Prevalence and Economic Importance of Fasciolosis in Slaughtered Sheep in Iğdır Province of Turkey

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ABSTRACT

Fasciolosis is a zoonotic parasitic liver infection caused by *Fasciola hepatica* (*F. hepatica*) and *Fasciola gigantica* (*F. gigantica*), as well as other digenetic trematodes in the Fasciolidae family. With this study, it was aimed to determine the prevalence of Fasciolosis and the economic loss in the region in sheep slaughtered in a private slaughterhouse in Iğdır. The material of the study consisted of sheep and lambs slaughtered in a private slaughterhouse in Iğdır. The study was carried out by going to the slaughterhouse once a week between January 1 and December 31, 2022. Livers, bile ducts and gall bladders of sheep after slaughter were examined for Fasciolosis. For this purpose, the presence of Fasciolosis was tried to be determined by making transverse sections in the liver-biliary ducts and opening the gallbladders. In our study, the prevalence of Fasciolosis in slaughtered sheep in Iğdır was determined as 26.2% (857/3271). In the study; The lungs of 857 sheep with fasciolosis were completely destroyed and due to the economic value of the liver it has been determined that there is an economic loss of 6925 $ in the province of Iğdır. As a result, it can be said that the prevalence and economic loss of Fasciolosis in sheep in Iğdır province is quite high. In this context, it is necessary to develop disease control measures suitable for the region by evaluating the local epidemiology of Fasciolosis.

Keyword: *Fasciola hepatica*, *Fasciola gigantica*, Iğdır, Sheep.

INTRODUCTION

Fasciolosis is a zoonotic parasitic liver infection caused by *Fasciola hepatica* (*F. hepatica*) and *Fasciola gigantica* (*F. gigantica*), as well as other digenetic trematodes in the Fasciolidae family (Mas-Coma et al., 2019; Uzun et al., 2022). *F. hepatica* and *F. gigantica* are parasites of domestic/wild ruminant animals (commonly: sheep, cattle and goats) and cause high rates of mortality-morbidity (Hosseini-Safa et al., 2019).

In the reports of the Centers for Disease Control and Prevention (CDC); it has been reported that *F. hepatica* is seen in more than 70 countries where sheep and cattle are raised, and *F. gigantica* is less common than *F. hepatica*. Although *F. hepatica* and *F. gigantica* are different species, "intermediate forms", which are thought to be hybrids of the two species, have been identified in parts of Asia and Africa (CDC, 2019). Fasciolosis clinically; It shows symptoms of fever, nausea, swollen liver, skin rashes and extreme abdominal pain (John et al., 2019). Moreover; parasites commonly found in the liver and biliary tract cause acute or chronic diseases with clinical symptoms such as anemia, liver dysfunction and weight loss. Fasciola can infect not only the liver and bile ducts, but also the peritoneal cavity, lungs, subcutaneous tissue, lymph nodes (Hosseini-Safa et al., 2019).

Fasciolosis; it causes great economic losses due to reasons such as destruction of organs such as liver, decrease in meat-milk yield, decrease in wool quality and infertility in farm animals (Balkaya

and Şimşek, 2010). In addition, this situation affects productivity, reduces animal production, and ultimately has a negative impact on human nutrition (Doğan, 2018). One study reported that F. hepatica causes an annual economic loss of £40.4 million (pounds) to the UK cattle industry (John et al., 2019). Undoubtedly, the parasitic factor that causes such loss must be correctly identified both when the animal is alive and in the slaughterhouse, and the destruction rules must be fulfilled.

With this study, it was aimed to determine the prevalence of Fasciolosis and the economic loss in the region in sheep slaughtered in Iğdır province.

MATERIAL AND METHOD

Animal material

The material of the study consisted of sheep and lambs slaughtered in a private slaughterhouse in Iğdır. The study was carried out by going to the slaughterhouse once a week between January 1 and December 31, 2022. Livers, bile ducts and gall bladders of sheep after slaughter were examined for Fasciolosis. For this purpose, the presence of Fasciolosis was tried to be determined by making transverse sections in the liver-biliary ducts and opening the gallbladders (Ogambo-Ongoma 1969; Biçek ve Değer 2005).

