition score (OR=36.046, 95% CI: 13.046 - 99.591, p -value=0.000) were found to be statistically significant ($P \leq 0.05$) with the prevalence of bovine fasciolosis (Table 2).

Table 1: Summary of Univariate Analysis for Risk Factors Associated with Bovine Fasciolosis in Bor county, Jonglei State, South Sudan, using the Chi-square test

Risk factors	Animals tested	Animals Affected (%)	df	χ^2	p-value
Sex			1	1.507	0.220
Male	309	55 (17.8)			
Female	75	18 (24.0)			
Age (years)			2	10.847	0.004
Young (2 – 5)	27	2 (7.4)			
Adult (6 – 8)	80	7 (8.8)			
Old (≥ 9)	277	64 (23.1)			
Body condition			2	101.183	0.000
Good	319	33 (10.3)			
Fair	37	18 (48.6)			
Poor	28	22 (78.6)			
Breed			1	0.812	0.367
Nilotic	378	71 (18.8)			
Ankole	6	2 (33.3)			

Statistically significant at $P \leq 0.25$ (two-sided) in the univariate model.

Table 2: Final Multivariate Logistic Regression Model of Bovine Fasciolosis in Bor County, Jonglei State, South Sudan

Risk factors	Animals affected (%)	Exp. (B)	95% C.I. for Exp. (B)		p-value
			lower	upper	
Sex					
Male	55 (17.8)	Ref			
Female	18 (24.0)	1.519	0.704	3.279	0.287
Age (Years)					
Young (2 – 5)	2 (7.4)	Ref			
Adult (6 – 8)	7 (8.8)	1.013	0.160	6.422	0.989
Old (≥9)	64 (23.1)	3.537	1.333	9.380	0.011
Body condition					
Good	33 (10.3)	Ref			
Fair	18 (48.6)	8.329	3.774	18.381	0.000
Poor	22 (78.6)	36.046	13.046	99.591	0.000

Statistically significant at $P \leq 0.05$ in the multivariate model.

IV. Discussion

Fasciolosis represent one of the most common liver parasite in domestic ruminants and humans, and its present throughout the world where the climate condition are suitable for snails (*Lymnaea* spp), the intermediate host of *F. gigantica* and *F. hepatica*[9].

The infection is considered as a neglected disease according to the world health organization [10].The present study was carried out to estimate the prevalence of Bovine Fasciolosis and to determine the association of potential risk factors with the prevalence of the disease in Bor county, Jonglei state.

Based on post mortem examination (Liver Inspection) an overall prevalence of Bovine Fasciolosis was found to be 19%, this result is in agreement with the findings of Kassaye *et al*[11]who reported a prevalence of 20.3% in Addis Ababa Abattoir, Ethiopia and also is in accordance with a study carried out by Girmay *et al*[12](21%) in Tigray region northern Ethiopia. Moreover, the prevalence of this study is slightly lower than the findings carried out in Punjab by Khan, and Magbool[1], who reported a prevalence of 22%, and much lower than in other studies in different parts of the world, [13] in Kombolcha (53.5%), [14] in Jimma (37.7%) and [15] in Wodogent and Kemissie (41%). Differences in prevalence rates among geographical condition are attributed mainly to the variation in climatic and ecological conditions such as altitude, rainfall and temperature.

Four potential risk factors were entered into SPSS version 23 using cross tabulation and Chi-square (Univariate Analysis) to estimate the prevalence of bovine fasciolosis among different potential risk factors and to reveal the association of bovine fasciolosis with these risk factors under a significance level ≤ 0.25 . The following risk factors showed a statistical significant association with bovine fasciolosis: Sex (p-value= 0.22), Age (p-value=0.004) and body condition score (p-value=0.000).

