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A RETROSPECTIVE SURVEY WITH POST MORTEM EXAMINATION OF LIVER FUKES AND LUNG HYDATIDOSIS IN LIVESTOCK IN BABIL, IRAQ

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Abstract

A retrospective study with post mortem examination materialize from 2013 to 2018 to appraise the prevalence of lung hydatidosis and liver flukes in ruminants (cattle, sheep, goat) butcher at the abattoirs of Babil province, Iraq. A total of 382315 animals slaughtered in the 5-year period 6.637 % of livers were infested with liver flukes and 7.75% of lungs infested with hydatid cyst. A significant difference in the pervasiveness of liver flukes were attended among studied animals ($P \geq 0.001$) and the highest and lowest prevalence were detected in cattle, goat and sheep (3.665% /1305 % /1.669 %) respectively. Data showed significant seasonal pattern for fascioliasis ($P \geq 0.001$) in sheep, goat and cattle (1.74/1.39/3.55)%, (1.28/1.43/4.02)%, (1,54/0.68/3.52)%, (1.94 /1.99/ 3.48) % slaughtered during spring, summer, fall and winter respectively. Post mortem findings of lung hydatidosis recorded presence of hydatid cysts with variable number and size appears as a white unilocular fluid filled cysts while Gross finding of liver fasciolosis reveled presence of cholangitis, pericholangitis with fibrosis as well as necrotic parenchyma with dark red hemorrhagic tracts of immature flukes migration tracts through liver parenchyma. This survey provides standard data for the prospective control of these potentially important parasitic infections in the region.

Key words : fascioliasis, abattoirs, liver flukes, post mortem.

Introduction

Infestation with parasitic diseases designed as a crucial trouble in livestock industry which is an essential part of the agricultural products which produces economic loss worldwide. One of the most important ruminant's helminthic parasites are *Fasciola* spp. founding in many parts of the world (Kantzoura *et al.,* 2011; Massoud *et al.,* 2012). *F. hepatica* has a sophisticated dissemination, whereas *F. gigantica* construct in Africa and Asia, despite in such cases the flukes ecological requirements and their snail intermediate host are specific (Ashrai *et al.,* 2006).

Infestation with liver flukes causes abortion, parasitized livers condemnation, milk and meat manufacturing reduction, expense of control measures and mortality escalation (Carnevale *et al.,* 2013). Cattle, sheep and goat are principal definitive hosts of these parasites. Though, humans and other mammelians, may be infected as inadvertent host (McCann *et al.,* 2010). The life cycle of *Fasciola* spp. is indirect implicate humans, wild and domestic herbivorous mammals as definitive hosts while, freshwater gastropods of the family of Lymnaeidae as intermediate hosts (*Andrews*., 2009).

Echinococcosis is also called hydatid disease, hydatidosis, or echinococcal disease, is a parasitic disease of tapeworms caused by infection with either *Echinococcus granulosus* or *E. multilocularis*. *Echinococcosis* is classified as either alveolar or cystic echinococcosis. The disease firstly described by the Babylonians in Bible (بيوابچلا, 1999). It is endemic in Iraq. The disease recorded in Erbil, North Iraq by Benyan *et al.,* (2013) and in Basrah province with highly prevalence (Murtaza, *et al.,* 2017). The disease often starts without symptoms depend on the cyst's location and size and

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may last for a year. Alveolar echinococcosis (AE) is caused by long tapeworm infection, *Echinococcus multilocularis*, a ~1-4 millimeter which is the larval stage, found in foxes, coyotes, and dogs (definitive hosts), *E. multilocularis* intermediate hosts are small rodents. Alveolar disease usually commence in the liver then disperse to other body parts such as the lungs or brain (WHO, 2014).

Visceral tissues are most frequently infected organs with larval stages (hydatids) especially the liver, in the intermediate hosts, beside other locations, including brain and long bones. When the intermediate host swallowed the egg, it hatches under the influence of the intestinal juice with the presence of enzymes (Pancreatin and Trypsin) to release a small, hooked embryo (oncosphere) which evaginates and attaches within the gut wall, and then penetrates the intestinal wall.

