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Research Article

Retrospective Survey of Liver flukes in Sheep and Cattle based on Abattoir Data in Al-Najaf Province, Iraq

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Abstract

The current study focused on slaughtered sheep and cattle in Al-Najaf city which are infected with liver fluke from the period between January 2016 till December 2018. The total sheep examined were 244806, in which 525 were found to be positive for liver fluke, while in cattle, the total examined number was 59001, in which 397 were found to be positive for liver fluke. In current study, the prevalence rate was estimated to be 0.67% in sheep, and 0.66% in cattle. There are no differences between sheep and cattle rate infection. The highest rate of infestation in sheep and cattle was 0.69% and 0.80% in April respectively, while the lowest infestation rate was 0.38% for sheep and cattle in October. The findings of this study demonstrated that the prevalence of liver fluke infections is generally lower than those reported from other regions of Iraq, and at the same time, the *Fasciola* species clearly remains prevalent, and it might play an important role in the life cycle and transmission of this disease in Al-Najaf province.

Keywords: Liver Fluke; Sheep; Cattle; Abattoir; Month

Introduction

Fasciolosis is a verminous infestation caused by infection with *Fasciola* species which has two spp. *Fasciola hepatica* and *Fasciola gigantica*. This disease predominates in regions where sheep and cattle are breeding, they being the most important reservoirs for the organism and causes economic loss due to condemnation of affected organs, fatality, decreased production of meat, milk, and wool; decreased weight and infertility [1]. Moreover, fasciolosis is a public health noteworthy zoonosis with 2.4-17 million individuals thought to be infected worldwide and more than 180 million at risk of infection [2]. Humans are accidental hosts by eating aquatic plants or drinking water contaminated with metacercaria [1].

Fascioliasis is an important economical disease of cattle and sheep, extending throughout the world. Nearly 250 million sheep and 300 million cattle are affected everywhere in the world. Besides cattle and sheep, the buffaloes, swine and goats and humans are also susceptible to the disease [3].

F. hepatica and *F. gigantica* are the main types of this parasite. They can be Differentiated by depending on morphological features like shape and body length [3]. *F. hepatica* has a complex developmental life cycle [4].

This large economic effect representing direct losses may be an underestimate taking into account the indirect costs of treatment, or loss of animal workforce in some other countries.Furthermore, fascioliasis is emerging as a relevant issue in human health, affecting roughly 2.6 million people worldwide.

For this reason, it has been considered as a re-emerging neglected disease by the WHO [5].

There is a little data about the prevalence of fascioliasis and its veterinary and economic importance. Assessing the spread and previlance of the disease based on the abbatoir data is possible in the absence of epidemiological information. There is several studeis that recorded statistical informations about fascioliasis in different animals in middle east area such as [6] in Iran, [7] in Pakistan, [8] in Saudi Arabia, and [9] in Turkey.

Likewise, some studies published on the prevalence of fascioliasis from several regions of Iraq [10-15].

In Iraq, many factors affect the distribution of the disease in different parts of the country, such as old-style and non-standard animal agriculture and the presence of great population of snail. Fascioliasis deemed as one of the serious health concerns of the

area and has a heavy influence on the economy and social welfare of the people in Iraq.

Gaining epidemiological facts appear to be crucial before working any control programs.

Information resulting from slaughterhouses records has been known as useful sources of data for the study of epidemiological aspects of certain diseases [16].

In our research, we conducted an active abattoir survey at Al-Najaf slaughterhouse, located in the south of Iraq, to determine the occurrence of liver fluke infection in sheep and cattle that slaughtered for human consumption.

The monthly, seasonal and annual distribution of the disease was determined, and there was a comparison between them based on data of 3 years.

Epidemiological studies are influenced by many factors that are constantly renewed and to ensure the availability of modern epidemiological information. This study was performed to detect the prevalence of this parasites among sheep and cattle.

Materials and Methods

Study area

The present study was conducted at Al-Najaf province abattoir. Al-Najaf lies in the south of the country and borders Saudi-Arabia. Al-Najaf is in a fertile agricultural region, with major products including rice, maize corn, barley, pearl millet, wheat, dates, and livestock. The average annual temperature is 23.6°C. The rainfall here averages 97 mm. The province had an estimated population of 1,221,248 [17].

