Prevalence of fasciolosis emphasis on age, origin, body condition and post mortem by geographic information systems on sacrificial examination in Malang District – East Java

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Abstract. Infection with Fasciola gigantica, a liver trematode, is frequently reported in Malang district. The study was aimed to determine the prevalence of fascioliasis in Malang District, East Java during Eid Qurban 2019. Data were collected from 68 cutting points in 9 sub-districts. A total of 265 cows, 895 goats and 112 sheep than analyzed based on questioner emphasis on age, origin, body condition, and postmortem abnormalities. Overall the highest prevalence of fasciolosis was 57% cattle and 18% goat in Gondanglegi sub-district and 100% sheep in Wajak sub-district. A total of 86% of fasciolosis in cattle have good body conditions came from Malang District. There was also 82% in goat and 78% in sheep infected came from Malang District too. Morphological and postmortem examination findings that 53% of adult cattle (2-3 years), adult goat and sheep (1-1.5 years) were 78% and 89% respectively have abnormalities in the liver. This data showed adult livestock more resistant to fasciolosis infection. From that data above that further surveys should be carried out to understanding on the epidemiology of fascioliasis in the study area and classified risk factors affecting the infection.

Keywords: Fasciolosis, Prevalence, Eid of Adha, Malang district

1. Introduction
Fasciolosis or liver fluke is a parasitic disease caused by the Fasciola hepatica and Fasciola gigantica trematodes [1]. Fasciolosis is a plant borne trematodes that are harmful to health and can decrease livestock productivity and harm economic activity [2]. The direct economic impact is a loss due to the rejection of the liver by consumers [3]. While the effects due to acute infections are weight loss, reduced growth, and infertility. While in the chronic phase of the disease infections can decrease in production [4].

Fasciola hepatica has a worldwide distribution but is dominated in temperate zones, while the Fasciola gigantica is found in most parts of Asia with a tropical climate [5]. In Asian, Indonesia becomes a country that is endemic to Fasciola gigantica. Indonesia’s climate condition with high rainfall and high humidity strongly supports the development of Fasciola gigantica [6,7].

The published data of fasciolosis in Indonesia during 2013-2019 (6 years) mainly on slaughter animals. Prevalence of fasciolosis in male cattle 92.0% and female cattle 89.3% in 2013 years at Aceh [8]. In
2015 research in Lampung report that the prevalence of fasciolosis in cattle 27.62% [9]. In 2017 has been reported at Batu city that the prevalence of fasciolosis in cattle, goat, and sheep was 22.97%, 1.65% and 4.83% respectively [10]. The latest research year 2019 reported the prevalence of fasciolosis on Waggon cows at Berau Regency, East Kalimantan 21.65% [7]. The prevalence data shows the existence of Fasciola sp. as a common liver disease in domestic animals in various regions of Indonesia so researchers need to know the risk factors associated with the Fasciola sp. infection.

The aim of this study was to determine the current status of the case of fasciolosis and its distribution in Malang District, East Java during Eid Qurban 2019 using the Geographic Information System (GIS). This information will help in designing and implementing more effective preventive efforts in the prevention of fasciolosis.

2. Materials and methods

2.1 Morphological and pathological observations

The analysis was conducted through the morphological and pathological observations of the cattle in Malang District. The data was collected on August 11, 2019. A formation of the structured survey questionnaire was designed to capture in morphological and pathological observations. The procedure consisted of determining the tooth structure to know the age. The age estimation of cattle being slaughtered into four categorized, the < 1.5 years of all teeth are temporary and set rather the in the jaw, especially the two center incisors, the 1.5-2 year the central pair of temporary incisor teeth or pinchers is replaced by the permanent pinchers, 2-3 years permanent first intermediates, one on each side of the pinchers, are cut and > 3 years the second intermediates or laterals are cut [11,12]. The age of goats and sheep slaughtered was estimate by looking at its teeth and categorized into 6 categories of which 1-1.5 years there are two temporary teeth, 2 years there are 4 temporary teeth, 2-2.5 years there are 6 permanent teeth or, 2.5-3 years Full mouth, and worn mouth or broken mouth over 3 years of age [13].

Pathological observations focus on liver, lung, heart and spleen. Liver examination includes parietal and visceral surfaces and incising parts around bile ducts, to identify liver flukes or the typical lesions of fasciolosis. During postmortem, lung, heart and spleen examination was conducted by visualization, palpation, and incisions, where necessary, for the presence of parasites and other gross abnormalities [14,15].

