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Hygienic, Pathological and Economic Impacts of Liver Lesions at some Slaughterhouses in Suez Canal Region, Egypt

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Abstract

Liver is budget-friendly and full of nutrients including protein, and micronutrients as vitamin B12, vitamin A, riboflavin, copper, and iron. Liver appeared as the most affected organ among offal of slaughtered animals. This work had studied the pathological lesions in a total of 85200 different slaughtered animals in many providence abattoirs in Suez Canal region through year 2021. The direct economic loss from organs condemnation (Kg) was also assessed. In 2021, a total of 4200, 64800 and 16200 camels, cattle, and sheep respectively were slaughtered for domestic consumption. The percentage of liver lesions from camels, cattle, and sheep were 1.04%, 3.62%, and 2.85 respectively. The total economic losses due to the liver condemnation of camel, cattle and sheep were 31680 LE (2023$), 1313760 LE (83893$) and 138600 LE (8851$) respectively. The total economic loss due to liver condemnation reached 1484040 LE (94766$). The results of the current study made clear the need for the creation of an efficient program to combat Egypt's meat-related social problems.

KEYWORDS
Abattoir, Economic loss, Cattle, Camel, Liver.

INTRODUCTION

Abattoir has a great importance to prevent the transmission of diseases and affections to the human. The necessary veterinary inspection has a great position in defending human-being from being contaminated with zoonotic meat-borne diseases (Abdelaziz *et al*., 2021). In Egypt, the most animal species admitted for slaughtering are cattle, sheep, and camel. In concern to edible offal, liver is considered to be of the most expensive and nutritive value. Inspection of slaughtered animal governed by the legislation No. 517, 1986, Egyptian Guidelines for camel, cattle, and sheep inspection.

There are risk results from consuming offal of affected slaughter animals which are detected in the slaughterhouses (Ahmad and Elsharawy, 2018). Grossly, liver appeared as the most affected organ followed by lung, kidney, and spleen (Jahan *et al*., 2018). Parasitic diseases have a critical effect on human and livestock in developing nations (Abdulhameed *et al*., 2018). Fascioliasis is major parasitic disease that has a considerable effect on human health and the safety of meat (Aminzare *et al*., 2018; Pezeshki *et al*., 2018). It may be considered by humans as a serious public health problem (Baharsefat *et al*. 2007). Other than parasite diseases, there are different types of disease that affect liver leading to liver inflammation which known as hepatitis which may be acute or chronic (Awah *et al*., 2007; Piedrafita *et al*., 2010), and finally cause economic losses for slaughtered animals.

Slaughterhouse rules are a significant control point in the chain of livestock production and are crucial for the detection of diseases that are relevant for both public health and economic reasons (Raji *et al*., 2010). For enhancing animal health, preventing disease, and minimizing economic losses, abattoirs can offer a preliminary baseline of data for future monitoring of the most important infectious diseases.

Each year, thousands of animals are slaughtered and processed into meat for human consumption in Egypt's Suez Canal Governorates.

To ascertain the prevalence of the pathological lesions affecting their livers, insufficient research has been done on animal species brought in for slaughter. In order to calculate the financial losses caused by liver condemnation, as well as to identify the most pathological lesions affecting the liver of three animal species; camels, cattle, and sheep at certain province abattoirs in the Suez Canal region over the course of one year (2021), this study was carried out.

MATERIALS AND METHODS

Study population

Through 2021, this work had examined the pathological lesions in 356267 various slaughtered animals from numerous state-run abattoirs in the Suez Canal region, Egypt. According to the ante-mortem and postmortem inspection methodology, data on the prevalence of liver gross lesions were gathered throughout the study's inspection period.

Examining the remains of dead animals at the Providence

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abattoir, qualified vets inspected the meat under the tight supervision of the municipal government. Before or shortly before being slaughtered, all animals that were provided for consumption were physically examined. While the animals were at rest or moving, checks were done to look for any obvious signs of illness. Visual examination of the carcasses and organs was part of the post-slaughter inspection, and the liver received particular attention by probing and incision.

Macroscopic and microscopic pathological lesions

According to the Egyptian Guidelines for Inspection of camel, cattle, and sheep meat inspectors recorded the liver diseases they saw and rejected. All liver lesions were gathered, their average weight was calculated, and digital images were taken. Each lesion was fixed in 10% formalin before the paraffin embedding procedure was used to prepare the section A 5 µm thick paraffin section was cut, and haematoxylin and eosin stain were applied. Histological findings were reported after microscopically examining the stained slice.