The oncosphere has mucopolysaccharide and hyaluronidase that facilities its transmission through the host tissue (Faleh, 2002), then oncosphere removes through the lymphoid vessel to the circulatory system or through peritoneal cavity penetration and reaches different organs, particularly liver because its highly vascularity and sinusoids dilation make it suitable site for implantation, beside liver tissue is soft and easily penetrated by the oncosphere (Al-malki, 2012), Once oncosphere develops into metacestode which conceder individual fluid-filled cysts, surrounded by a fibrous wall (ectocyst) that protect the fragile hydatid like a tire protects an inner tube, blood vessels are obliterated within the developing pericyst, the host tissue adjacent to the cyst arise a chronic inflammatory reaction with mononuclear cells infiltration (Faleh, 2002). The germinative membrane which is the inner layer of the cyst rich with DNA (Faleh, 2002), some cysts can become much bigger than 1-7 cm in diameter, a few cysts die as the animal gets older forming scars. Often, dead cysts become either caseous (filled with cheesy material), or they become calcified (Gareth, 2007). Some cysts are sterile; either after bacterial infection, calcification or not produce brood capsules (Paredes *et al.,* 2011). Although most cysts occur in the liver, it may be exist in lungs or less often in other internal organs including the bones (Ahuja *et al.,* 2001). Alveolar echinococcosis have more health threatening by causing parasitic liver, lungs and brain tumors, if left untreated, Alveolar echinococcosis can be fatal (CDC, 2012).

Materials and Methods

This study is a reflective survey overlapping a period of 5 years from 2013 to 2018, daily documentation for cattle, sheep and goats condemnation in all municipal abattoirs of livestock animals belonging to Alhela veterinary hospital, Babil (middle of Iraq) were used as data source. Meat inspector (veterinarian) examined each slaughtered animal individually due to his ordinary tasks as part of an ongoing scrutiny system,. The livers and lungs were inspected according t o Ogambo-Ongoma (1972) to fasciolosis and dicrocoeliosis recognition and parasites characteristic morphological identiflcation (Soulsby 1982; Reinecke 1983).

Parasite species identification

Counting on morphological features of parasite, identification of the recovered agents species classified in to *Fasciola hepatica*, *Fasciola gigantica* and unidentified or immature forms of liver fluke (Urquhart, 1996).

Postmortem Examination

During postmortem, carcasses examination (especially lung and liver) was conducted by visualization, palpation, and incisions, where necessary, detecting presence of cyst or parasites and other gross abnormalities. Pathological lesions were differentiated according to guidelines on meat inspection for developing countries (FAO, 2007). The recorded data was used to quotation the parasites pervasiveness rate. The prevalence was collected monthly to indicate any seasonal trends.

Results

Slaughtered livestock quantum number 382315 (146439 cattle, 59730 goats and 176146 sheep) were included in this study. The data showed that a total number of infected animals with liver fluke in spring, summer, fall and winter were (381, 416, 356, 356) respectively whereas a total number of infected animals with lung hydatidosis were (400, 480, 444, 371) respectively (table 1).

Counting, the data reveals that cattle, sheep and goats are infected with Echinocococcus parasites. For the period of 2013-2014, 2014-2015, 2015-2016,2016-2017, 2017-2018, 2018-2019 1.146% (278/25045), 0.146% (40/27311), 0.563% (160/28435), 0.574 (132/23007), 0.633% (133/21025) and 0.606% (131/21616) respectively of slaughtered cattle were infected with lung hydatidosis and 0.283% (38/13415), 0.225% (26/11571), 0.262% (32/12224), 0.243% (14/5770), 0.447% (31/6931) and 0.448% (44/9819) respectively of slaughtered goats and 0.658% (163/24764), 0.205% (45/21924), 0.414% (117/28279), 0.287% (84/29305), (0.363% (117/32227) and 0.255% (101/39647) respectively of slaughtered sheep hydatidosis (tables: 2, 3 and 4).

As well as, our results showed that cattle, sheep and

Table 1: Amount number of slaughtered animals annually from 2013 to 2019 in the abattoirs of Babil.

