



# Macroscopic and Histopathologic Study of Liver Lesions and Their Prevalence in Slaughtered Sheep in Yasuj Slaughterhouse, Iran

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## Abstract

**Background and aim:** The purpose of this study was to determine the amount of liver lesions in slaughtered sheep in Yasuj slaughterhouse with specific reference to the prevalence rates, gross and histopathological features.

**Material and Methods:** This study was conducted from winter 2018-2020. A total of 800 livers from 3062 slaughtered sheep identified as having one or more liver lesions were used for macroscopic and microscopic studies.

**Results:** Fifteen percent of the 800 studied livers had liver lesions. In the macroscopic and microscopic study of these lesions, 39 cases (4.9%) were diagnosed with liver abscess, 28 cases of hydatid cyst (3.75%), 20 cases of fasciolosis (2.5%), fatty liver (2.5%) and 2 cases of scurvy cystosis (2.5%).

**Conclusion:** Our study shows the high rate of liver lesions, especially abscesses and parasites in sheep in Yasuj slaughterhouse and the need for more attention to the prevention and treatment of these lesions.

**Key words:** Liver lesions, Pathology, Sheep, Yasuj

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## Introduction

Liver is the largest gland in animal body and has numerous circulatory, excretory, metabolic, defensive and hemopoietic functions (Carlton & Mc Gavin 1995). Liver plays an important role in sheep health. Its nutritional value and role in Iranian traditional cuisine makes it more important. Some liver lesions are zoonotic and these lesions in sheep lead to great losses of meat production and ranchers' income due to the condemnation of livers in the slaughterhouses (Ntiamoah *et al.*, 2021). Hepatic disease is common in small ruminants. Different hepatobiliary diseases are noted in sheep and the most common ones are liver flukes, clostridial diseases, hepatic lipidosis, hepatic and mineral and other plant toxicoses (Aiello & Moses, 2016). Hepatic parasitic disease has a significant clinical and financial impact on ruminates breeding which cause direct losses due to confiscation of parasitized liver and indirect losses due to hepatobiliary alterations and anti-helminthic drug costs (Arbabi *et al.*, 2011). Yasuj is the capital city of Khohkeloyeh and Boyer Ahmad province that is in southwest of Iran and is a major sheep and goat husbandry hub in Iran. However, there is no information about the incidence of pathological conditions associated with hepatobiliary system in this area. Therefore, this study was conducted to evaluate the incidence and pathological changes of hepatobiliary system in this region.

## Material and Methods

Eight hundred livers that were condemned during slaughter from 3062 sheep presented to Yasuj industrial slaughterhouse were used for this study. These animals were slaughtered between winter 2018 to winter 2020. The age of the sheep was estimated before slaughter by dental examination. Based on age, the sheep were divided into three groups of under one year, 1-2 year and >2 years, based on teeth formula and owner statement. It was not possible to get the exact records on breed and weight for each slaughtered animal during the study period due to poor recording systems at the slaughterhouse.

After slaughter, the liver was removed from the body and was examined for pathological abnormalities. Postmortem liver examination was performed by visual examination, palpation and

incision of liver lobes. Gross liver lesions were diagnosed based on changes of the liver color, size, consistence or presence of adhesion, necrosis, abscess or parasites.

General condition and sex of each animal were recorded, too. Tissue samples were collected from the lesions and were fixed in 10% formalin buffer. The formalin fixed pieces of tissues were processed by routine paraffin embedding technique for microscopy. Five-micron sections were cut in histopathology lab and were stained with standard hematoxylin and eosin for histopathological examination using light microscopy. Prevalence of pathological lesions was calculated and expressed as a percentage of the total number of sheep.

## Results

Out of a total of 800 sheep livers of different breed, age and sex, slaughtered at the Yasuj slaughterhouse, 120 had different pathological conditions, giving a prevalence rate of %15. None of the carcasses of these animals were condemned in postmortem inspection. Among 800 sheep liver inspected, 120 (15%) had various lesions including: Abscess 39 (%4.87), hydatid cyst 30 (%3.75), necrosis 26 (%3.25), Fasciolosis 20 (%2.5), fatty liver and cysticercosis 2 (%1.6). The results of gross and histopathological examination of the livers in this study are summarized in Table1. The prevalence of liver lesions in different ages are shown in table 2. In Abscess cases, different size abscess usually filled with creamy, foul-smelling pus were located on liver surface (Figure1). On microscopic view, fibrous capsule around the abscess and numerous neutrophils, tissue debris and necrosis were noted.