Economic loss assessment

The total average weight of the organs and the average retail price of an organs express in Egyptian pounds were used to calculate the direct economic loss (Kg) from organ condemnation.

Statistical analysis

Records for postmortem and meat inspections were collected, entered, revised, and verified. The numbers of lesions shown in coloured images were used to quantify the frequency of pathological anomalies. Using Microsoft Excel version 2003, an X^2-test was used to look at the seasonal trend over the entire study period. Seasonal differences were analyzed, and a P value of 0.05 or lower was deemed statistically significant.

RESULTS AND DISCUSSION

Annually in Egypt, there is increasing in human population, joined with increasing pressure on needs of meat. In 2021, a total of 4200, 64800 and 16200 camels, cattle, and sheep respectively were slaughtered at Suez Canal abattoirs for domestic consumption. The results in Table 1 revealed the number and percentage of liver lesions in slaughtered animals. The percentage of liver lesions from camel, cattle, and sheep were 1.04 %, 3.62 %, and 2.85 % respectively.

Table 1. Number and percentage of liver lesions in slaughtered animals.

Animal	Inspected Liver		
	Total No.	Number (%)	Lesions (%)
Camel	4200	4156 (98.96)	44 (1.04 %)
Cattle	64800	61806 (96.38%)	2346 (3.62 %)
Sheep	16200	15576 (97.15%)	462 (2.85%)

Close monitoring of meat hygiene, including proper implementation of meat inspection procedures during slaughter, should be a vital part of the national public health protection program (Biffa *et al*, 2010). In view of the reality, the biggest laboratory on the earth is the abattoirs; serious liver lesions problems which may develop affecting to the animal production and public health importance of zoonotic diseases (Abdel-Rassol *et al*., 2022). This reflects the importance of meat inspection at slaughterhouses from which is the removal of meat and offal which unsafe for human consumption (Declercq, 2018).

The results in Table 2 showed the incidence of liver lesions among slaughtered animals. The total liver lesions in camels, cattle and sheep were 44, 2346, 462 respectively. The incidence of fasciolasis among slaughtered camels, cattle and sheep were 0 (0 %), 1560 (66.50 %) and 175 (37.88 %) respectively. Hepatic abscesses affections among camels, cattle and sheep were 0 (0 %), 134 (5.71%) and 36 (7.79 %) respectively. Hepatic cirrhosis among camels, cattle and sheep were 20 (45.46 %), 200 (8.53 %) and 41 (8.87 %) respectively. Hepatic necrosis among slaughtered camels, cattle and sheep were 3 (6.82 %), 175 (7.46 %) and 23 (4.98 %) respectively. Hepatitis among slaughtered camels, cattle and sheep were 0 (0 %), 120 (5.12 %) and 23 (4.98%) respectively. Meanwhile, liver nodule affections among camels, cattle and sheep under study were 21 (47.73 %), 157 (6.69%) and 164 (35.50 %) respectively.

Table 2. Incidence of liver lesions among slaughtered animals.

Livers lesions	Camel		Cattle		Sheep	
	No.	%	No.	%	No.	%
Fasciolasis	0	0	1560	66.5	175	37.88
Hepatic abscesses	0	0	134	5.71	36	7.79
Hepatic cirrhosis	20	45.46	200	8.53	41	8.87
Hepatic necrosis	3	6.82	175	7.46	23	4.98
Hepatitis	0	0	120	5.12	23	4.98
Liver nodule	21	47.73	157	6.69	164	35.5
Total	44	100	2346	100	462	100

Meat inspection is considered as the safeguard of human and animals` health. One of its importance is diagnoses of zoonotic diseases as it is regarded as the world's largest laboratory. Huge information collected from slaughter animals has led to several studies on animal health based on results from slaughterhouses. Liver health is the most significant criterion for classifying meat from camels, cattle, and sheep in terms of their suitability for human consumption. It cleared that the percentage of animals with liver lesions varies according to countries (Mwabonimana *et al*., 2008; Belkhiri *et al*., 2009; Raji *et al*., 2010; Alawa *et al*., 2011).

The liver in Figure 1 showed hepatic abscess in cattle liver showing a well circumscribed pale yellow area of pus collection with small scattered abscessiation around the main one.

