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Fasciolosis Prevalence in Sacrificial Cattle of West Sumatra, Indonesia

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ABSTRACT

Fasciola is a species of the trematode genus that can cause devastating parasitic disease, namely fasciolosis. *Fasciola* spp. infestation can affect ruminants, such as cows, buffaloes, goats, and sheep, resulting in economic losses to livestock owners. Ruminants are the definitive host for the *Fasiola* species. This cross-sectional research was conducted on Eid al-Adha/Qurban in July 2022 to determine the prevalence of fasciolosis in sacrificial cattle in Fifty Cities District, West Sumatra, Indonesia. A total of 106 samples of sacrificial cattle liver from the abattoir were investigated. Examination of the liver for the presence of *Fasciola* spp. was carried out by postmortem examination by removing the liver from the abdominal cavity immediately after slaughter. The livers of all sacrificial cattle were examined by systematic inspection, palpation, and incision for *Fasciola* spp. infestation. Necropsy results of samples indicated the prevalence of *Fasciola* spp. (36.79%), which was higher in female animals, compared to males. Based on age, the highest prevalence was at the age of > 4 years, (52.95%), followed by 2 years (39.62%) and 3 years (25.00%). Regarding the cattle breed, the highest prevalences were indicated in Pesisir cattle (47.61%), Simmental cattle (44.44%), Bali cattle (37.28%), Ongole cattle (20%), and Limousine cattle (14.28%). This study revealed that fasciolosis in sacrificial animals in Fifty Cities, West Sumatra, was influenced by gender. Therefore, the findings of this study suggest improving treatment protocol for the prevention of fasciolosis in sacrificial animals.

Keywords: *Faciola*, Liver, Prevalence, Sarficial cattle

INTRODUCTION

Fasciolosis is an important parasitic disease caused by the trematode worms of the *Fasciola* species in cattle, in other ruminants, some rare animals, and even in humans. *Fasciola* spp. have also been spread worldwide (Keyyu et al., 2006; Alatoom et al., 2007; Yemisrach and Mekonnen, 2012). *Fasciola* spp. dominate in countries with tropical and subtropical climates, such as Pakistan, Bangladesh (Mas-Coma et al., 2005), and India (Martindah et al., 2005). The impact of fasciolosis in Indonesia can reach 513.6 billion Indonesian Rupia (IDR)/ year due to animal deaths, weight loss, reduced carcass quality, reduced milk production, and medical expenses (Kithuka et al., 2002; Valero and Salmeron, 2003).

Parasites can reduce livestock productivity and cause economic losses for farmers (Lotfalizadeh et al., 2022). Parasites can survive in the host's body by consuming nutrients from the host's tissue, competing with the host for nutrient absorption, and causing various detrimental effects, such as weight loss, reduction of growth rate, decreased immune system, and death of the host. Livestock infected with parasites usually suffer from emaciation. As a result, these infected animals may have a lower selling value in the market (Khan et al., 2008; Zelpina et al., 2022). In addition, the presence of parasites in the liver of sacrificial animals can also cause acute parenchymal hepatitis and chronic cholangitis. After attacking the liver, the next stage of *fasiola* can cause disturbances in fat, protein, and carbohydrate metabolism, which can interfere with growth, reduce body weight, cause anemia, and lead to death (Irianto, 2009). In humans, infectious diseases can occur due to drinking water containing metacercariae and consuming food such as beef and kitchen utensils that are washed with water containing metacercariae (Irianto, 2009).

Eid al-Adha, an annual Muslim holiday, is celebrated by slaughtering specific animals like cows, buffaloes, goats, and sheep. The animals chosen for sacrifice must meet certain criteria, such as being of appropriate age and being healthy without any defects. Prior to slaughter, the animals undergo an examination to ensure their overall health and suitability. This inspection helps determine whether they are fit for sacrifice. After the slaughter, a postmortem inspection is carried out to ensure the safety and quality of the meat, carcass, and internal organs. If any issues are found during these inspections, such as the animal being unfit for consumption, the unfit parts are disposed of properly (Fatmawati and Herawati, 2018). A Study conducted by Paramanandi et al. (2020) on sacrificial animals in Malang City

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showed that the incidence of fasciolosis in cattle reached 26.03%. The incident fascioliasis, or liver fluke infection, can vary among herds and regions. For instance, a study conducted in 2015 in the Nile Delta region of Egypt found a herd prevalence of 9.77% (El-Tahawy et al., 2017). In Denmark, there was an increase in the annual herd prevalence from 25.6% in 2011 to 29.3% in 2013 (Olsen et al., 2015). Studies conducted in South Africa, Ethiopia, and Nigeria have reported varying prevalence rates of fascioliasis at the individual animal level. The prevalence ranged from 10% to 50.5% in these countries' slaughtered animals from different abattoirs (Ardo et al., 2014; Onyeabor and Wosu, 2014; Jaja et al., 2017; Getahun et al., 2017). Based on this, it is important to know the infestation of *Fasciola* spp. in sacrificial cattle in Fifty Cities District, West Sumatra, Indonesia.

