

EPIDEMIOLOGICAL STUDY ON THE PREVALENCE OF HYDATIDOSIS IN SLAUGHTERED RUMINANTS IN KERBALA GOVERNORATE

دراسة وبائية لانتشار الأكياس المائية في المجترات المجزورة في محافظة كربلاء

Hikmat . S. Al-Nassir*

* College of Veterinary Medicine

University of Kerbala

ABSTRACT

A retrospective survey was conducted for determining the prevalence of hydatid cysts in food animal species: sheep, goats, cattle, buffaloes and camels in Kerbala Governorate between January and December 2011. Slaughterhouse specimens of 1130 sheep, 200 goats, 292 cattle and 79 buffaloes were collected through weekly visits.

Hydatid cysts in liver and lungs of the above mentioned animal species were detected and counted, while the fertility rate of the cysts was microscopically examined. A temporal distribution of infection was studied to determine the seasonal variation of the incidence rates.

The rate of infection was 2.41% in sheep, 2.16% in goats, 3.18% in cattle, 4.79% in buffaloes and 0% in camels. The highest percentage of infection (4.79%) was noticed in buffaloes can be attributed to the old age at which the animal was examined, while the argument behind the lowest infection rate 0% in camel was the unique raising system of camel as well as the weak relationship between camel and stray dogs.

The infection was noticed more frequently in livers (53% sheep and buffaloes, 56% goats and cattle) than lungs of all examined animal species. The results also revealed that the highest infection rate of hydatidosis in all examined animal species was recorded in the first quarter of the year (winter season). The grazing system of the animals during late autumn and winter may increase the opportunity of Echinococcus eggs to enter the animal GIT and formation of cysts in the targeted viscera.

Fertile cysts were found more frequently in livers of cattle 37.7% and buffaloes 36.7% , while lungs of the same species harbor 22.9% and 26.6% of fertile cysts respectively. Fertile cysts were also detected in 15.8% lungs of sheep and 15% goat- lungs, while livers of the same species were less infected by fertile hydatid cysts (11.2% , 12.5% of sheep and goat respectively).

الخلاصة:

أجريت دراسة تراجعية للمدة من كانون الثاني 2011 إلى كانون الأول 2011 لبيان مدى انتشار الأكياس المائية (العذرية) في الأغنام والماعز والأبقار والجاموس المذبوحة في مجازر محافظة كربلاء. أخذت عينات من الحيوانات المصابة وكانت الأغنام (1130)، الماعز (200)، الأبقار (292) والجاموس (79). وأرسلت الأكياد والرئات المصابة إلى المختبر للتأكد من إصابتها بالأكياس المائية وفحص خصوبة الأكياس باستخدام المجهر الضوئي. كما تم دراسة الاختلافات الموسمية لشدة الخمج في الحيوانات المجترة.

أظهرت الدراسة أن نسبة الخمج كانت 2.41% في الأغنام، 2.16% في الماعز، 3.18% في الأبقار، 4.79% في الجاموس. وكانت أعلى نسبة للأكياس المائية في الجاموس والتي تعزى إلى طول فترة تربية الجاموس وكبر عمرها عند إجراء الفحص.

سجلت أعلى حالات الخمج في أكباد المجترات (53% في الأغنام والجاموس، 56% في الماعز والأبقار) مقارنة برئات الحيوانات المفحوصة. كما أظهرت الدراسة تسجيل أعلى نسب الخمج في فصل الشتاء وفي جميع أنواع الحيوانات المفحوصة. وربما يعود السبب في ذلك إلى طريقة الرعي في المناطق الموبوءة وزيادة الفرصة لتناول بيوض الطفيلي من قبل الحيوانات المجترة ومن ثم تكوين الأكياس في الأعضاء المنتخبة.

أوضحت هذه الدراسة إن أعلى نسبة خصوبة الأكياس سجلت في أكباد الأبقار (37.7%) والجاموس (36.7%) بينما كانت رئات الأبقار والجاموس تحمل أكياس خصبة في 22.9% و 26.6% على التوالي. وعلى العكس أظهرت الدراسة إن

15.8% من رئات الأغنام و15% من رئات الماعز كانت تحمل أكياسا خصبة في حين حملت الأكباد نسبة اقل من الأكياس الخصبة اذ كانت 11.2% في الأغنام و12.5% في الماعز .
أظهرت الدراسة أن مرض الأكياس المائية منتشر في محافظة كربلاء وله تأثير كبير على الصحة العامة والحالة الاقتصادية في المحافظة . كما أن الكشف عن وجود أعداد كبيرة من مختلف الحيوانات المجترة والمصابة بالأكياس المائية إضافة إلى الطرق غير الصحيحة في إتلاف الأعضاء المخمجة سيشكل مصدرا لإصابة الكلاب السائبة كمضيفات نهائية للطفيلي ومن ثم انتقال الإصابة إلى الإنسان . وعلى هذا الأساس بات في حكم الضرورة الشروع بحملة وطنية للسيطرة على المرض من خلال القضاء على الكلاب السائبة , منع ذبح المجترات خارج المجازر الحكومية , الإتلاف الصحيح للأعضاء المخمجة مع زيادة وعي المواطنين عن وبائية المرض.