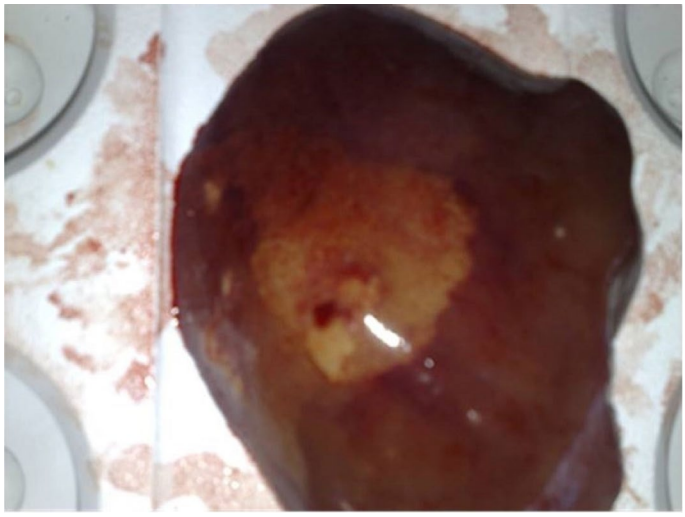

Fig. 1. Hepatic abscess in cattle liver showing well circumscribed pale yellow area of pus collection with small scattered abscessiation around the main one.

The liver in Figure 2 showed hepatic necrosis, multifocal pale areas (1x1 cm) are scattered on the liver surface.

The liver in Figure 3 showed parasitic hepatitis & hepatic portal cirrhosis and very small distinctive surface hepatic abscesses.

The liver in Figure 4 showed Liver characteristic by their pro-

file has considerably changed due to the multiple light brown nodules, prominent under the capsule. In between the nodules large amounts of fibers tissue, infiltrated by biliary pigments, give it a yellow color.

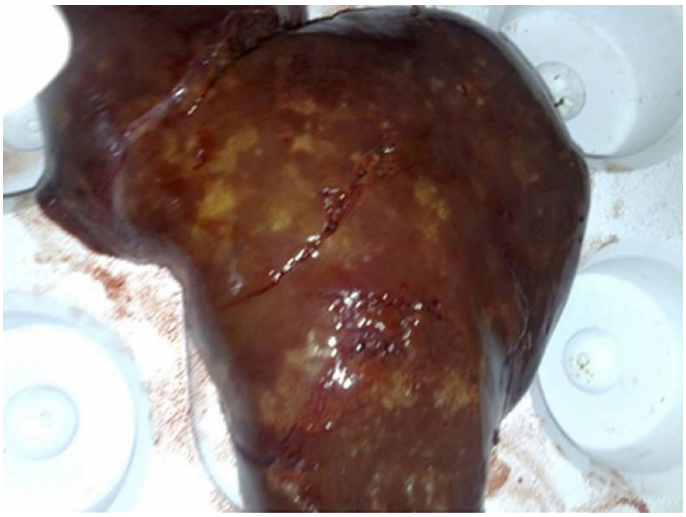

Fig. 2. Hepatic necrosis, multifocal pale areas (1x1 cm) are scattered on the liver surface.

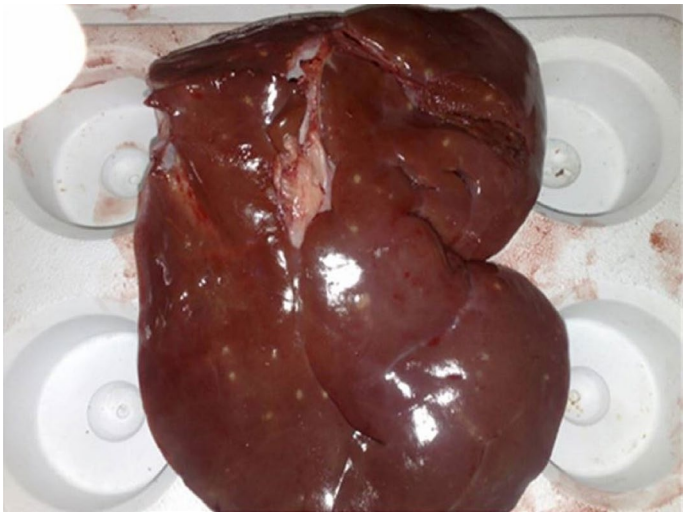

Fig. 3. Parasitic hepatitis and hepatic portal cirrhosis and very small distinctive surface hepatic abscesses (1x1 mm).

Fig. 4. Liver showing multiple light brown nodules under the capsule. In between them a large amount of fibrous tissue is seen and infiltrated by yellowish discoloration of biliary pigments.

From 4200 slaughtered camels, the liver nodules were the highest lesion (21, 47.73%) followed by hepatic cirrhosis (20, 45.46%), while in the slaughtered cattle and sheep the fasciolasis was the highest lesion 1560 (66.50%) and 175 (37.88%) respectively.

Table 3. Incidence of pathological lesions of condemned livers among slaughtered animals.