MATERIALS AND METHODS

Ethical approval

This study was conducted according to the protocol approved by the Animal Welfare and Experimental Ethics Committee of the Agricultural State Polytechnic of Payakumbuh, Indonesia.

Study design

A cross-sectional study was conducted in June 2022 at the slaughtering site for sacrificial cattle in Lima Puluh Kota Regency (Fifty Cities District), West Sumatra, Indonesia, located at 02528.71 North Latitude 02214.52 South Latitude and 1001544.10 East Longitude, 1005047.80 East Longitude. The sampling technique was carried out using a non-probability sampling technique, a total of 106 samples using a purposive sampling approach, namely sample discovery technique with certain considerations of the recorded samples based on breed, age, sex, and the time of sampling from 08.00 to 12.00 western Indonesian time.

Examination sample

The livers of all cattle slaughtered during the study period were carefully examined by officers from the Animal Husbandry and Animal Health Service (veterinarians) for evidence of worm infection and pathological lesions in the livers of the sacrificial cattle using systematic inspection, palpation, and incision for *Fasciola* spp. infestation (Soulsby, 1982; Ahmad et al., 2020). In addition to fasciolosis prevalence, information on individual cattle, including breed, sex, and age, was used to investigate the determinants of infection.

Statistical analysis

Observational data were entered into Microsoft® Excel 2020, and a descriptive analysis test using the statistical package for social software (SPSS, version 20. Chicago, USA) was used. The chi-square test is used to evaluate the relationship between the presence of *Fasciola* spp. and variables including breed, sex, and age. The p-value was considered significant at $p < 0.05$.

RESULTS AND DISCUSSION

In Fifty Cities District, 106 sacrificial animal livers were examined through necropsy, revealing the presence of *Fasciola* spp., with a prevalence of 36.79%. Among these cases, the prevalence was higher in female sacrificial animals, with 41%. Regarding age, the highest prevalence of *Fasciola* was observed in animals older than 4 years, with (52.95%), followed by 2-year-old animals (39.62%) and 3-year-old animals (25.00%). When considering the breed of cattle, the prevalence of fasciolosis was found to be (47.61%) in Pesisir cattle, (44.44%) in Simmental cattle, (37.28%) in Bali cattle, (20%) in Ongole breeding cattle, and (14.28%) in Limousin cattle (Table 1). Statistical analysis revealed a significant association between *Fasciola* infection and gender, indicating that the prevalence of *Fasciola* differed between male and female animals ($p < 0.05$). However, no significant associations were observed between *Fasciola* infection and age or breed, suggesting that age and breed did not significantly impact the occurrence of *Fasciola* infection ($p > 0.05$).

According to Table 1, the prevalence of *Fasciola* spp. in sacrificial animals in Fifty Cities District during the 2022 slaughter was recorded at 36.79%. This prevalence rate differs from other regions in Indonesia. For instance, in the Monokwari District, West Papua Province, the prevalence of fasciolosis was found to be 15.27%, while in the Malang District, East Java Province, the prevalence was 30% (Kusumarini et al., 2020; Purwaningsih et al., 2020). Additionally, in other countries, such as the Oromia Regional State in Ethiopia, the prevalence of fasciolosis was reported to be 19%, and in Kwara State, Nigeria, the prevalence reached 74.90% (Elelu et al., 2016; Turuna and Adugna, 2019).

According to the data presented in Table 1, the positive prevalence of *Fasciola* spp. was observed in female sacrificial animals (41%). The statistical analysis revealed a significant difference in the presence of *Fasciola* spp. considering the gender of the sacrificial animals ($p<0.05$). This finding contrasts with a study conducted by

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Woldemariam and Wossene (2007), which concluded that gender does not influence the susceptibility to *Fasciola* spp. infection, as both male and female animals were equally prone to infection.

Table 1. Prevalence of *Fasciola* spp. in sacrificial cows in Fifty Cities District, West Sumatra, regarding sex, age, and race in 2022

Risk factor	Sample size (N)	Positive	Prevalence (%)
Sex			
Female	94	39	41 [a]
Male	12	0	0 [b]
Age (years)			
2	53	21	39.62[b]
3	36	9	25.00[b]
>4	17	9	52.95[b]
Breed			
Bali Cattle	59	22	37.28[b]
Pesisir Cattle	21	10	47.61[b]
Simmental Cattle	9	4	44.44[b]
Ongole breed	10	2	20[b]
Limousine Cattle	7	1	14.28[b]
Total	106	39	36.79

[ab] Distinct superscript letters denote statistical significance at a significance level of $p < 0.05$.

