Kufa journal for Veterinary Medical Sciences Vol.(10) No.(2)

Kufa journal for Veterinary Medical Sciences

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Retrospective survey of hydatid cyst infection in sheep and cattle based on abattoir data in Al-Najaf province, Iraq

Khaleel Z. K. Al-Alo

Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine, University of Kufa, Iraq

Email(Khaleelz.khaleel@uokufa.edu.iq)

Received date:1Dec2019 Accepted:(459) 22Dec2019 page (8-19) Pubished:31Dec2019

Abstract

Cystic echinococcosis (CE) is a parasitic zoonotic disease which is highly endemic in Iraq and has an extensive effect on livestock productivity and human health. The current study focused on slaughtered sheep and cattle in Al-Najaf city abattoir, which infected with hydatid cysts from the period between January 2016 till December 2018. The total sheep examined were 244806, in which 3339 were found to be positive for hydatidosis, while in cattle, the total examined number was 59001, in which 887 were found to be positive for hydatidosis. In current study, the prevalence rate was estimated to be 1.49 % for hydatidosis in sheep, whereas in cattle it was 1.60 %. There were no differences between sheep and cattle rate infections. The highest rate of infection in sheep and cattle was observed in April 2.03% and July 1.89 respectively, while the lowest rate was observed in September 1.27% and November 1.04, respectively. Seasonally, the highest infection rate of hydatid cysts was 1.60 % in spring for sheep and 1.77 % in summer for cattle. The findings of this study demonstrated that the prevalence of hydatid cysts infections is generally lower than those reported from other regions of Iraq, and at the same time, it clearly remains prevalent. Hydatid cysts are common and widely distributed in sheep and cattle and they might play an important role in the life cycle and transmission of this zoonosis in Al-Najaf province.

Key words: Hydatid cyst, sheep and cattle, abattoir, Al Najaf, Iraq.

دراسة مسحية لداء الأكياس المائية في الاغنام والابقار في مجزرة النجف الأشرف/ العراق

خليل زينل خليل العلو

فرع السريريات/ كلية الطب البيطري/ جامعة الكوفة

الخلاصة:

داء الأكياس المائية هو مرض طفيلي مشترك بين الانسان والحيوان، مستوطن في العراق وله تأثير كبير على إنتاجية الثروة الحيوانية والصحة العامة. أجريت الدراسة على الأغنام والأبقار المجزورة في مجزرة مدينة النجف والمصابة بالاكياس المائية في الفترة بين شهر كانون الثاني لعام 2016 الى شهر كانون الاول لعام 2018 لبيان مدى نسبة انتشار المرض والحدوث الشهري والموسمي للاصابة. الحيوانات المجزورة من السلالات المحلية ومن كلا الجنسين وباعمار مختلفة. استخدم الفحص البصري والجس باليد للكشف عن آفات الاكياس المائية. وجد أن نسبة الاصابة في الاغنام 1.49 % (3339 حيوان مصاب من مجموع 244806 حيوان مفحوص)، في حين ان نسبة الاصابة في الابقار كانت 1.60 % (887 حيوان مصاب من مجموع

59001 حيوان مفحوص). لم تكن هناك فروق في الاصابات بين الاغنام والابقار. لوحظ أعلى معدل للإصابة في الأغنام والأبقار في شهر نيسان بنسبة 2.03 ٪ وشهر تموز بنسبة 1.89 % على التوالي ، في حين لوحظ أدنى معدل إصابة في شهر ايلول بنسبة 1.27 % وشهر تشرين الثاني بنسبة 1.04% على التوالي. كانت أعلى نسبة إصابة موسمية للأغنام في فصل الربيع بنسبة 1.60% وفي الابقار في فصل الصيف بنسبة 1.77%. أظهرت نتائج الدراسة أن معدل انتشار الاكياس المائية في النجف الاشرف أقل من النسب التي تمت الإشارة اليها في مناطق أخرى من البلد، وفي نفس الوقت، فإن المرض لا يزال سائدًا بشكل واضح. غن الاكياس المائية شائعة ومنتشرة في الأغنام والماشية على نطاق واسع، و تلعب دوراً مهماً في دورة حياة الطفيلي وانتقال المرض الى الانسان.