Samples collection and animal selection

This study was performed at Al-Najaf abattoir, in period. Retrospective study designs were used to collect the required data for the study in the period from January 2016 to December 2018, at Al-Najaf abattoir. Abattoir data were obtained from the District Veterinary Office, covering the study period. In addition to field visits to the abattoir for the same purpose. Overall 303807 of slaughtered sheep, and cattle during the study period were examined for the presence of liver flukes. Post mortem examination were employed in the abattoirs by visual examination, palpation, and systematic incision of each carcass and visceral organs. The numbers of total slaughtered animals and infected animals and the type of lesion were carefully counted and recorded on standardized data sheets. Furthermore, the prevalence of fascioliasis was evaluated for each month, each season, and as an annual ratio generally.

All the animals coming to the abattoir were from the Al-Najaf province and surrounding areas, and all of these animals were of local breeds and different ages.

Statistical analysis

Data collected for the studies were entered into a Microsoft excel worksheet and analyzed using the SPSS software package (Version 16). The prevalence of fascioliasis was calculated as the number of Fasciola spp. infected individuals divided by the total number of slaughtered animals and was then multiplied by 100. One-way ANOVA was used for analysis of differences in the prevalence of fascioliasis. $P<0.05$ was considered for statistical significance.

Results and Discussion

The epidemiology of helminthes diseases complex involves a balance between the infection rate and the resistance of the host. And according to this equation, in tropical and temperate areas, young animals are particularly answerable to grow heavy infection. However, there is a marked difference in the seasonal incidence of the disease between those tropical areas in which the climate includes a long hot and dry season and those in which the dry season is short or absent [4].

There are many consequences of fluke infestation, such as decreased growth rate of animals, reduced production rate, increased susceptibility to secondary infections, production of low-quality products for human consumption, and cost of disease control procedures [18].

General prevalence rate

The incidence of liver fluke in slaughtered sheep and cattle in Al-Najaf city abattoir during the period from 1/January/2016 to 30/December/2018, illustrated in table 1 and table 2.

Year	Total No.	Infected No.	%
2016	109484	510	0.50
2017	66575	556	0.85
2018	68747	459	0.68
Total	244806	1525	0.67

Table 1: General prevalence rate of Liver fluke among slaughtered sheep during years 2016, 2017, 2018.

A total of 244806 sheep and 59001 cattle were examined through the three years, and the overall prevalence rate of the liver fluke infection was 0.67% (1525/244806) in sheep and 0.66% (397/59001) in cattle, as indicated in (Table 1 and Table 2).

Year	Total No.	Infected No.	%
2016	26111	168	0.65
2017	16963	192	1.12
2018	15927	37	0.23
Total	59001	397	0.66

Table 2: General prevalence rate of Liver fluke among slaughtered cattle during years 2016, 2017, 2018.

The rate of fascioliasis among slaughtered sheep is lower than that observed in Baghdad (7.1%) [19], Kirkuk (80% in cattle and 72% in sheep) recorded by [20], and a (0.5% in sheep and 2.63% in cattle) observed by [11], in Karbala (4.11%) [21], in Al- Najaf (0.87%) in all animal species [22], in Mosul (16.5%) [23]. While it was higher than those reported in Sulaimaniya (0.13%) [24], in Kirkuk (0.50%) [11], and (0.36%) [25] and (0.28%) in sheep and (1.35%) in cattle in Kirkuk [26].

Moreover, in the current research, the prevalence of infection was lower than those of other countries. In Iran, the infection rate recorded were 1.7% in Kermanshah [27], 3.28% in Kashan [28], 0.56% in Arak [29]. In Pakistan 42.06% [30], and 25.46% [31]. In Zimbabwe 37% [32], in Kenya 26% [33], in Zambia 46% [34], and in Egypt 14.7% [35].

The discrepancies in the prevalence of these infections might be attributed to significant differences between these studies in climatic conditions, including the average rainfall, temperature, seasonal changes, type of animals, and livestock management strategies [36]. Comparison of the present study with previous research indicated the reduced prevalence of liver fluke diseases in Iraq and Al-Najaf province, which might be associated with droughts, hindering disease transmission and low rates of (snails) intermediate host due to the hot dry summer season [18]. Also, measures such as effective management of slaughtered animals have resulted in reduced prevalence of *Fasciola* and Dicrocoelium diseases; therefore, today, healthier animals enter the market.

The highest infection rate of liver fluke in sheep was observed in 2017 (0.85%). While the lowest infection rate was in 2016 (0.50%). In cattle the highest infection rate was (1.12%) in 2017, and the lowest infection rate was (0.23%) in 2018. (Table 1 and Table 2).