Statistical analysis

The statistical comparison of the data was performed using the SPSS® software program (SPSS 26.0, Chicago, IL, USA). Chi-square (X^2) test was used to compare the incidence of Fasciola spp. in sheep and lambs according to age and gender.

Economic analysis

In the postmortem examination findings of slaughtered animals, all of the livers should be destroyed due to parasitic factors in the liver. In this context, in calculating the economic loss; the total number of livers destroyed and the selling price of the liver were taken into account. The average weight of a sheep's liver was 1 kg, and the average selling price of liver was 8.08 $/piece (access:https://www.enflasyon.co/urun/kuzu-karaciger-kg-26010006) (1$=18,69 TL).

The following formula is used to calculate the direct economic loss.

$$\mathbf{DEL = N \times P \times W}$$

In this formula; DEL: direct economic loss, N: is the number of livers destroyed, P: Average price of sheep liver in 2022, W: mean weight of liver (accepted as 1 kg).

RESULTS

Fasciola spp. agent was detected in the livers of 857 sheep out of 3271 sheep slaughtered in a private slaughterhouse in Iğdır and whose livers were examined and the prevalence of Fasciolosis in Iğdır province was determined as 26.2%.

The distribution of the number of Fasciola spp. found in sheep slaughtered in Iğdır by months is given in Figure 1.

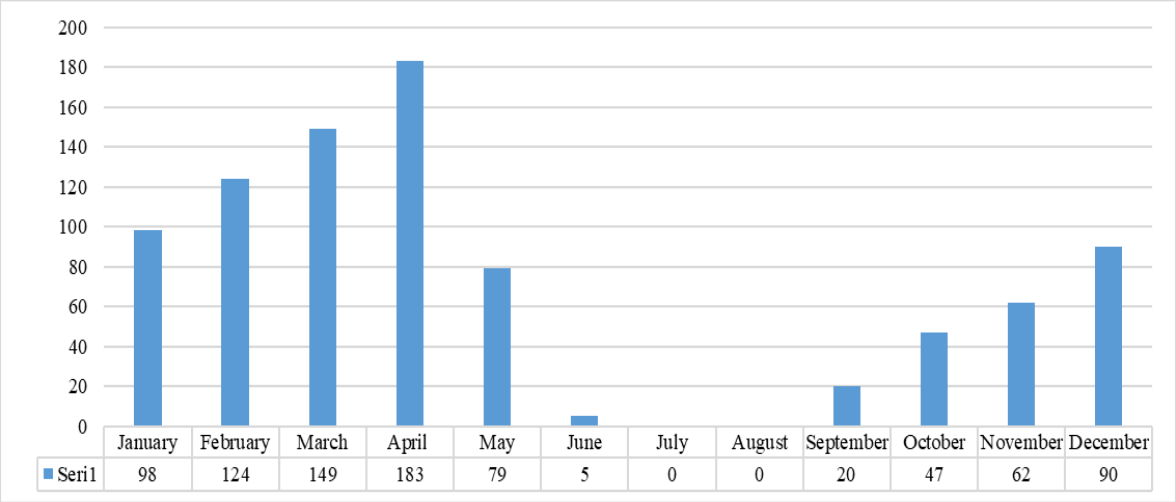

Figure 1. Fasciola spp. prevalence by month

When figure 1 is examined, the most common months for Fasciola spp. in sheep/lambs coming to the slaughterhouse are March and April, and Fasciola spp. the seasonal distribution of the incidence is given in Figure 2.