2.2 Prevalence and geographical distribution of the fasciolosis

The prevalence of fasciolosis is determined based on the case that occurs in cows, goats, sheep that were collected from 68 cutting points in 9 sub-districts in Malang district. A total of 295 cows, 895 goats, and 112 sheep are cut and checked. To determine the geographic distribution of the fasciolosis positive cases used Geographic Information System (GIS) mapping using QGIS 7.6.0. The map was formed by adding the coordinates of the samples on the layers of geographic and administrative shapefile.

2.3 Body condition and origin of cattle

During ante-mortem inspection body condition score and origin of each animal were recorded using a structured record-keeping sheet through physical inspection and face-to-face interview while the body condition score was grouped as poor, medium, and good [14]. Record and examination result Data will be analyze descriptively.

3. Results

3.1 Morphological and pathological observations

Based on the results of the morphological examination and pathological examination. An overall of 29 (8 sheep and 21 goat) at the age of 1-1.5 years the highest prevalences of the case of fasciolosis with abnormalities in the liver sheep and goat were 89% \((n = 8)\) and 78% \((n = 21)\) respectively whereas at the cattle infection Fasciola sp. most at age 2-3 With a liver abnormality of 53% \((n = 37)\) with abnormalities (Table. 1).
Table 1
Prevalence rate of fasciolosis in sheep, goat and cattle base on age and pathological observations at Malang District – East Java.

| Host  | Pathological Observations | Prevalence of Fasciolosis base on age (year) | Total |
|-------|----------------------------|---------------------------------------------|-------|
| Sheep | Liver                      | 1-1.5 2-2.5 2.5-3 2-3 1.5-2 >3             |       |
|       |                            | 1-1.5 2-2.5 2.5-3 2-3 1.5-2 >3             |       |
| Sheep | Liver                      | 8 (89%) 1 (11%)                            | 9     |
| Goat  | Liver                      | 21 (78%) 5 (18%) 1 (4%)                    | 27    |
|       | Lung                       | 2 (50%) 2 (50%)                            | 4     |
|       | Lung, Liver                | 14 (100%)                                  | 14    |
|       | Liver, Lung, Spleen        | 3 (100%)                                   | 3     |
|       | Liver, Heart, Lung         | 3 (100%)                                   | 3     |
| Cattle | Liver                     | 37 (53%) 32 (46%) 1 (1%)                   | 70    |
|       | Lung, Liver                | 2 (12.5%) 7 (87.5%)                        | 8     |
|       | Liver, Heart, Lung         | 1 (100%)                                   | 1     |

3.2 Prevalence and geographical distribution of the fasciolosis

A total of 265 cattle, 895 goat and 112 sheep were examined to determine the current status of the case of fasciolosis in Malang District, East Java. The prevalence of fasciolosis was evaluated during Eid Qurban 2019. The involved Fasciola sp. in cattle, goat and sheep were 30% \((n = 79)\) , 6% \((n = 51)\) and 8% \((n = 9)\). The highest prevalence of fasciolosis in cattle (57%) and goat (18%) at Gondang legi sub district and sheep (100%) in Wajak sub district. Overall prevalences are summarized in Table 2. The geographic distribution of the observed from 68 cutting points in 9 sub-districts revealed that fasciolosis spread evenly throughout the area. Mapping the distribution of this trematode in livestock (cattle, goat and sheep) can give indications and information of the possible risk areas for endemic fasciolosis (Fig. 1 and Fig. 2).

Table 2
Prevalence of Fasciola sp. infection in cattle, goat and sheep according to sub district of Malang District – East Java.

| Sub District  | Prevalence of Cattle | Prevalence of Goat | Prevalence of Sheep |
|---------------|----------------------|--------------------|---------------------|
|               | Examined Invected %  | Examined Invected %| Examined Invected % |
|               | No                  | No                  | No                  | No                  | No                  |
| Bululawang    | 43 5 12             | 296 6 2             | 7 1 14              |
| Dau           | 39 16 41            | 84 6 7             | 83 6 7              |
| Gondanglegi   | 23 13 57            | 55 10 18           |                     |
| Kepanjen      | 26 9 35             | 86 2 2             | 4                   |
| Lawang        | 45 11 24            | 150 8 5            | 2 1 50              |
| Pakis         | 34 9 26             | 63 11 17           | 9                   |
| Sinosari      | 18 6 33             | 63 2 3             | 5                   |
| Turen         | 17 6 35             | 61 5 8             | 1                   |
| Wajak         | 20 4 20             | 37 1 3             | 1 1 100             |
| Total         | 265 79 30           | 896 51 6           | 112 9 8             |
3.3 Body condition and origin of cattle