Seasonal prevalence rate

The overall seasonal prevalence rate of liver fluke among slaughtered sheep for the three years was 0.70%, 0.61%, 0.64%, and 0.51% in spring, summer, autumn, and winter, respectively. The highest infection rate of was observed in spring (0.69%), whereas the lowest infection rate was in winter (0.51%) (Table 3, Figure 1).

In cattle the overall seasonal prevalence of liver fluke for the three years was 0.8%, 0.75%, 0.60%, and 0.50% in spring, summer, autumn, and winter, respectively. The highest infection rate was observed in spring (0.80%), and the lowest infection rate was in winter (0.50%) (Table 4, Figure 2).

	Infection ratio%			
	2016	2017	2018	Average
Winter	0.27	1.09	0.19	0.51%
Spring	0.28	0.97	0.84	0.69%
Summer	0.64	0.63	0.56	0.61%
Automn	0.78	0.65	0.5	0.64%

Table 3: Seasonal prevalence of Liver fluke among slaughtered sheep during years 2016, 2017, 2018.

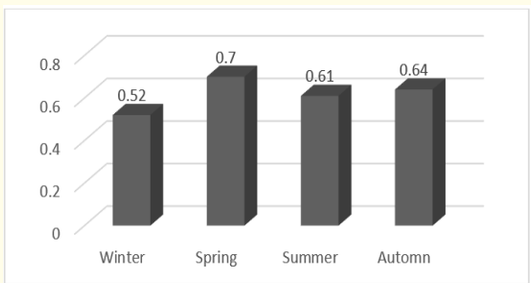

Figure 1: Seasonal prevalence of liver fluke of sheep for three years at Al-Najaf abattoir.

	Infection ratio %			
	2016	2017	2018	Average
Winter	0.31	1.1	0.11	0.50%
Spring	0.57	1.53	0.3	0.80%
Summer	0.86	1.2	0.2	0.75%
Automn	0.83	0.67	0.31	0.60%

Table 4: Seasonal prevalence of Liver fluke among slaughtered cattle during years 2016, 2017, 2018.

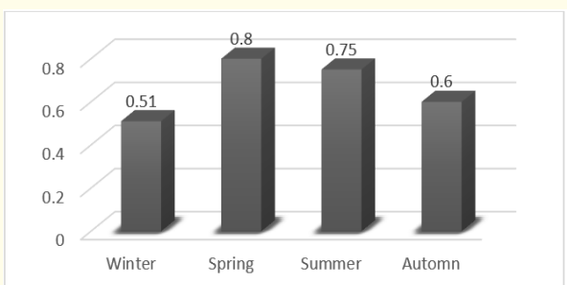

Figure 2: Seasonal prevalence of liver fluke of cattle for three years at Al-Najaf abattoir.

The highest prevalence of Fasciola infections among all evaluated animals was reported during spring (0.7% for sheep and 0.8% for cattle) and the lowest prevalence rate was during winter (0.52% for sheep and 0.51% for cattle).

Concerning comparison of the current study findings with other studies, a study in Kirkuk found that the Fasciola infection rate was higher in spring [20]. Zghair 2007 carried out a study in Karbala and found that this infection rate was higher during spring season and lower during winter season [21]. In Babylon Al-Delimi [37] found the highest rate in summer and lowest in winter months. In Iran, the highest infection rate was in winter 1.91% and the lowest was in autumn 0.48% [29].

Climates and environmental conditions affect the infection rate through the availability of rain, the humidity ratio, period of coldness, and the length of the rainy season which vary from region to another, and from one year to another, all these factors affect the spread of the disease from one region to another and from one year to another year at the same region.

Since the period of completion of the parasitic phases of liver fluke takes about 12-16 weeks through the eggs and their development to the Miracidium, cercariae and the stage of Metacercaria, as these phases begin in winter to be completed in the spring, and this is why we observe the evolution of the disease in the spring as mentioned by most studies [3,38,39].

There is no significant difference of infection between sheep and cattle for liver fluke in the four seasons of the three years, as indicated in table 5.

Disease	Winter	Spring	Summer	Autumn
Liver fluke in sheep	1.29 - 1.62 1.43 ± 0.09 A	1.32 - 2.03 1.60 ± 0.21 A	1.35 - 1.47 1.42 ± 0.03 A	1.27 - 1.65 1.48 ± 0.11 A
Liver fluke in cattle	1.29 - 1.62 1.43 ± 0.09 A	1.32 - 2.03 1.60 ± 0.21 A	1.35 - 1.47 1.42 ± 0.03 A	1.27 - 1.65 1.48 ± 0.11 A

Table 5: Seasonal differences of infection with liver fluke for sheep and cattle.