الكلمات المفتاحية: دراسة مسحية، اكياس مائية، ابقار واغنام، مجزرة النجف الاشرف، العراق.

Introduction:

Echinococcosis is a zoonotic disease occurs throughout the world and causes economic losses and public health problems in many countries. It is a serious infection caused by cysts of the tapeworm *Echinococcus granulosus,* which belongs to family Taeniid. The adult tapeworm occurs in dogs and occasionally in other carnivores including dingoes, foxes and cats, with the intermediate life cycle stage forming in many warm-blooded animals including sheep, cattle, pigs and kangaroos, as well as in humans (1,2).

Hydatidosis occurs in developed and developing countries of temperate, arctic and tropical climate. The disease found in different areas of the world without favorite for racial or ethnic communities (3).

Without control measures, infection rates can be very high in livestock and dogs, with associated significant incidence in humans (4,5).

The disease has a great public health concern especially when the cystic larval stage occurs in the organs of central nervous system or other important tissues of the body with their complicated inevitable squeal (6).

The hydatid cyst act like tumors that can disrupt the function of the organ where they are found, causing reduced milk and meat production, poor growth, and elimination of organs at inspection in abattoir (7). In humans the disease may be severe, sometimes fatal, with long term and expensive treatment.

Hydatid cysts are one of significant parasite of agriculture animals that cause

economic problem due to losses of edible organs like livers and lungs. The parasite has a negative effect on growth and performance of the animal, and decreasing the yield and quality of meat and milk. In addition to lowering the fertility and value of fleece. According to the previous report, hydatidosis is responsible for reducing a 10% of milk yield and 5% in carcass weight. Condemned organs or even the whole carcass represents a high financial loss in many countries (8).

The substantial risk factors are commonly presented among the communities such as practice slaughtered an animal at a backyard of their houses, improper disposal viscera, ignore treatment dogs with anthelmintic, most likely can increase the occurrence of hydatid cyst in human and animal (9,10). In order to control and reduce the harmful impact of the disease in endemic areas on human and animals, a special consideration should be undertake to destroy the affected organs, reduce the stray dogs and periodic treatment of domestic and stray dogs with antiparasites (11).

Few reports are available on the prevalence and economic importance of hydatidosis in Iraq. Hydatid cyst is considered a public health importance in Iraq. Many cases with hydatid cysts have been reported in all Iraqi province (12,13).

Therefore, the objective of the present paper is to determine the current prevalence of hydatidosis in slaughtered

sheep and cattle. And to estimate the monthly, seasonal and annual distribution of the disease, and to compare between them on basis of data of three years.

Epidemiological studies are influenced by many factors that are constantly renewed and to ensure the availability of modern epidemiological information.

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 (14).

Samples collection and animal selection:

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 hydatid cyst. Post mortem examination were employed in the abattoirs by visual examination, palpation, and systematic incision of each carcass and visceral organs, particularly the lung, liver, spleen, kidney, and heart. 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 hydatid cyst infection was evaluated for each month, each season, and as an annual ratio.

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 hydatid cyst infection was calculated as the number of hydatid cyst 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 hydatid cyst infection. $P<0.05$ was considered for statistical significance.

Results

General prevalence rate:

The incidence of hydatid cyst in slaughtered sheep and cattle during the period from 1/January/2016 to 30/December/2018, illustrated in table 1 and table 2.

A total of 244806 sheep were examined through the three years, and the overall prevalence rate of the hydatid cyst infection was 1.49 % (3339 /244806) as indicated in Table 1.

The highest infection rate of hydatid cyst in sheep was observed in 2018 (1.90%). While the lowest infection rate was in 2016 (0.87%). (Table 1).

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

Year	Total No.	Hydatid cysts	
		Infected No.	Infection %
2016	109484	938	0.87
2017	66575	1124	1.70
2018	68747	1277	1.90
Total	244806	3339	1.49

A total of 59001 cattle were examined through the three years, and the overall prevalence rate of the hydatid cyst infection was 1.60 % (887 /59001), as indicated in Table (2).
The highest infection rate of hydatid cyst in cattle was observed in 2017 (2.20%). While the lowest infection rate was in 2018 (1.01%). (Table 2).