In this section, the body condition of the livestock becomes one of the risk factors that are directly related to fasciolosis infection. A total of 85% infection of *Fasciola sp.* occurs in cattle with medium body condition and came from Malang District. There was also 82% of fasciolosis in goat and 78% of sheep that are infected with *Fasciola sp.* have moderate body conditions and came from Malang District.

### Table 3
Prevalence of fasciolosis base on body condition and origin inspection of Malang District – East Java.

| Origin                                | Goat Medium | Sheep Medium | Good | Cattle Medium | Poor |
|---------------------------------------|-------------|--------------|------|---------------|------|
| Malang District                       | 42 (82)     | 7 (78)       | 19 (86) | 46 (85) | 3 (100) |
| Malang District and Outside Area      | 2 (4)       | 1 (11)       |      | 1 (2)        |      |
| Outside Area                          | 1 (2)       | 1 (11)       |      |              |      |
| Malang City                          | 5 (10)      |              |      | 6 (11)       |      |
| Malang City and Malang District       | 1 (2)       |              | 3 (14) | 1 (2)   |      |
| Total                                 | 51          | 9            | 22   | 54           | 3    |
Discussion

We investigated the current status of *Fasciola* sp. and distribution in Malang District, East-Java during Eid Qurban, 2019. The results indicate a high prevalence of *Fasciola* sp. in cattle (30%). This result also shows prevalence in goats (6%) and sheep (8%) lower than prevalence in cattle. Overall in Gondanglegi sub-district the highest infection in cattle (57%) and goat (18%). Meanwhile the highest infection of fasciolosis in sheep at Wajak (100%). This suggests that the cattle infection was dominant in Malang District, following goat and sheep. On the other hand, sacrificial examination during Eid Qurban has been recorded in Batu City, 2017 with a prevalence in cattle, goat, and sheep was 22.97%, 1.65% and 4.83% respectively [10]. Factors that cause differences in the prevalence rate of each sub-district such as climate and ecological conditions like altitude, rainfall, temperature and livestock management system [16].

Based on the ecological distribution of infected liver fluke most of it comes from Malang District. The area is directly enclosed by large rivers (Fig. 1 and Fig. 2). This indicates that there has been direct contact between the grazing area with intermediate host (*Lymnae* sp.) as vector liver flukes [1,8]. The livestock management system and the use of water resources derived from the river also become the risk factor of the transmission of liver flukes [17,18].
In this section, the highest prevalence categorized on good body condition 86% followed by medium 85% and poor condition 3%. These results indicate that the *Fasciola sp.* infection runs chronically because weight loss will be seen when acute infections occur [3]. However, it should also be a record that the cattle that have good body conditions potentially infected by fasciolosis.

Regarding the relationship between the pathological lesions and the animal age show that adult cattle (2-3 years) more resistant with *Fasciola sp.* infection (53%) with postmortem examination mostly abnormalities in the liver. Research conducted by Barbosa et al., 2019 reported that older animals present a greater level of liver lesions and a higher level of parasitization, reflecting their long period of exposure to the risk factor Metacercaria [19]. In the current study, liver abnormalities in goats and sheep that indicate the presence of fasciolosis infections are in the range of ages 1-1.5 years. This data shows the status of infections in goats and sheep is still low but regular supervision should be taken to prevent increased cases.

**Conclusions**

Based on the data we can be concluded that the high distribution of *Fasciola sp.* in Malang District East-Java, 2019. This condition indicates the level of epidemicity of the *Fasciola sp.* that succeeded in infecting most of the cattle both cows, goats and sheep that have a good or medium body condition. The higher risk of infection will occur especially in adult cattle (2-3 years). When mapping the levels of inspection, regional differences were seen distribution of *Fasciola sp.* in Malang district. This data can contribute to effective analysis of disease incidence and preventive strategy in Malang district such as improve the farming systems for better environment conditions. The high case of this fasciolosis should be carried out a deeper investigation from a collaboration government and researcher to analyses of related factors associated distribution of fasciolosis.

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