Species	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	Total
Sheep	24764	21924	28279	29305	32227	39647	176146
Goat	13415	11571	12224	5770	6931	9819	59730
Cattle	25045	27311	28435	23007	21025	21616	146439
Total	63224	60806	68938	58082	60183	71082	382315

Table 2: Seasonal prevalence rate (%) of lung hydatidosis with total number of slaughtered cattle at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	cattle	5874	64	1.09%	6607	86	1.30%	6770	66	0.97%	5794	71	1.23%	25045	287	1.146%
2014-2015	cattle	6171	6	0.10%	6916	11	0.16%	7490	14	0.19%	6734	9	0.13%	27311	40	0.146%
2015-2015	cattle	6623	36	0.54%	7557	35	0.46%	7347	49	0.67%	6908	40	0.58%	28435	160	0.563%
2016-2017	cattle	5798	35	0.60%	5972	38	0.64%	5582	33	0.59%	5655	26	0.46%	23007	132	0.574%
2017-2018	cattle	5133	31	0.60%	5758	44	0.76%	5442	31	0.57%	4692	27	0.58%	21025	133	0.633%

Table 3: Seasonal prevalence rate (%) of lung hydatidosis with total number of slaughtered sheep at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	sheep	7360	50	0.68%	7086	49	0.69%	5660	35	0.62%	4658	29	0.62%	24764	163	0.658%
2014-2015	sheep	6062	9	0.15%	6291	14	0.22%	5103	16	0.31%	4468	6	0.13%	21924	45	0.205%
2015-2016	sheep	7723	28	0.36%	8210	34	0.41%	6718	32	0.48%	5628	23	0.41%	28279	117	0.414%
2016-2017	sheep	6924	21	0.30%	8650	20	0.23%	7731	25	0.32%	6000	18	0.30%	29305	84	0.287%
2017-2018	sheep	8032	30	0.37%	9510	36	0.38%	7444	27	0.36%	7241	24	0.33%	32227	117	0.363%

Table 4: Seasonal prevalence rate (%) of lung hydatidosis with total number of slaughtered goat at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	goat	3357	6	0.18%	4025	15	0.37%	3187	7	0.22%	2846	10	0.35%	13415	38	0.283%
2014-2015	goat	1778	3	0.17%	3192	7	0.22%	3641	10	0.27%	2960	6	0.20%	11571	26	0.225%
2015-2016	goat	2998	9	0.30%	3559	5	0.14%	2979	9	0.30%	2688	9	0.33%	12224	32	0.262%
2016-2017	goat	1756	2	0.11%	1342	2	0.15%	702	6	0.85%	1970	4	0.20%	5770	14	0.243%
2017-2018	goat	1353	6	0.44%	2456	11	0.45%	2192	9	0.41%	930	5	0.54%	6931	31	0.447%

Table 5: Seasonal prevalence rate (%) of liver flukes with total number of slaughtered cattle at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	cattle	5874	53	0.90%	6607	103	1.56%	6770	85	1.26%	5794	60	1.04%	25045	301	1.202%
2014-2015	cattle	6171	6	0.10%	6916	7	0.10%	7490	4	0.05%	6734	9	0.13%	27311	26	0.095%
2015-2016	cattle	6623	50	0.75%	7557	48	0.64%	7347	68	0.93%	6908	58	0.84%	28435	224	0.788%
2016-2017	cattle	5798	46	0.79%	5972	32	0.54%	5582	41	0.73%	5655	39	0.69%	23007	158	0.687%
2017-2018	cattle	5133	33	0.64%	5758	40	0.69%	5442	15	0.28%	4692	20	0.43%	21025	108	0.514%

goats in babil province are infected with liver fluke parasites. For the period of 2013-2014, 2014-2015, 2015-2016,2016-2017, 2017-2018 and 2018-2019, 1.202% (301/25045), 0.095% (26/27311), 0.788% (224/28435), 0.687% (158/23007), 0.514% (108/21025) and 0.379% (82/21616) respectively of slaughtered cattle were infected with liver fluke and 0.552% (74/13415), 012% (13/ 11571), 0.164%(20/12224), 0.000% (0/ 5770), 0.375% (26/6931) and 0.102% (10/9819) respectively of slaughtered goats were infected with liver fluke and 0.662% (164/24764), 0.091% (20/21924),0.332% (94/ 28279), 0.256% (75/29305), 0.205% (66/32227) and 0.121% (48/39647) of slaughtered sheep were infected with liver fluke (table 5, 6 and 7).