Pathological lesions	Camel		Cattle		Sheep	
	No.	%	No.	%	No.	%
Hepatic abscesses	3	12	4	14	6	21
Hepatic necrosis	3	12	6	21	4	14
Hepatic cirrhosis	12	48	10	36	9	31
Hepatic nodules	7	28	8	29	10	34
Total	25	100	28	100	29	100

The fasciola infestation of the liver is one of the most important reasons of liver discarding. Fasciolasis was the leading cause of liver condemnation and was responsible for 52.6 and 18.9% of total liver condemnation in cattle and sheep respectively (Mellau *et al*., 2010). The percentage of liver lesions due to fasciolasis varied according to many factors such as seasonal variation, animal species, age and immunity, grazing habits, and climatic conditions (Kadir and Rasheed, 2008; Taha, 2018; Tas *et al*., 2018; El-Meleh, 2019).

Higher prevalence of fascioliasis in buffalo carcasses were recorded by Mohammed and Maky (2020) and Abdelaziz *et al*. (2021), while higher prevalence of fascioliasis in cattle carcasses (0.07 and 0.14% for buffaloes and cattle carcasses, respectively) where recorded by Abdulhakim and Addis (2012) and Elmonir *et al*. (2015).

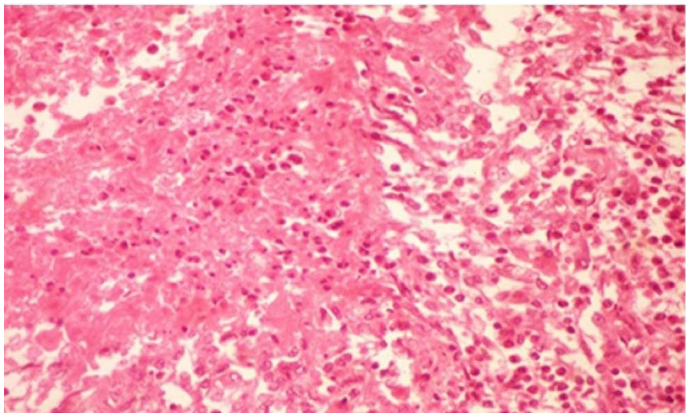

Fig. 5. Liver showing hepatic abscess consisting of central area of liquifactive necrosis surrounded by living and dead neutrophils (H&E.X250).

Several diseases/conditions mainly fasciolasis, cysticercosis, necrosis, abscess, calcification, hemorrhages, liver cirrhosis, hydatidosis, and other miscellaneous causes were the main causes for liver condemnation with great concern to fasciolosis (Mohamed, 2021) while hepatic cirrhosis was the chief cause of liver condemnation according to Ahmed *et al*. (2013).

The results in Table 3 showed the incidence of pathological lesions of condemned livers among slaughtered animals. The total pathological liver lesions in camels, cattle and sheep were 25, 28, 29 respectively. The incidence of hepatic abscesses among slaughtered camels, cattle and sheep were 3 (12%), 4 (14%) and 6 (21%) respectively. The incidence of hepatic necrosis among slaughtered camels, cattle and sheep were 3 (12%), 6 (21%) and 4 (14%) respectively. The incidence of hepatic cirrhosis among slaughtered camels, cattle and sheep were 12 (48%), 10 (36%) and 9 (31%) respectively. While the incidence of hepatic nodules among slaughtered camels, cattle and sheep were 7 (28%), 8 (29%) and 10 (34%) respectively.

In Figure 5, liver showed hepatic abscess consisting of central area of liquefactive necrosis surrounded by living and dead neutrophils (H&E. X250). In Figure 6, liver showed massive tissue destruction, necrosis and living and dead neutrophils (H&E, X400). In Figure 7, liver showing hepatic portal cirrhosis (fibrosis), eosinophils mixed with few mononuclear cells infiltration associated with bile duct hyperplasia (H&E, X200). In Figure 8, liver showing parasitic granuloma containing dead calcified larvae and surrounded by massive number of eosinophils (H&E, X400).

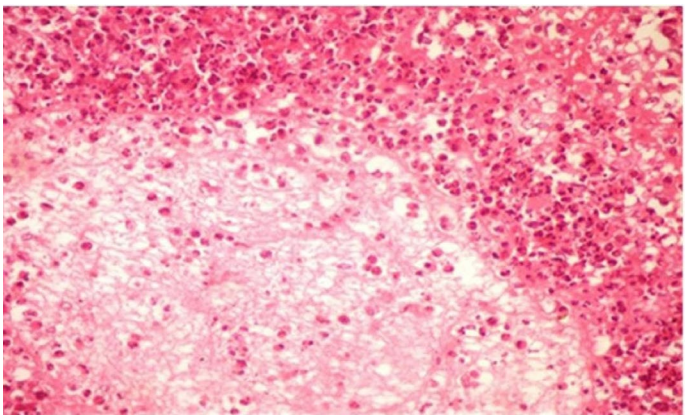

Fig. 6. Liver shows massive tissue destruction, necrosis and living and dead neutrophils (H&E, X400).