The different litters horizontally refer to the presence of significant (P< 0.05) differences.

Regarding the distribution of liver infections according to animal species in our study, we had found that the rate of liver fluke infection was equal in cattle and sheep (0.66%, 0.67%).

Al-Barwari 1978 recorded a higher distribution of infection in cattle than in sheep in Baghdad who found the rate of infection 27% and 7.1% in cattle and sheep respectively [40]. Also [11] found the same result of liver fluke infection which was higher in cattle as follow 2.63%, 0.50% and 0.43% in cattle, sheep and goats respectively. Abass., et al. 2018 also recorded higher infection in cattle than in sheep which was (80%, 72%, and 11%) in cattle sheep and goat respectively [26]. Also recorded a higher rate in cattle than in sheep and goats as follow 2.63%, 0.50% and 0.43% respectively [41].

The highest rate of liver flukes in this study among cattle might be due to most sheep and goats are slaughtered in early age compared to cattle.

The grazing habits of the animals affect the epidemiology of the disease. Cattle habitually graze in the wet marshy areas which is favoured by the fluke snail, so the eggs are placed in an appropriate environment. If food is available elsewhere, sheep and goats prefer to graze away from marshy pastures. Long wet seasons are usually related to a higher infection rate but sheep are more probable to ingest large numbers of cysts during dry periods after a wet season, when the animals are forced to graze in swampy areas, resulting in heavy infection [42].

Concerning parasite–host relationship, there is no evidence of any acquired resistance to Fasciola hepatica in sheep. Acute and chronic fasciolosis affect the host at any age. Cattle have a natural resistance and under normal conditions the clinical disease is only expected in young cattle. Chronically infected cattle can spontaneously recover, and previously infected animals can partially resist reinfection. However, this resistance is only possible because of chronic fibrotic changes in the liver, so with even a small number of fluke present, there may be production losses [42].

Monthly prevalence rate

According to monthly infection rate of liver fluke in sheep for the three years, the highest infection rate was in April (2.03%), and the lowest was noticed in September (1.27%). While in cattle, the highest infection rate was in November (0.94%), and the lowest was in October (0.38%) (Table 6 and 7, Figure 3 and 4).

Contrast to our results, a study was conducted in Karbala province has revealed that the highest number of infection with liver fluke in cow was noticed in the April 4.11%, and there is no infection during November [21], in Al-Najaf, the highest number of infection was 0.87% in January [22]. In Sulaimaniya, Kadir and Mo-

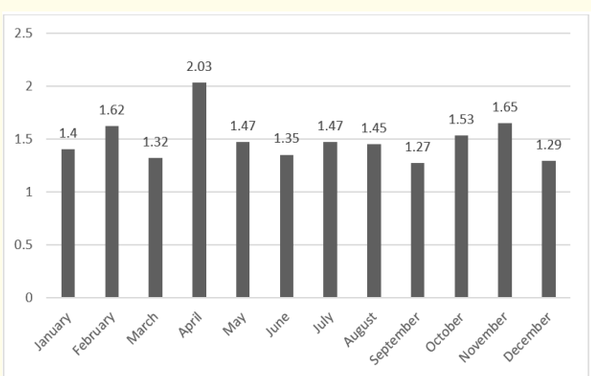

Figure 3: Monthly prevalence of liver fluke of sheep for three years at Al-Najaf abattoir.

Months	Total No.	Total No.	Total No.	Infected No.	Infected No.	Infected No.	%	%	%	%
	2016	2017	2018	2016	2017	2018	2016	2017	2018	Average
January	10621	5743	5459	59	73	130	0.56	1.27	2.38	1.4
February	9981	4617	5612	74	94	117	0.74	2.04	2.08	1.62
March	11769	5746	5765	86	84	102	0.73	1.46	1.77	1.32
April	11157	5688	4727	116	107	150	1.04	1.88	3.17	2.03
May	11744	5908	5890	102	98	111	0.87	1.66	1.88	1.47
June	7855	6151	5543	76	87	92	0.97	1.41	1.66	1.35
July	9489	6028	6031	76	138	79	0.80	2.29	1.31	1.47
August	8669	5835	5955	87	86	112	1.00	1.47	1.88	1.45
September	8669	5756	6594	67	78	111	0.77	1.36	1.68	1.27
October	7268	5097	6294	79	99	99	1.09	1.94	1.57	1.53
November	5422	4263	4922	59	89	87	1.09	2.09	1.77	1.65
December	6840	5743	5955	57	91	87	0.83	1.58	1.46	1.29
Total No.	109484	66575	68747	938	1124	1277	0.87	1.70	1.90	1.40

Table 6: Prevalence of liver fluke among slaughtered sheep in months, during years 2016, 2017, 2018.