Table 6: Seasonal prevalence rate (%) of liver flukes with total number of slaughtered sheep at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	sheep	7360	57	0.77%	7086	36	0.51%	5660	33	0.58%	4658	38	0.82%	24764	164	0.662%
2014-2015	sheep	6062	9	0.15%	6291	7	0.11%	5103	3	0.06%	4468	1	0.02%	21924	20	0.091%
2015-2016	sheep	7723	30	0.39%	8210	18	0.22%	6718	25	0.37%	5628	21	0.37%	28279	94	0.332%
2016-2017	sheep	6924	16	0.23%	8650	17	0.20%	7731	18	0.23%	6000	24	0.40%	29305	75	0.256%
2017-2018	sheep	8032	16	0.20%	9510	25	0.26%	7444	12	0.16%	7241	13	0.18%	32227	66	0.205%

Table 7: Seasonal prevalence rate (%) of liver flukes with total number of slaughtered goat at period from 2013 to 2018.

Year	Animal	Spring			Summer			Fall			Winter			Total		
		no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%	no.	inf.	%
2013-2014	goat	3357	27	0.80%	4025	24	0.60%	3187	4	0.13%	2846	19	0.67%	13415	74	0.552%
2014-2015	goat	1778	3	0.17%	3192	5	0.16%	3641	4	0.11%	2960	1	0.03%	11571	13	0.112%
2015-2016	goat	2998	6	0.20%	3559	4	0.11%	2979	4	0.13%	2688	6	0.22%	12224	20	0.164%
2016-2017	goat	1756	0	0.00%	1342	0	0.00%	702	0	0.00%	1970	0	0.00%	5770	0	0.000%
2017-2018	goat	1353	3	0.22%	2456	12	0.49%	2192	2	0.09%	930	9	0.97%	6931	26	0.375%

Table 8: Prevalence of lung hydatidosis (%) and liver fascioliasis (%) during 5 years (2013-2018).

Date of slaughtering	Lung infection (%)	Liver infection (%)
2013-2014	0.693 A	0.803 A
2014-2015	0.187 C	0.613 B
2015-2016	0.415 B	0.430 C
2016-2017	0.395 B	0.317 C
2017-2018	0.482 B	0.384 C

Table 9: Prevalence of lung hydatidosis (%) and liver fascioliasis (%)according to kind of animals.

Kind of animal	lung infection (%)	liver infection (%)
Goat	0.310 C	0.873 A
Cattle	0.611 A	0.341 B
Sheep	0.383 B	0.314 B

Table 10: Prevalence of lung hydatidosis (%) and liver fascioliasis (%) according to season.

slaughtering season	Lung infection (%)	Liver infection (%)
Spring	0.399 A	0.516 A
Summer	0.438 A	0.539 A
Fall	0.475 A	0.426 A
Winter	0.426 A	0.558 A

The averages of traits which have carried similar letters vertically indicates no significant differences at 0.05 or 0.01.

This study revealed that cattle, sheep and goats in Babil province were infected with liver fluke parasites for the period of 2013-2014, 2014-2015, 2015-2016, 2016-2017 and 2017-2018) (0.803 A, 0.613 B , 0.430 C , 0.317 C and 0.384 C) respectively while infection with lung hydatidosis were (0.693 A, 0.187 C, 0.415 B, 0.395 B, 0.482 B) respectively (table-8) in conjunction with, the results also showed the prevalence of liver fascioliasis in goats were higher (0.873 A) than cattle and sheep (0.341 B, 0.314 B) while prevalence of lung infection (%) in cattle were higher than sheep and goat (0.383 B, 0.310 C) respectively (Table 9).

From the data collected for five years the results revealed that seasonal prevalence of liver fascioliasis in winter were higher than infection in summer, spring and fall respectively while prevalence of lung hydatidosis in fall were higher than summer, winter and spring respectively (Table 10).

Counting to our data there is presence of significant difference at 0.01 between slaughtering season and animal kind on liver and lung infection (%) in goat and goat (0.404 B, 0.360 B, 0.096 C, 0.506 B) and (0.240 C, 0.266 BC, 0.410 B, 0.324 BC) and sheep (0.348 BC, 0.260 BC, 0.290 BC, 0.260 BC) while there is no significant deference between liver and lung infection in cattle during spring, summer, autumn and winter respectively (Table 11).