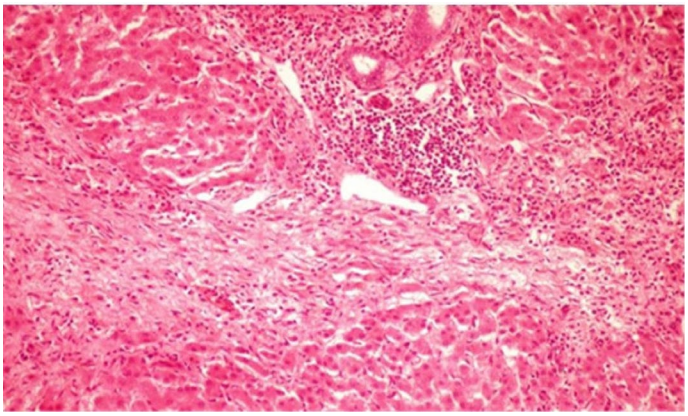

Fig. 7. Liver showing hepatic portal cirrhosis (fibrosis), eosinophils mixed with few mononuclear cells infiltration associated with bile duct hyperplasia (H&E, X200).

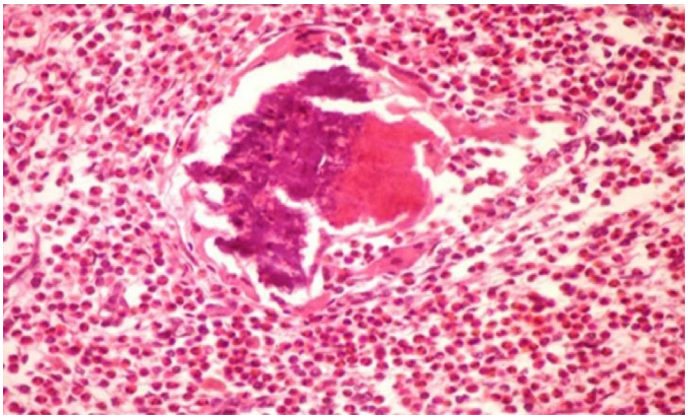

Fig. 8. Liver showing parasitic granuloma containing dead calcified larvae and surrounded by massive number of eosinophils (H&E, X400).

The results in Table 4 estimated the economic loss due to liver condemnation. The loss calculated by the Egyptian pound. The total weight loss of camel, cattle and sheep condemned liver were 264, 9384 and 924 kg, respectively therefore the economic losses were 31680 LE (2023 $), 1313760 LE (83893 $) and 138600 LE (8851$) respectively. The total economic loss due to liver condemnation reached 1484040 LE (94766$).

Table 4. The economic loss due to liver condemnation.

Animal species	No of condemned liver	Weight / Kg	Economic loss Egyptian currency LE
Camel	44	264	31680
Cattle	2346	9384	1313760
Sheep	462	924	138600
Overall TEL			1484040

Price of Camel liver / kg: 120 LE; Price of Cattle liver / kg: 140 LE; Price of Sheep liver / kg: 150 LE.
• The price shown has been set as a compensatory price for executions by Ismailia Governorate, 2021.

The results obtained were lower than that reported by Yatswakoa and Alhaj (2017); Dahourou *et al.* (2018); Mohammed and Maky (2020) and Ola-Fadunsin *et al.* (2020). While they were higher than those reported by Abunna *et al.* (2010) and Abdelaziz *et al.* (2021). The differences in the results were related to the prevalence of liver condemnation in the various geographic regions, animal feeding practices, the quantity of animals slaughtered, the degree and progression of the disease, and regional and annual liver prices.

CONCLUSION

From the obtained results it could be concluded that the causes of liver condemnation may differ from slaughtered animal to another one. In Suez Canal region abattoirs, Fascioliasis stands on the top of liver condemnation in cattle and sheep, liver nodules have the highest incidence in camel liver followed by hepatic cirrhosis. These hepatic lesions need more attention from the concerned authorities to get rid of them. From a purely economic point of view, infection with Fasciola is the cause of the highest losses in the slaughtered animals among parasite infection.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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