INTRODUCTION

Hydatidosis is a zoonotic disease caused by larval stage of *Echinococcus granulosus*. the disease causes public health problem and considerable losses which lie on the cost of hospitalization, incapacity to work and mortality (1). In ruminant animal hydatidosis has an adverse effect on production causing decreased production of meat, milk, wool and reduction in growth rate.

Reports have shown that the incidence of hydatidosis in animals in Middle East is high (2,3). In Iraq, hydatidosis is endemic and it is one of the major zoonotic diseases where sheep, cattle, buffaloes, goats and camels are still slaughtered traditionally and carcass wastes, infected organs mainly offal are easily accessible to stray dogs (4).

Many workers studied the infection rates of hydatidosis in ruminants in Iraq. In a study which was conducted in the governorate of Babylon, hydatidosis was found in 24.1% of the examined cattle, of them 62.4% was noticed in liver and lungs, 22.6% was in lungs and 15% was detected in liver (5). In another study the infection rate of the disease in sheep , goats and cattle in the governorate of Kirkuk was 32.6% , 26.3% and 24.9% respectively (2). The same study revealed that the infection rate in sheep, goats and cattle in the governorate of Diala was 30.8% in sheep, 20% in goats and 22.4% in cattle .However, in Thiqr governorate the infection rate of hydatidosis varied from 4.5 to 44% in sheep and 3.1 to 26.7% in goats (3). In a cross sectional study conducted in Iran, the prevalence values of hydatidosis in cattle, buffaloes, sheep and goats was 38.3%, 11.9%, 74.4% and 20% respectively (6).

Effective control of hydatidosis is based on presentation of breaking the cycle between definitive and intermediate hosts. The key to success is health education that elicit community should participate in. The aim of this study is to determine the prevalence of hydatidosis in food animals slaughtered in the governorate of Kerbala.

MATERIALS AND METHODS

Three different small abattoirs , in which only ruminants raised in the surrounding farms are slaughtered, were selected to carry out this study. During postmortem examination , livers and lungs which were grossly infected with hydatid cysts were collected from 1130 head of sheep, 200 head of goats, 292 head of cattle and 79 head of buffaloes for further investigations.

The infected organs which were collected on regular visits were examined at laboratories to confirming diagnosis of hydatid cysts. The surface of a randomly selected cyst of each infected organ was sterilized by alcoholic-iodine solution to reduce intra-cystic pressure, and then the cyst was penetrated by a needle and cut given with scalpel and blade, then the content (fluid and germinal layers) was transferred into sterile container and examined microscopically for the presence of protoscolices , cysts will be classified as fertile or infertile according to Macpherson,s method (1). The viability of protoscolices was determined by using eosin exclusion test for cell death, viable protoscolices do not take eosin stain.

Frequency statistics and descriptive one were followed in determining the number of infected cases , while the prevalence of hydatidosis was calculated as the number of sheep, goats, cattle and buffaloes found infected with hydatid cysts expressed as the percentage of the total number of slaughtered animals. Variation between infection rates in targeted organs and season of infection

were calculated by Chi-square (X²) test used to determine the presence or absence of association between explanatory variables.