Pathological examination

The main characteristic macroscopically lesions in the infected animal revealed the presence of number of hydatid cysts with variable size in the lung, liver parenchyma and abdominal viscera appears as a white unilocular fluid filled cysts (Fig. 1 and 2), while gross sections of liver infested with *Fasciola* sp. revealed leaf-shaped parasites travels in liver necrotic parenchyma leaving dark red hemorrhagic tracts which is migration tracts of immature flukes through the liver parenchyma (Fig. 3 and 4) also gross sections shows cholangitis and

Table 11: Interaction effect of animal kind and slaughtering season on lung and liver infection (%).

Animal kind	Slaughtering Season	Lung Infection (%)	Liver Infection (%)
Goat	Spring	0.240 C	0.404 B
	Summer	0.266 BC	0.360 B
	Autumn	0.410 B	0.096 C
	Winter	0.324 BC	0.506 B
Cattle	Spring	0.586 A	0.796 A
	Summer	0.664 A	0.998 A
	Autumn	0.598 A	0.892 A
	Winter	0.596 A	0.808 A
Sheep	Spring	0.372 BC	0.348 BC
	Summer	0.386 BC	0.260 BC
	Autumn	0.418 B	0.290 BC
	Winter	0.358 BC	0.260 BC

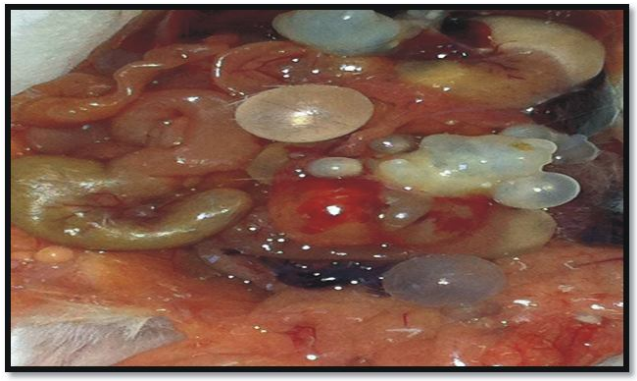

Fig. 1: Macroscopically section of infected animal shows the presence of number of secondary hydatid cysts that appear as white unilocular fluid filled cysts with variable sizes in abdominal viscera.

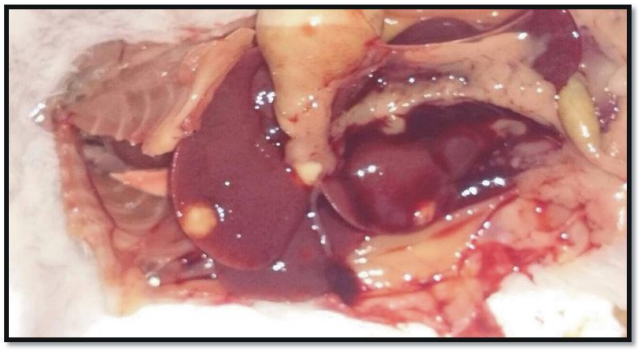

Fig. 2: Macroscopically section in the liver of infected animal shows the presence number of secondary hydatid cysts with variable sizes in the liver parenchyma.

pericholangitis with fibrosis resulting in thickened fibrotic walls with debris and adult flukes beside the lumen (Fig. 5).

Discussion

Fig. 3: Postmortem picture shows *Fasciola* hepatica which have leaf-shaped parasites excluded from infested liver.

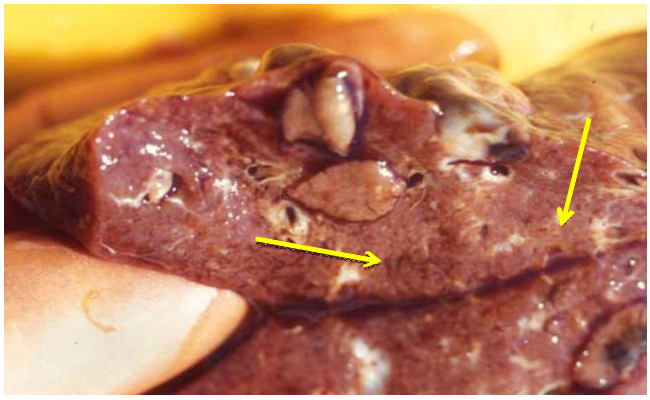

Fig. 4: Gross section of liver shows necrosis of liver parenchyma with dark red hemorrhagic tracts which is migration tracts of immature flukes through the liver parenchyma($\rightarrow$) .