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

Year	Total No.	Hydatid cysts	
		Infected No.	%
2016	26111	354	1.37
2017	16963	374	2.20
2018	15927	159	1.01
Total	59001	887	1.60

Seasonal prevalence rate:

The overall seasonal prevalence rate of hydatid cysts among slaughtered sheep for the three years was 1.60% in spring, 1.42% in summer, 1.48% in autumn, and 1.59% in winter. In which the highest infection rate through these years was in spring (1.60%), and the lowest was noticed in summer (1.42%). (Table 3).

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

	Hydatid cysts infection ratio%			
	2016	2017	2018	Average
Winter	0.72	2.02	2.04	1.59%
Spring	0.88	1.67	2.27	1.60%
Summer	0.92	1.72	1.62	1.42%
Automn	0.98	1.8	1.67	1.48%

In cattle, the overall seasonal prevalence of hydatid cysts for three years was 1.50% in spring, 1.77% in summer 1.40% in autumn, and 1.39% in winter, respectively. In which the

highest infection rate of hydatid cysts was in summer (1.77%), and the lowest was noticed in winter (1.39%). (Table 4).

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

	Infection ratio%			
	2016	**2017**	**2018**	**Average**
Winter	**1.24**	**1.97**	**0.97**	**1.39%**
Spring	**1.02**	**2.51**	**0.98**	**1.50%**
Summer	**1.58**	**2.63**	**1.11**	**1.77%**
Automn	**1.63**	**1.65**	**0.93**	**1.40%**

There is no significant difference in infection of sheep and cattle for hydatid cyst between the four seasons of the three years, as indicated in (Table 5).

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

Disease	winter	spring	summer	autumn
Hydatid cyst 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	1.48-0.11 1.27±1.65 A
Hydatid cyst 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

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

Monthly prevalence rate:

According to monthly infection rate of hydatid cyst in sheep for the three years, the highest infection rate was in April (2.03%), and the lowest was noticed in September (1.27%). (Table 6). While in cattle, the highest infection rate for the three years was in July (1.89%), and the lowest was in November (1.04%). (Table 7).

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

Months	**Total No.**	**Total No.**	**Total No.**	**Infected No.**	**Infected No.**	**Infected No.**	**Infection %**	**Infection %**	**Infection %**	**Infection %**
	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**
Februa	**9981**	**461**	**5612**	**74**	**94**	**117**	**0.74**	**2.04**	**2.08**	**1.62**

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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

Table7: Prevalence of hydatid cysts among slaughtered cattle in months, during years 2016, 2017, 2018.

Months	Total No.	Total No.	Total No.	Infected No.	Infected No.	Infected No.	%	%	%	%
	2016	2017	2018	2016	2017	2018	2016	2017	2018	Average
January	2394	1562	1110	30	23	14	1.25	1.47	1.26	1.33
February	2328	1371	1143	30	40	12	1.29	2.92	1.05	1.75
March	2422	1370	1236	20	26	10	0.83	1.9	0.81	1.18
April	2424	1511	1129	28	37	11	1.16	2.45	0.97	1.53
May	2318	1299	1300	25	42	15	1.08	3.23	1.15	1.82
June	2201	1566	1274	24	47	13	1.09	3.00	1.02	1.7
July	2493	1531	1331	37	41	20	1.48	2.68	1.50	1.89
August	2024	1421	1442	45	31	12	2.22	2.18	0.83	1.74
September	2024	1311	1464	43	20	18	2.12	1.53	1.23	1.63
October	1935	1336	1464	32	29	12	1.65	2.17	0.82	1.55
November	1916	1360	1568	21	17	12	1.10	1.25	0.77	1.04
December	1632	1325	1466	19	21	10	1.16	1.58	0.68	1.14
Total No.	26111	16963	15927	354	374	159	1.37	2.20	1.01	1.53

Discussion

This study was performed at Al-Najaf abattoirs located in Al-Najaf province. An abattoir can provide good information about animal diseases that usually have the asymptomatic condition. Therefore, abattoir surveys provide an excellent opportunity for detecting diseases of both economic and public health importance in different animal species (15). This survey, however, included three important elements regarding with epidemiological aspects of hydatidosis in the sheep and cattle. Hydatidosis is a cosmopolitan disease and can cause a huge impact on meat quality and monetary burden.