	Total No.	Total No.	Total No.	Infected No.	Infected No.	Infected No.	%	%	%	%
Months	2016	2017	2018	2016	2017	2018	2016	2017	2018	Average
January	2394	1562	1110	1	18	0	0.04	1.15	0	0.69
February	2328	1371	1143	11	26	4	0.47	1.90	0.35	0.87
March	2422	1370	1236	7	19	4	0.29	1.39	0.32	0.76
April	2424	1511	1129	15	25	5	0.62	1.65	0.44	0.78
May	2318	1299	1300	19	20	2	0.82	1.54	0.15	0.57
June	2201	1566	1274	11	29	2	0.50	1.85	0.16	0.58
July	2493	1531	1331	24	13	1	0.96	0.85	0.08	0.57
August	2024	1421	1442	23	12	5	1.14	0.84	0.35	0.69
September	2024	1311	1464	23	16	8	1.14	1.22	0.55	0.65
October	1935	1336	1464	15	4	5	0.78	0.30	0.34	0.38
November	1916	1360	1568	11	7	1	0.57	0.51	0.06	0.94
December	1632	1325	1466	8	3	0	0.49	0.23	0	0.63
Total No.	26111	16963	15927	168	192	37	0.65%	1.12%	0.23%	0.68

Table 7: Prevalence of liver fluke among slaughtered cattle in months, during years 2016, 2017, 2018.

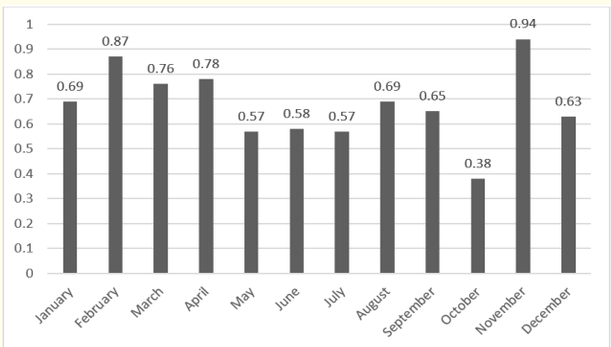

Figure 4: Monthly prevalence of liver fluke of cattle for three years at Al-Najaf abattoir.

hammed found the highest rate was in November [24]. In Kirkuk the more prevalence in sheep, cattle, and goats was in March and April [26].In north of Iran, the cattle highly infected in April 80% followed by sheep and goat in March 72% and 11% [20]. This might be related to difference in geographical distribution, sample size and period of study.

To sum up, this study generally found that the rate of infection was low, and it helps illustrating the importance of recording the rates of infected meat in monitoring the potentiality important parasitic diseases.

Conclusion

This abattoir survey generally reflected the disease situation in the Al-Najaf province and showed that the prevalence of liver fluke infections is generally lower than those reported from other regions of Iraq, and at the same time, the *Fasciola* spp. clearly remains prevalent, and this inspection has helped illustrating the utility of records of meat inspection in observing situations of disease and establishing potential extended term trends. The study found that spring is crucial for animals as a result of its highest rates of infection, followed by summer seasons. Rates of infection are equal in sheep and cattle. And the results highlight that animal helminths are of great public health and economic significance. Furthermore, this study provides a preliminary baseline data for the future monitoring of these potentially important parasitic diseases.

Recommendation

1. Carry out further studies to show the real distribution of infections.
2. Developing a prediction model and to formulate appropriate control strategies and decrease the economic loss due to condemnation of infected livers
3. A proper meat inspection should be performed on slaughtered ruminants in slaughter house.
4. Establish a diagnostic laboratory in each slaughter house.
5. Efforts should be made to control the economic and public health importance helminthes infections.
6. Veterinary authority should apply a control program to control on this disease through better standardization abattoirs system.

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Conflict of Interest

The authors declare that they have no competing interests.

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