In livers infected with hydatid cyst, 1-9 centimeters cysts were noted on the liver. Most hydatid cysts were partially embedded in the liver parenchyma and some of them were fully embedded. The cysts were filled with clear to slightly turbid fluid. Some of the cysts were calcified and hard to cut (Figure 2). Parasitic membranes especially inner germinal layer followed by laminated layer and different numbers of microscopic sections. The cysts were surrounded with eosinophils. Giant cells and mononucleated inflammatory cells were surrounded by fibroblastic cells. The formation of connective tissues around the cyst and portal hepatitis fibroplasia were the other microscopic features.

Type of pathological lesion	Female	Male	Total infected	% of total infected	% of total examined
Abscess	21	18	39	%32.5	%4.87
Hydatid cyst	17	13	30	%25	%3.75
Necrosis	10	17	26	%21.6	%3.25
Fascioliasis	12	8	20	%16.6	%2.5
Fatty liver	2	0	2	%1.6	%0.25
Cysticercosis	2	0	2	%1.6	%0.25
Total	64	56	120	100%	%15

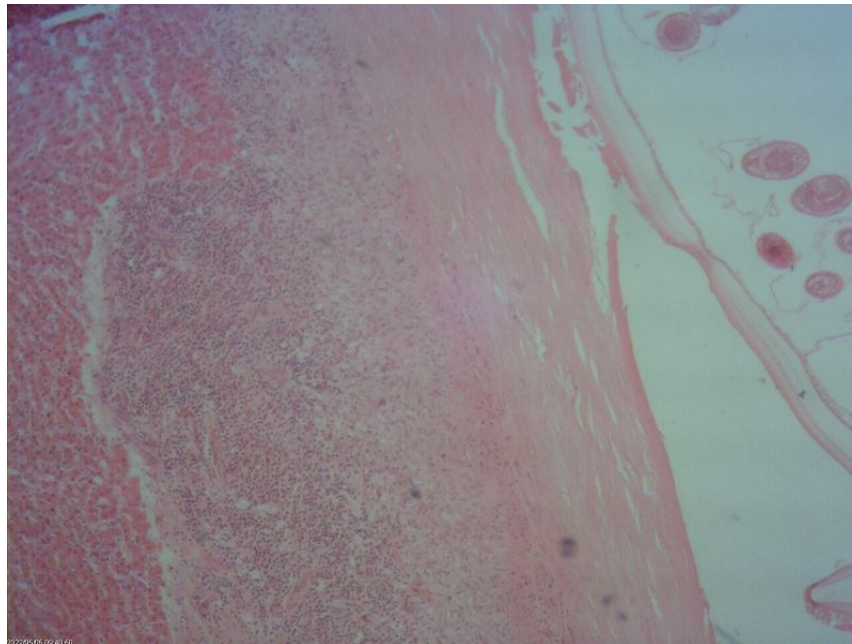
**Table 1.** Types, numbers and percentages of histopaological lesions of affected livers of sheep slaughtered in Yasuj slaughterhouse.

Type of pathological lesion	Female			Male			Total infected
Age	<1	1-2	>2	<1	1-2	>2	
Abscess	3	8	10	4	6	8	39
Hydatid cyst	1	5	11	1	2	10	30
Necrosis	3	4	3	6	4	7	26
Fascioliasis	2	3	7	2	1	5	20
Fatty liver	0	0	2	0	0	0	2
Cysticercosis	0	1	1	0	0	0	2
Total	9	21	34	13	13	30	120