A number of studies have examined the spread of hydatidosis in Iraq and have found that its prevalence has increased in animal breeding areas in recent times due to a lack of periodic tests for dogs and poor health care for livestock. This disease is endemic in environmental areas where dogs, livestock and humans are found together, as this arrangement allows the parasite to complete its life cycle (16,17).

Hydatidosis is still a major economic and an endemic public problem in Iraq and some other areas of the world. Also hydatid disease is known to be present and relatively frequent in man, regardless of the disease is notifiable; still, the surgically confirmed cases are the best-confirmed methods.

General prevalence rate of the hydatid cyst infection:

Overall prevalence rate of the hydatid cyst in sheep was 1.49 %. The present study finding agree with the findings of (18–21) who reported infection rate of 1.04%, 1.5%, 2%, 1.9% in Al-Najaf, Baghdad, Mosul and Karbala respectively. And contrasts with finding of (22–26) who reported infection rate of 4.18%, 45%, 5.9%, 7.3%, 6.45%, 14.75% in Al-Najaf, Sulaimaniya, Babel, Nassiriyah, Basrah, and Erbil province in Iraq respectively. In which the prevalence of hydatid cysts in the current study in sheep is lower than prevalence in previous studies that have been achieved in other provinces of Iraq. The difference in the infection rate in different provinces may be related to geographical distribution, period of study, sample size, individual flocks, years studied, region investigated, source of animals and their levels or degrees with dog's contact, type of livestock raising, management practiced, sort of zoogeography and possibly other factors.

Since the relationship between sheep herds and dogs is very close, contaminated (infected) feces of dogs scattered near by the sheep herds and due to dryness of the area with movement of sheep, the eggs float in the air and dust, and are very resistant to draught, so the chances of disease transmission will be increased. The stray dogs usually feed on the abattoir offal's and they will easily have access to the infected viscera of slaughtered animals because the abattoir control measurement in most part of the country is poor and infected ofals usually not condemned (27).

Also, our results were lower than those reported in neighbouring countries. i.e. 4% in Jordan, 3% in Hamedan in Iran, 23.57% in Tabriz in Iran, 13.5% in Saudi Arabia, 8.06% in Egypt, 19.35% in Yemen, 8.06% sheep in Yemen, 7.7% Ethiopia, 11% in Morocco, 56% in Greece, and 9.8% in china (28–36).

Our findings related to infection rates were much lower than those recorded in other country. Such results are plausible, expected and acceptable.

E. granulosus shows considerable geographic variation. Apart from abaiotic variables factors such as differences in culture, social activities and attitude to dogs in different regions contribute to the variation in prevalence rates. The prevalence of hydatidosis is fluctuated greatly between individual flocks, years studied, region

investigated, source of animals and their levels of dog's contact, type of livestock raising, management practiced, and sort of zoogeography.

The overall prevalence of the hydatid cyst in cattle in our study was 1.60 %. While the infection rate in other study was 0.55% in Mosul (19). 4.4 % in Al-Najaf (37), 1.7% in Karbala (21), 8.3% in Kirkuk (38). The lower rate of infections in this study might be due to the upper mentioned factors.

The results indicated no specific pattern of seasonal endemicity. Peak seasonal infections were slightly noted in winter, spring and summer for sheep and cattle. This case is highly related to the chance of these animals to contact with the final host acquiring the metacestode regardless the time and place proposed. The authors may suggest that the individual variation may play part in their resistance to hydatidosis (39). This may explain the difference in immunity between some breeds as mentioned between some breeds of sheep in China (40).

Notably, previous surveys of hydatidosis included very small numbers of animals examined at abattoirs from different localities, such as (41) and (21). Hence such figures do not reflect the real indication of the incidence among inspected livestocks. A characteristic feature of the current study is the great number of animals slaughtered in comparison with previous study carried out by the others.

The results of this study showed that there is no significant difference between sheep and cattle in hydatid cyst infection. And this agree with (18,22,28,35,42) and disagree with (24,25,38,43) who mentioned that the hydatid cysts were higher in cattle, followed by sheep and goats in their study.