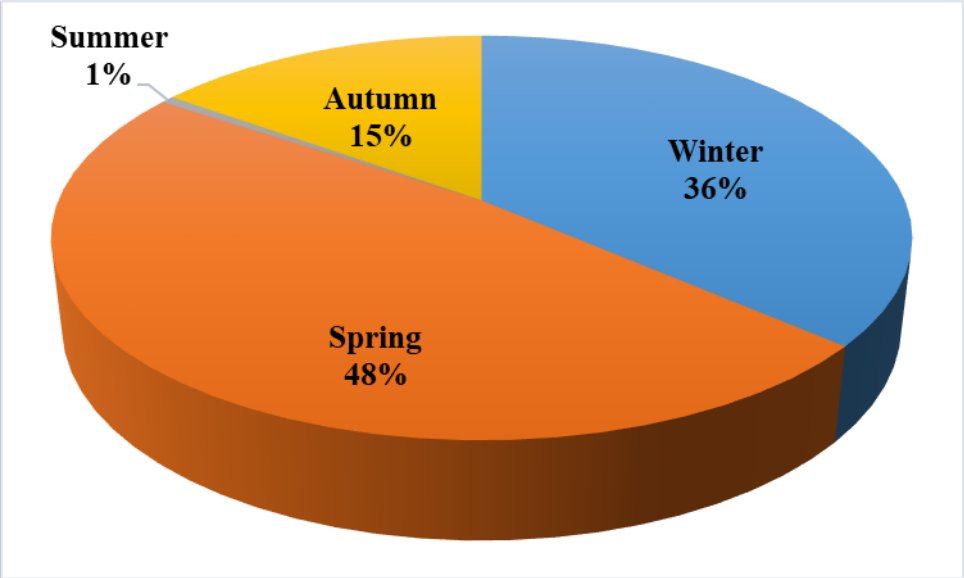

Figure 2. Seasonal distribution of Fasciola spp.

When Figure 2 is examined, it is seen that Fasciola spp. is most common in the liver in spring, followed by winter and autumn, respectively.

In the liver examination; it was determined that of 857 sheep with Fasciola spp. agents 58.2% (499/857) were male and 41.7% (358/857) were female. The distribution of Fasciola spp. agents in the liver of sheep by gender is given in Table 1.

Table 1. The rate of incidence of Fasciola spp. agent by sex

Sex	Fasciola Spp.		Total
	Positive	Negative	
Male	499	1445	1944
	25.7%	74.3%	100%
Female	358	969	1327
	27.0%	73.0%	100%
Total	856	2414	3271
	26.2%	73.8%	100%

X^2=0.741; P=0.389; P>0.05

When Table 1 is examined, Fasciola spp. agents were found in 25.6% of males and 27% of females who came to the slaughterhouse, and no statistically significant difference was found between the incidence of parasites and gender in the chi-square analysis (P>0.05).

The distribution of the incidence of Fasciola spp. according to age is given in Figure 3.

When Figure 3 is examined, it is seen that Fasciola spp. agents are mostly found in animals aged >3. In addition, in the study; while Fasciola spp. agents were not found in the liver examination of lambs younger than 8 months, the incidence of parasites was 1.75% in lambs between 8 months and 1 year old.