**Table 2.** Prevalence of liver lesions with respect to age.



**Figure 1.** Different sizes of abscess are seen on the liver surface. Note the calcified abscess.

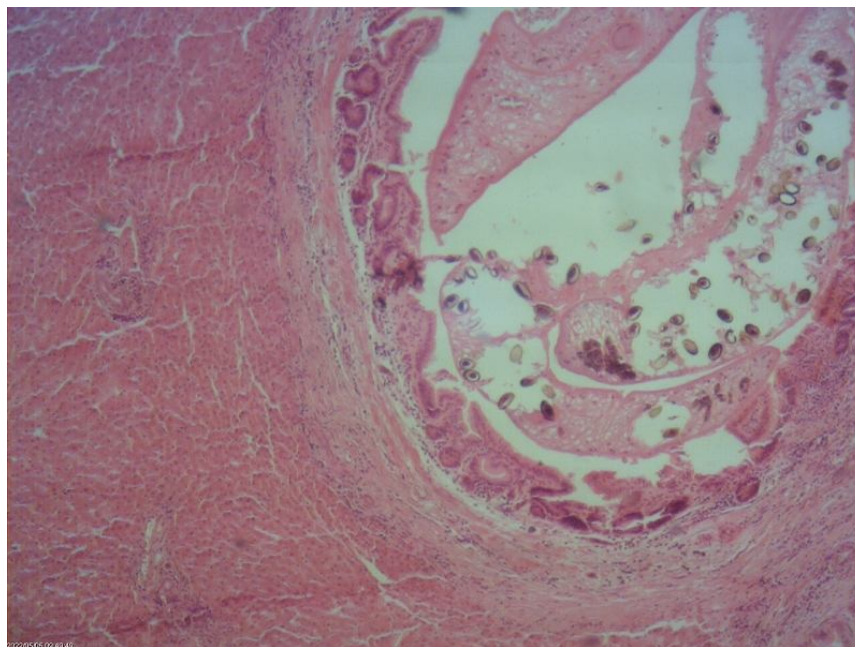


**Figure 2.** Hydatid cyst: Protoscolices (thin arrows), Hydatid cyst wall (two headed arrow), fibrotic layer with granulation tissue and inflammatory cells (thick arrows) are noted.

In cases with fluke infestation, Whitish-grey lines were abundant on liver surface. In cut surface, bile duct hypertrophy accompanied with liver parenchyma distraction and hemorrhagic lesions were noted. In microscopic view, big necrotic areas in liver parenchyma and sections of

the flukes in dilated bile ducts was seen. Fibrosis around the affected bile ducts and presence of numerous eosinophils and some mononuclear inflammatory cells were also noted (Figure 3). Areas of necrosis with different microscopic patterns of necrosis were noted in 26 cases (Figure 4).





**Figure 3.** Liver flukes (Dicrocoeliosis): Adult parasite in distended bile duct surrounded with fibrosis and infiltration inflammatory cells.



**Figure 4.** Focal necrosis on liver surface.

Fatty livers were bigger than normal pale and swollen with an irregular surface and yellowish-brown color. In microscopic view, the hepatocytes were swollen, and large spherical vacuoles were. Mild inflammation was present in one slide. In cases with cysticercosis macroscopic yellowish-white

cysts, ill-defined edges were visible in liver parenchyma. Hemorrhagic lines caused by the metacestodes larvae migration were seen on the liver surface. Fibrosis necrosis, mucous gland hyperplasia, bile duct hyperplasia and hemorrhage were also noted in microscopic examination. On macroscopic

examination, yellowish-white cysts with ill-defined edges were easily visible with the naked eye, embedded in the tissues and caused extensive local damage.

### Discussion

Livers are the most rejected organ at post-mortem meat inspection (Ali Mohamed, 2021). Liver diseases represent a serious problem and have a great impact on livestock industry and may pose health risks to meat consumers by spreading zoonotic diseases (Nyindo & Lukambagire, 2015). Liver pathological lesions may be affected by season, climate, rainfall level, routes of husbandry and feeding regimen (Tannon, 2017). We found a %15 prevalence of liver lesions in our study. The study was conducted on healthy animals, so it is possible that the prevalence of liver disease in the area be higher as the number found in our survey. Tannon reported 3.26% prevalence rates of liver lesions from Mousel, Iraq (Tannon, 2017). Ghasemian Karyak and Abassi Hormoz (2013) have reported that %5.53 of the livers were condemned in Gachsaran slaughterhouse. The difference in our study with other researchers can be related to environmental and management factors and the accuracy of liver lesion inspection (Ghasemian Karyak & Abassi Hormoz, 2013).

Older sheep had more liver lesions compared to younger ones in our study. The age influences on the occurrence of liver lesion have been reported by Ntiamoh *et al.*, and Arafat *et al.* These researchers believe that as small ruminants are being fattened for sale and slaughter that increases longer exposure of animals to feeds that some can contain aflatoxins, microorganisms and stressors cause more liver lesions in adult animals (Ntiamoh *et al.*, 2021; Arafat *et al.*, 2015). Liver lesions had a higher incidence in female sheep in our study, but the difference was not noticeable. Same results are reported by Ntiamoh *et al.*, and Arfat *et al.* This could be due to hormonal and pregnancy stress in female sheep and this fact that female sheep are slaughtered in older ages (Ntiamoh *et al.*, 2021; Arafat *et al.*, 2015).