Statistical significant association between fasciola infection and sex of animal is in agreement with a study conducted by Yadav *et al*[16] (p-value= 0.17) in Nepal and P Chakraborty and Mam [17] (p-value= 0.02) in Chittagong district, Bangladesh. On the other hand, the current study is not in conformity (p-value=0.97) with findings carried out in Nedjo municipal abattoir, west Ethiopia by Tolesa *et al*[18]. Our results showed that, rate of fasciola infection is higher in female (24%) than male(17%).These results are in agreement with previous studies [19] and [20]who reported prevalence in male=55.2, female=70.2 and in male=20.8, and in female=45.08, respectively.

Moreover, it is in conformity with a previous study Yadav *et al*[16]in Nepal who reported 17.7% in males and 82.3% in females. Higher prevalence of bovine fasciolosis in female than male cattle cannot be explained exactly but it might be assuming that hormonal stress leading to immune suppression may be associated with this phenomenon.

In our study age showed a significant association with bovine fasciolosis (p-value= 0.004) in the univariate analysis and the multivariate analysis (p-value=0.011). This finding is in accordance with a study conducted at Lokoja abattoir, Kogi State, Nigeria by OKO *et al*[21] which was (p-value=0.000). Another study carried out by Affroze *et al* [22] at Netrokona district, Bangladesh showed conformity with our study (p-value=0.0003); in Kashmir [23] showed a statistical significant association (p-value=0.007) which is in agreement with the current study. On the other hand, our result is not in agreement with the finding of a study conducted by Sileshi and Mulat[24] in Kemissie Amhara, Ethiopia with a P-value=0.60. Moreover, Yeneneh[25] at Andassa livestock Research Centre in north west of Ethiopia showed that there was no statistical significant association (p-value= 0.41) with age, thus a result not in accordance to our study.

The results of the current study revealed that, age has a significant effect on the prevalence of fasciolosis, being 23% in old (≥9 years) compared to 7.4% in young animals (2–5 years). Furthermore, cattle owners in the study area used to bring old age animals to slaughter house more than young and adult, the reasons are: meat producers prefer old cattle so that they may get more profit from steak, also cattle keepers

never sell young and adult animal to meat producers, because they keep them for milk, breeding and likewise, cultural activities, marriage and prestige. Also, meat of old animals have a high quantity of fats which costumers like.

The high prevalence of *Fasciola* infection in our study among older cattle, rather than others, could be attributed to the degree of exposure to the parasite which is normally greater in old animals rather than young and adult ones.

The present study indicated that, there is a high association between body condition score and bovine fasciolosis (p-value=0.000). This result is in agreement with a previous report carried out in Nile Delta region of Egypt by Abdelgawadet *al*[26] (p-value=0.0001). On the contrary, this finding is not in agreement with a study conducted by Seidet *al*[27] (p-value=0.987) in Gechi District, BunoBedelle Zone, south west Ethiopia.

The current study revealed a high prevalence (78.6%) in poor body condition score compared to fair (48.6%) and good body condition score (10.3%); this is in line with the findings reported by Kassyeet *al*[11] in Addis Ababa Abattoir, Ethiopia. This might be associated with less resistance as a result of malnutrition, poorly nourished animals appear to be less competent in getting rid of infection, although it is not unusual for well-fed animal to succumb to disease. Similarly, other infections might render poorly nourished animals susceptible to fasciolosis.

These potential risk factors, which had significant associations with bovine fasciolosis in the univariate analysis, were fitted into multivariate logistic regression model at a significance level ≤ 0.05 so as to control for confounding and to measure strength of association. Old age (≥ 9 years) (p-value=0.011) and poor body condition (p-value=0.000) had shown remarkable significant associations with bovine fasciolosis, these results are in line with previous reports (p-value=0.000) carried out by Muna and Wubit[28] in Halaba Municipal Abattoir, Southern Ethiopia.

V. Conclusion

This study showed an overall prevalence of bovine fasciolosis of 19% (73/384) in Bor county, Jonglei State. The final multivariate model revealed that old age (≥ 9 years) and fair or poor body condition were statistically significantly (p-value ≤ 0.05) associated with the disease.

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