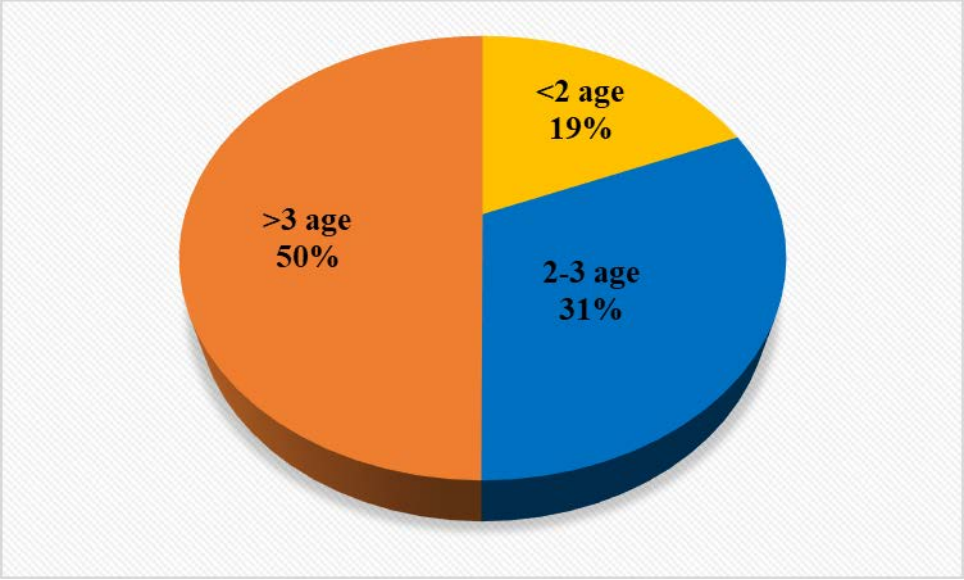

Figure 3. Distribution of Fasciola spp. incidence by age

The rate of sheep <2 years old was 18.67% (160/857) among 857 sheep whose Fasciola spp. agents were found in the liver examination, and this rate was determined as 31.39% (269/857) in 2-3 years old sheep and 49.94% (428/857) in sheep >3 years old. The distribution of Fasciola spp. agent in the liver of sheep by age is given in Table 2.

Table 2. Distribution of Fasciola spp. agent by age

Age	Fasciola spp.		Total
	Positive	Negative	
<2	160	962	1122
	14.3%	85.7%	100%
2-3	269	820	1089
	24.7%	75.3%	100%
>3	428	632	1060
	40.4%	59.6%	100%
Total	857	2414	3271
	26.2%	73.8%	100%

X^2=194.177; P=0.000 P<0.01

When Table 2 is examined, Fasciola spp. agents were found in 14.3% of sheep <2 years old, in 24.7% of sheep 2-3 years old and in 40.4% of sheep >3 years old, and it is seen that the incidence of parasites increases with age. As a matter of fact, a statistically significant difference was found between the incidence of parasite and age in the chi-square analysis (P<0.05).

In Iğdır, 857 sheep livers infected with Fasciola spp. agents were completely destroyed and the economic loss caused by 1 kg of liver, with an average market price of 8.08 $, was determined as 6.925 $.

DISCUSSION

Liver trematodes, which are common in butchery animals, cause great damage to the livestock economy (Biçek and Değer, 2005). These factors can adversely affect food intake, digestion, and ultimately various physiological events in the body (Balkaya and Şimşek, 2010), and ultimately have negative effects on human nutrition (Şimşek and Köroğlu, 2004).

Turkey seems to be a suitable country in terms of both climatic and ecological factors for fasciolosis, the prevalence of which varies between 4% and 61.6% in sheep in different countries of the World (Hammami et al., 2007; Kantzoura et al., 2011; Domke et al., 2013; Rinaldi et al., 2015; Denizhan and Biçek, 2018). Fasciolosis prevalence was determined between 0.5-73.7% in studies conducted on cattle throughout Turkey (Toparlak and Gül, 1989; Kara et al., 2009; Balkaya and Şimşek, 2010; Altun and Sağlam, 2014). It has been reported that this rate is between 0.6-95% in sheep (Vural, 1970; Gargılı et al., 1999; Utuk et al., 2012; Çaya, 2012; Sevimli, 2013; Denizhan and Biçek, 2018; Ertaş et al., 2022). The prevalence of fasciolosis in different regions has been reported to vary depending on the presence of the snail population, animal care/feeding, and environmental conditions (Yıldırım et al., 2007). In our study, the prevalence of Fasciolosis in slaughtered sheep in Iğdır was determined as 26.2%. In another study conducted in Iğdır in 2021, the prevalence of fasciolosis in sheep was reported as 16.7% by stool examination (Ertaş et al., 2022). This situation can be explained by farm management differences. However, it should be noted that the differences in the methods used to determine the prevalence of fasciolasis also cause the rates to change. (Denizhan and Biçek, 2018). In different studies conducted in this context; While the prevalence of faciolosis varies between 0.8-20.99% according to stool examination results in Turkey, it has been reported to vary between 0-49.43% in studies based on antibody detection. In different studies conducted in this context; While the prevalence of faciolosis varies between 0.8-20.99% (Celep et al., 1990; Utuk et al., 2012) according to stool examination results in Turkey, it has been reported to vary between 0-49.43% (Utuk et al., 2012; Denizhan and Biçek,