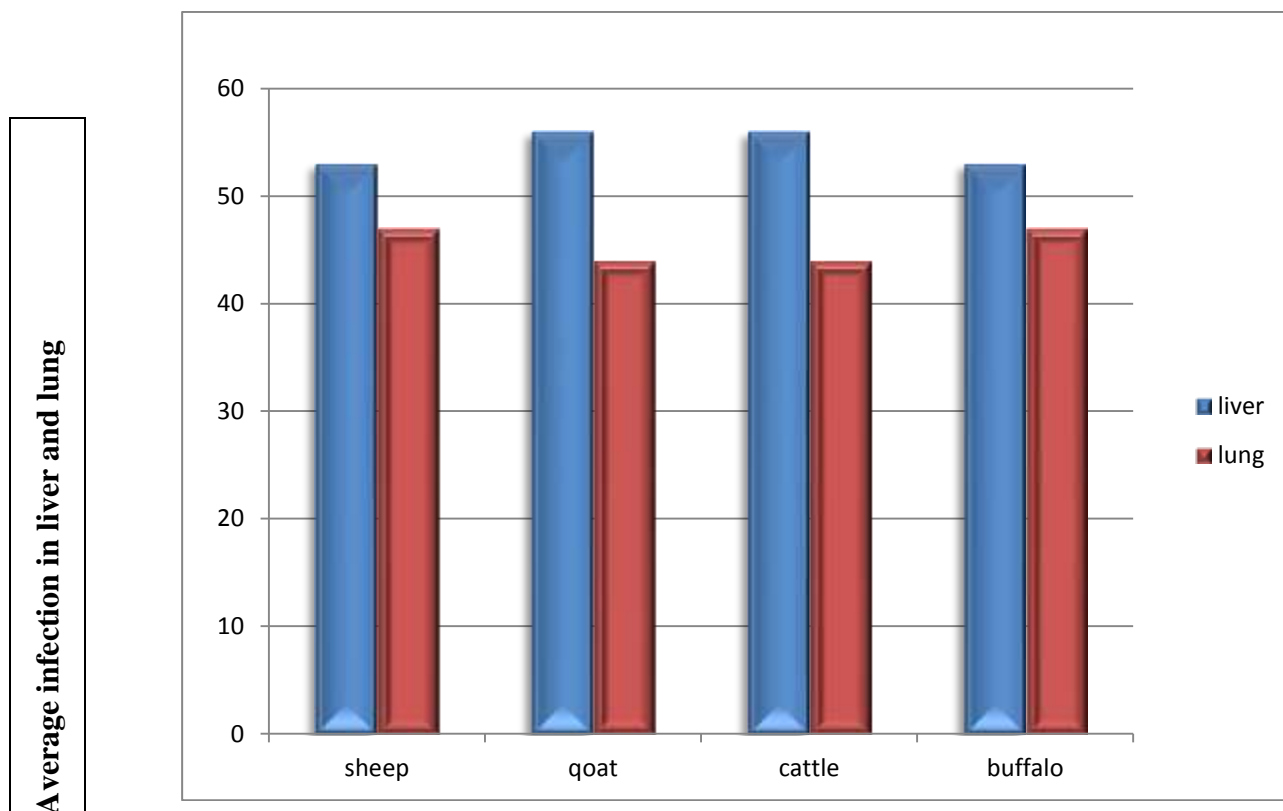
RESULTS

Out of 45,572 slaughtered sheep which were examined during this study to determine the prevalence of hydatidosis, a total of 1130 (2.41%) were found infected with hydatid cysts. From a total of 9257 goats, 200 (2.16%), 9178 cattle, 292 (3.18%) and 1647 buffaloes, 79 (4.79%) were harboring hydatid cysts. However, the infection of hydatid cyst was not detected in any of 222 camels which were examined during the study. No significant difference with the prevalence rate between sheep and goats was reported. Nevertheless, the prevalence rate of the disease between cattle and buffaloes indicated a significant difference(P≤0.05) in this survey (Table 1).

The difference in the infection rates of hydatidosis between liver and lungs is shown in Figure 1. It was observed that 53% of sheep and buffaloes and 56% of goats and cattle harbored the infection more frequently in their livers, while lung was found to be the affected organ in 47% of sheep and buffaloes, and 44% of goats and cattle.

Table 1 . : The numbers and rates of hydatid cyst infection in slaughtered ruminants .

Period of examination	Sheep		Goats		Cattle		Buffalo		Camel	
	Examined	Infected cases (%)	Examined	Infected cases (%)	Examined	Infected cases (%)	Examined	Infected cases (%)	Examined	Infected cases (%)
January	2964	78 (2.63%)	702	15 (2.13%)	1027	29 (2.82%)	244	8 (3.27%)	24	0 (0%)
February	2493	65 (2.6%)	410	9 (2.19%)	590	19 (3.22%)	96	8 (8.33%)	7	0 (0%)
March	2605	78 (2.99%)	506	12 (2.37%)	493	21 (4.25%)	82	4 (4.87%)	7	0 (0%)
April	4492	110 (2.44%)	889	21 (2.36%)	886	31 (3.49%)	164	6 (3.65%)	16	0 (0%)
May	4655	114 (2.44%)	1025	24 (2.34%)	806	31 (3.84%)	139	8 (5.75%)	9	0 (0%)
June	3674	94 (2.55%)	821	17 (2.07%)	670	23 (3.43%)	104	7 (6.73%)	15	0 (0%)
July	4537	95 (2.09%)	889	17 (1.91%)	947	26 (2.74%)	148	6 (4.05%)	23	0 (0%)
August	4489	102 (2.27%)	948	16 (1.79%)	894	20 (2.23%)	126	5 (3.96%)	26	0 (0%)
September	3122	85 (2.72%)	738	16 (2.16%)	676	21 (3.10%)	105	5 (4.76%)	23	0 (0%)
October	4295	103 (2.39%)	810	18 (2.22%)	889	27 (3.03%)	143	6 (4.19%)	36	0 (0%)
November	4411	103 (2.33%)	818	19 (2.32%)	677	23 (3.39%)	146	7 (4.79%)	24	0 (0%)
December	3835	103 (2.68%)	701	16 (2.28%)	623	21 (3.37%)	150	9 (6%)	12	0 (0%)
Total	45572	1130 (2.413%)	9257	200 (2.16%)	9178	292 (3.18%)	1647	79 (4.79%)	222	0 (0%)