Fig. 5: Macroscopic picture of infested liver with fascioliasis shows cholangitis ($\rightarrow$) pericholangitis with fibrosis resulting in thickened fibrotic walls with debris and adult flukes beside the lumen ($\leftrightarrow$).

Condemnation of infected organs as lung and liver provoke economic losses in livestock accordingly, predictable statistics epidemiological monitoring aspects of disease have been justifiable and prepare a guideline data for comparison for the future. Slaughterhouses survey provides exceptional indicators for the prevalence

of infectious diseases of economic importance and public health together (Raji *et al.,* 2010), different countries in Asia such as Saudi Arabia, Iran, Bangladesh, India, Pakistan, China, Japan, Turkey, Tunisia, Korea, and Iraq provoke plentiful reports of fascioliasis (Ezatpour *et al.,* 2014), with considerable deference in prevalence rate in Iraq neighboring countries. fasciolosis and dicrocoeliosis prevalence rate in Saudi Arabia, 0.04 and 0.00 % in sheep and goats, jointly (Over *et al.,* 1992) , in Pakistan *F. hepatica* prevalence rate in sheep and goats was 51.3, and 14.8 %, respectively (Sharma and Raina 1989). In Turkey, were 3.99 and 23.55% in sheep, and 0.48 and 2.65 % in cattle, reciprocally (Gargili *et al.,* 1999) while in Iran 0.8, 0.7 and 1.5 % of the sheep, goats and cattle were infected by *Fasciola* spp. respectively (Shahbazi *et al.,* 2016). The prevalence differences of liver flukes may arises from livestock husbandry, environmental conditions changes, stocking rate, abundance of infected definitive hosts, the nature of the pasture and grazing patterns of animals (Khanjari *et al.,* 2014). corresponding with the meteorological data, the elevation of fasciolosis prevalence during these seasons as autumn and winter due to high rainfall with the prevalence of snails infection, compared to other months of the year. Some researchers stated that spring and fall were the main periods for fasciolosis transmission; however, potential infections during other periods of the year were possible (Khallaayoune and Hari 1991). Ambient temperature is effective at the power of parasite eggs and life, eggs survives in subsided temperatures for few months, but lasts less than three weeks in the heat of summer. Failure in documentation the infected parts of slaughtered animals, disposing of animal waste properly afford to the carnivores that's lead to continue and increases the frequency of the parasite cycle (Khanfar, *et al.,* 2004).

Hydatidosis is a common and threatening disease to humans and animals with no specific clinical symptoms in animals. Usually its diagnosis takes place by autopsy or post-mortem examination after slaughter (Eslami, 1991). Liver infestation with *Fasciola* sp. revealed presence of migration tracts in liver necrotic parenchyma leaving dark red hemorrhagic tracts which is migration tracts of immature flukes through the liver parenchyma, these lesions corresponded to Hashemnia *et al*., (2015) who mentioned the migratory tunnels filled with blood, fibrin and cellular debris, also Gajewska *et al*., (2005) explains digestion of hepatic tissue by the parasite and cause extensive parenchymal destruction and immunological reactions with intensive haemorrhagic lesions also gross sections shows cholangitis and pericholangitis with fibrosis resulting in thickened fibrotic walls with debris and adult flukes beside the lumen

Conclusion

The main goal of this study was to determine a prevalence of hydatid cysts and liver fascioliasis presenting in sheep, goat and cattle slaughtered at Babil abattoirs. The results of this study indicate that hydatidosis and liver fascioliasis is highly prevalent disease in livestock animals in babil province. This study provides an exploratory guideline data for future monitoring these potentially crucial parasitic diseases, identiflcation of risk factors and decrease the economic loss due to accusation of infected organs with the prediction model for mapping disburse control strategies. veterinary authority should apply a control program to control these diseases through better standardization abattoirs system, increase knowledge of farmers and eliminated stray dogs.

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