2018) in studies based on antibody detection. Our study results show that although the prevalence of Fasciolosis in Iğdır is low compared to many parts of the world and Turkey, it causes great economic losses. The extreme differences in the prevalence of fasciolosis; can be attributed to significant differences, including average precipitation, temperature, seasonal changes, animal species and livestock management strategies (Halimi et al, 2015).

Depending on the season, the prevalence of fasciolosis was reported most in autumn and winter, and least in summer (Oryan et al., 2011; Acıöz, 2019). On the other hand, the prevalence of fasciolosis in this study was mostly seen in the spring season. It is thought that the reason why our study results differ from the literature is due to climatic and care/feeding differences. Moreover; The decrease in the incidence in the summer months can be explained by the very small number of animals that came to the slaughterhouse at that time.

It has been reported in different studies that the prevalence of fasciolosis increases with age (Karapınar, 2009; Balkaya and Şimşek, 2010; Şen et al., 2011; Shinggu et al., 2019; Esim et al., 2020; Saltan and Taşcı, 2020). In our study, parallel to the literature, the highest prevalence of Faciolosis was seen in sheep >3 years old. As the reason for this; It is thought to be caused by the excess intake of metacerkers or the decrease in resistance to environmental factors due to the long-term stay of old animals in the pasture (Maqbool et al.,. 2002; Esim et al., 2020).

In different studies, when the prevalence of Fasciolosis was evaluated according to gender, it was reported that there was no effect of gender (Maqbool et al., 2002; Opara, 2005; Şen et al., 2011; Bostancı and Oguz, 2017; Denizhan and Biçek, 2018; Esim et al., 2020). However; reported that Fasciolosis is more common in female animals in different studies. As a possible reason for this, it has been shown that non-breeding males go to slaughter in a short time and in this context, females live longer than males (Phiri et al., 2005; Yavuz et al., 2007; Adanır and Çetin, 2016).

Fasciola spp.; in addition to the loss of offal, it causes significant economic losses due to poor quality carcass, decrease in growth rate, decrease in fertility and death. It is estimated that annual yield loss is 302 billion dollars due to Fasciolosis, which puts more than 700 million animals at risk worldwide (Mahmodd et al., 2017). In different studies, the losses due to Fasciolosis; it has been reported that it is 1.94 million $ in Sudan (Rahmeto et al, 2010) and 52 million € in Switzerland (Schweizer et al, 2005). It has been reported that the loss due to the destruction of the liver in Asian countries is 17.02 million $/year (Mahmood et al., 2017). In our study, it was determined that the loss due to the destruction of the buildings in Iğdır was 6.925 $/year. In parallel with the findings of this study, in a study conducted in Iran, the economic loss caused by 895 infected sheep livers was reported as $7,160 (Arbabi et al, 2018). In addition, it has been reported that there is an annual production loss of approximately 42.8 million $ due to bovine fasciolosis and a total production loss of 89.2 million $ (cattle, sheep, goat) due to hydatid cysts for Turkey at the national level (Sarıözkan, 2013). It can be said that the differences between the economic losses are due to the prevalence of the disease and the changes in the average liver/meat price in different regions.

CONCLUSION

As a result, it can be said that the prevalence and economic loss of Fasciolosis in sheep in Iğdır province is quite high. In this context, it is necessary to develop disease control measures suitable for the region by evaluating the local epidemiology of Fasciolosis.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest for this study.

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