The prevalence of fasciolosis based on age from highest to lowest was 52.95% in > 4 years, 39.62% in 2 years, and 25.00% in 3 years. Based on Table 1, it is indicated that the age of the sacrificial animal cattle has no effect on *Fasciola* spp. This is consistent with research conducted by Mariam et al. (2014) on dairy cattle in farms and households in Hawassa City, indicating that age has no effect on the prevalence of fasciolosis. However, there are differences in results that can be caused by long exposure time. Furthermore, a study conducted in the Azores archipelago, specifically Flores Island (Indonesia), revealed that older animals displayed more extensive liver lesions, compared to younger animals. This difference was attributed to a higher degree of parasitization, which indicates a longer period of exposure to the parasite. The primary factor contributing to this prolonged exposure was the ingestion of metacercariae while grazing in desert areas (Barbosa et al., 2019). It is important to note that providing forage in fresh or wet conditions can also pose a risk of metacercariae infection. Metacercariae can survive on fresh grass; thus, it is recommended to dry the forage in the sun for 2-3 days to eliminate the metacercariae (Martindah et al., 2005). According to Sudardjat (1992), infection with *Fasciola* spp. influenced by intrinsic factors and extrinsic factors. Intrinsic factors include age, gender, and heredity. Several studies conducted on cattle have reported varying results regarding liver fluke infection. For instance, Suweta (1991) found that the prevalence of liver fluke infection is higher in older adult cattle (over 3 years old) compared to younger adult cattle (2-3 years old). This suggests that age plays a role in susceptibility to liver fluke infection. Similarly, Sayuti (2007) stated that Bali cattle aged over 12 months are more prone to *Fasciola* spp. infection compared to Bali Benunur cattle aged less than 6 months and those between 6-12 months, taking into account the influence of gender. These findings highlight the potential impact of age on the vulnerability of cattle to *Fasciola* spp. infection, but further research is needed to understand better the specific age-related factors involved.

In Fifty Cities District, a variety of cattle breeds were slaughtered as sacrificial animals, including Pesisir cattle with a prevalence of fasciolosis at 47.61%, Simmental cattle at 44.44%, Bali cattle at 37.28%, Ongole cattle at 20%, and Limousin cattle at 14.28%. The analysis indicated that the cattle breed did not significantly impact the presence of *Fasciola* spp. in sacrificial animals across Fifty Cities District, West Sumatra. There are differences in the prevalence of *Fasciola* spp. of each type of sacrificial animal slaughtered. This is in accordance with research conducted by Padmadewa (2014) at the slaughterhouse Giwangan Yogyakarta , Indonesia, with the conclusion that cattle breeds affect the type of worm that infects. Additionally, various factors contribute to the epidemiology of *Fasciola* spp. These factors include the dissemination of liver fluke eggs in the environment, resulting from contaminating domestic livestock and other mammals. Environmental conditions, such as seasonal variations, temperature, and humidity, also influence the availability of worm eggs. The distribution of intermediate host snails in the field, as well as the prevailing circumstances and conditions in the field that facilitate snail dispersal, further impact the epidemiology. Moreover, the stage of worm development within the snail's body and the number of metacercariae that reach maturity before leaving the snail are important considerations. The number of cercariae, the field conditions under which they spread, and the grazing practices employed for livestock are additional factors influencing the epidemiology of *Fasciola* spp.

Various factors contribute to the epidemiology of *Fasciola* spp. These factors encompass the dissemination of liver fluke eggs in the environment through contamination of domestic animals and other mammals, as well as the prevailing

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environmental conditions such as season, temperature, and humidity that enable the availability of worm eggs. Additionally, the distribution of intermediate host snails in the environment, the prevailing conditions that facilitate snail dispersal, the level of worm development within the snail's body, the quantity of metacercariae that can mature before leaving the snail, and the number of cercariae present, along with the environmental conditions conducive to cercarial dissemination, are all influential factors (Keyyu et al., 2006).

CONCLUSION

The prevalence of fasciolosis in sacrificial animals in Fifty Cities District, West Sumatra, is 36.79%. It was observed that sacrificial animals aged over 4 years have a higher prevalence, which is also influenced by gender. Therefore, the findings of this study highlight the need to improve the availability of fasciolosis-free sacrificial cattle. It is hoped that the producers of sacrificial cattle will take measures to protect against fasciolosis infestations. Further research is required to determine the risk factors for fasciolosis infestation in sacrificial cattle.

DECLARATIONS

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Availability of data and materials
All data and materials are available by request.

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Authors' contribution
Engki Zelpina, Prima Silvia Noor, Ramond Siregar, Sujatmiko Sujatmiko, Ulva Mohtar Lutfi, Yurni Sari Amir, and Delli Lefiana conducted this research. Sampling and field necropsy were carried out by Engki Zelpina, Prima Silvia Noor and Ramond Siregar. Data analysis was conducted by Sujatmiko Sujatmiko and Ulva Mohtar Lutfi, and manuscript preparation was carried out by Engki Zelpina, Yurni Sari Amir, and Delli Lefiana. The writing team has seen the manuscript and agreed to submit it.

Competing interests
No conflicts of interest are the research.

Ethical consideration
All authors have checked plagiarism, permission to publish, fabrication and/or falsification of data, duplicate publications and/or submissions, and inappropriate information have all been checked by the authors.

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