This difference in prevalence rate among animal species attributed, to the mode of grazing, presence of the definitive host carnivore, the intermediate host, and the strains of the parasite also have essential role in hydatid cyst distribution which is known as host specificity (Hama and Jubrael, 2012).

Seasonal prevalence rate of hydatid cysts infection:

The overall seasonal prevalence rate of hydatid cysts among slaughtered sheep for the three years was 1.60%, 1.42%, 1.48%, and 1.59% in spring, summer, autumn, and winter respectively. These results are similar to that of (19), but are less than rates obtained by (22) and (25) who mentioned rates of 4.79%, 2.13%, 2.64%, and 4.61 in winter, spring, summer, and autumn respectively.

In cattle, the overall seasonal prevalence of hydatid cysts for three years was 1.50% in spring, 1.77% in summer 1.40% in autumn, and 1.39% in winter. These results similar to that of (25) who reported 0.47% in winter, 1.74% in spring, 0.49% in summer, and 0.43% in autumn. And less than those rates obtained by (22) who recorded a ratio of (4.51%, 4.54%, 3.98% and 4.55% in winter, spring, summer, autumn respectively) and by (38).

This indicates that the hydatid cysts infection has a seasonal variation in the sheep and cattle.

The reasons for variation among seasons may be attributed to the different environmental condition that belong to different geographical situation, and its effect on the presence of intermediate host, and the life cycle of the parasite itself (27).

In sheep, the highest infection rate of hydatid cysts through these years was in spring 1.60 %, and the lowest was noticed in summer 1.42 %.

Contrast to our finding, a study was conducted in Basrah province has revealed that the highest number of infection with hydatidosis in sheep was noticed in the summer while the lowest number has been seen in autumn (26). Another study

conducted by (45) in Kirkuk province has revealed that the highest number of infection with hydatidosis in sheep was noticed in the autumn while the lowest number has been seen in spring. While (19) mentioned that the highest seasonal incidence was observed in winter for sheep and goats, which found the lowest level of incidence in summer was 0.16% for sheep and 0% for goats. In cattle no infection was taken place in winter and autumn.

In cattle the highest infection rate of hydatid cysts was in summer 1.77 %, the lowest was noticed in winter 1.39 %. This finding contraverse to that of (38) who reported a highest infection rate in autumn, and (22,25) who reported a highest infection rate in spring.

This indicates that the hydatid cysts have a seasonal variation of infection in the intermediate host.

Monthly prevalence rate of hydatid cyst infection:

According to monthly infection rate of hydatid cyst in sheep for the three years, the highest infection rate was in April, and the lowest was noticed in September.

The highest infection rate in sheep recorded by others were in September 4.01% (22), July and august (26), February (25), May, December 35.7%, (26) and the lowest infection rate in sheep recorded were September and October (26), March (25), February (28), September (26).

In cattle, the highest infection rate for the three years was in July, and the lowest was in November. and in sheep the highest infection rate recorded by others were in March 5,215 (22), May , April (28).

Conclusions

Rates of infection are equal in sheep and cattle. A high number of hydatid cysts was observed; this is a considerable source of infection for dogs and other carnivores as final hosts, which transmit the parasite to human beings. Infection with high numbers of helminths results in considerable direct losses of organs and carcasses, as well as indirect losses of production and performance.

This abattoir survey generally reflected the disease situation in the Al-Najaf province and showed that the prevalence of hydatid cyst infections is generally lower than those reported from other regions of Iraq, and at the same time, 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. 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 the infections.
2- Developing a prediction model to formulate appropriate control strategies to decrease the economic loss due to the infection.
3- A proper meat inspection should be performed in slaughter house.
4- Establish diagnostic laboratory in each slaughter house.
5- Greater efforts are needed to control the transmission of hydatid cysts from abattoirs by the proper disposal of infected offal, especially of sheep.
6- Increase knowledge of farmers and people toward hydatid cysts, and eliminated stray dogs from the province.

Acknowledgement:

We would like to thank the Director and the Veterinarians at Al-Najaf abattoirs for providing us a permission and facilitated

obtaining the data and samples during the period of study.

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