Liver is particularly susceptible to abscesses because it receives blood from several sources (Radostits *et al.*, 2010). Ghadrddan-Mashhadi *et al.*, have reported a %8.7 of liver abscess in sheep in

Ahwaz, Iran and noted that the condition was significantly higher in female sheep. These researchers believe that the high incidence of this condition in female animals is related to their higher age at slaughter and feeding risky diet before slaughter. In sheep, liver abscess occurs in all breeds, sexes and ages but the disease usually develops during the early stages of fattening when lactic acid from change in ration occurs (Ghadrddan-Mashade *et al.*, 2006). Lack of macro or microelements has an important role in the formation of hepatic abscess in young animals, liver abscesses may occur as a sequel of an umbilical infection but in all ages, they may occur in cases of pyaemia as well as low vitamin A content of the diet. Most of the sheep in Khohkeloyeh and Boyer Ahmad are free grazing animals and the high prevalence of liver abscess is reasonable. Based on histopathological surveys, the livers with liver flukes were diagnosed as Fasciolosis (18 cases) and dicrociliu (2 cases). Human fasciolosis outbreak has been reported in Iran that makes this fluke infestation more important (Behzadifar *et al.*, 2019). On the other hand, liver condemnation due to fasciolosis shows the importance of this infection in terms of economic losses.

A wide range of fasciolosis (1% to 28.7%) has been reported from Iran. Moshfe and bagheri (2003) have reported a %17.6 infection with Fasciola in Yasuj (Moshfe & bagheri, 2003). The lower prevalence in our study can be attributed to environmental and management factors. Our study was done after several years of decrease in rainfall that can lead to unfavorable conditions for snails as the intermediate host. Another reason could be better management of sheep in this area and more use of anti-parasite drugs. Higher incidence of liver fasciolosis in female sheep agrees with what is reported (Piri *et al.*, 2017). The overall prevalence of cystic echinococcosis in slaughtered sheep livestock in Iran is %4.3 (Vaisi-Raygani *et al.*, 2021). Bagheri has reported a %2.1 prevalence of hydatid cyst in Yasuj slaughterhouse (Bagheri, 2003). In another study, the prevalence of hydatid cyst has been reported to be %4.8 in Kohkeloyeh and Boyer Ahmad in 2008 (Mozeni, 2008). The prevalence rate of hydatid cyst was lower in our study that can be related to better elimination and prevention of access of stray dogs to raw offal's.

Oryan *et al.*, has reported a 17.52% infection of sheep with *Cysticercus tenuicollis* and %45.52 infection of hydatid cyst in Shiraz Slaughterhouse (Oryan *et al.*, 2012). We didn't find any record about Cysticercosis in Yasuj. The difference between our study and Oryan *et al.*, can be attributed to differences in environmental conditions that are conducive to the perpetuation of the parasite, abundance of infected definitive host, livestock husbandry, stocking rate, nature of the pasture and grazing patterns of animals. Same histopathological features of Cysticercosis have been reported to Bamorovat *et al.* In conclusion, the results of our study demonstrate the high prevalence of liver lesions, specially abscess and parasite infestations in Yasuj that is regarded a great concern for both human and sheep health and should be considered for therapeutic and preventive programs to overcome liver problems.

#### Conflict of interest

Nil.

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## بررسی ماکروسکوپی و هیستوپاتولوژیک ضایعات کبدی و شیوع آن در گوسفندان کشتار شده در کشتارگاه یاسوج، ایران

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### چکیده

**زمینه و هدف:** این مطالعه برای بررسی میزان ضایعات کبدی در گوسفند های کشتار شده در کشتارگاه یاسوج انجام شد. **مواد و روش ها:** زمان انجام این مطالعه بین زمستان ۱۳۹۷ تا زمستان ۱۳۹۰ بود. در مجموع ۸۰۰ کبد از ۳۰۶۲ گوسفند کشتار شده دارای یک یا چند ضایعه کبدی جهت مطالعه ماکروسکوپی و میکروسکوپی تشخیص داده شد. **یافته ها:** از ۸۰۰ کبد مورد مطالعه پانزده درصد مبتلا به ضایعات کبدی بودند. در مطالعه ماکروسکوپی و میکروسکوپی این ضایعات ۳۹ مورد (۴.۹٪) آبسه کبدی، کیست هیداتید ۲۸ مورد (۳.۷۵٪)، فاسیولوز ۲۰ مورد (۲.۵٪)، کبد چرب (۲.۵٪) و سیستی سرکوز ۲ مورد (۰.۲۵٪) تشخیص داده شد. **نتیجه گیری:** مطالعه ما میزان بالای ضایعات کبد به خصوص آبسه و انگل در گوسفند در کشتارگاه یاسوج و لزوم توجه بیشتر به پیشگیری و درمان این ضایعات را نشان می دهد.

**واژه های کلیدی:** ضایعات کبد، پاتولوژی، گوسفند، یاسوج

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