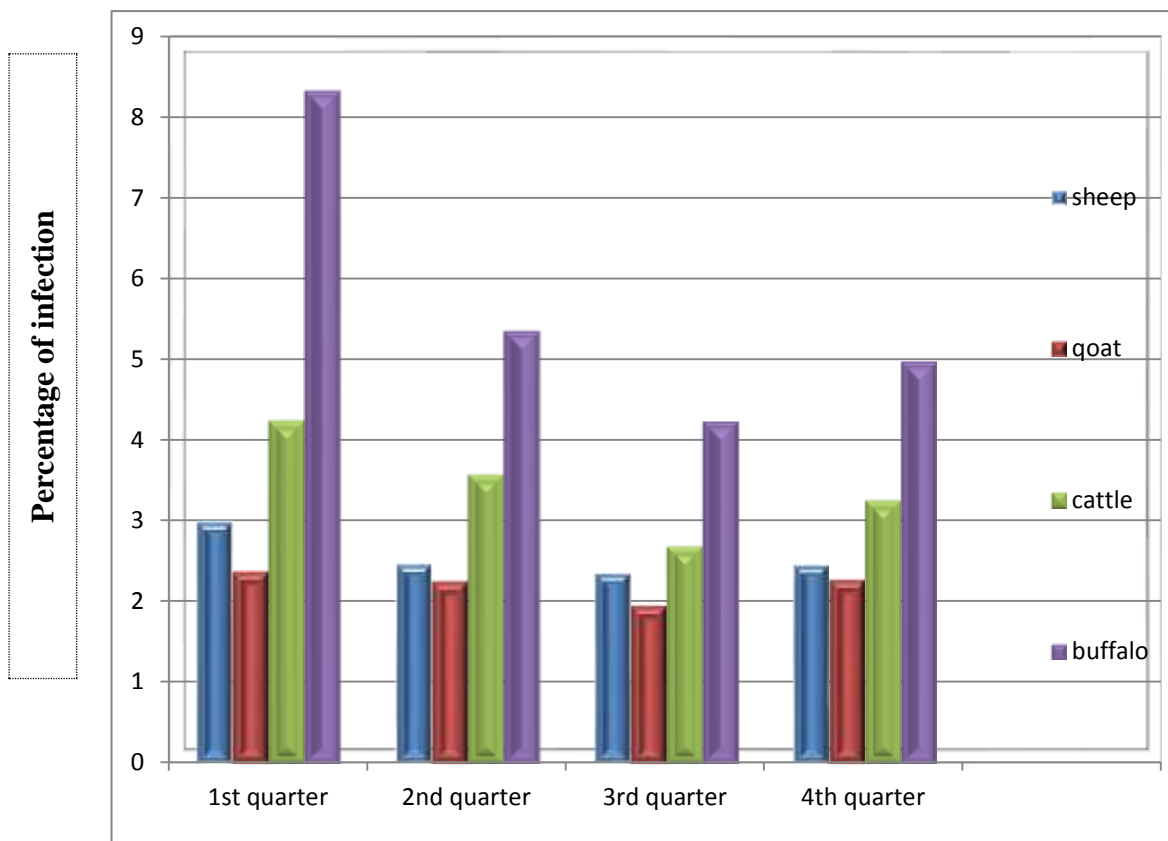
Animal species

Chi-square : $p \leq 0.05$

Figure 1: Infection rates of hydatidosis in liver and lungs of different animal species.

The results of this study revealed that the highest infection rate of hydatidosis in all animal species occurred in the first quarter of the year (winter season), as 2.9% of sheep, 2.37% of goats, 4.25% of cattle and 8.33% of buffaloes were infected with hydatid cyst during winter season (Figure 2).

Fertility and viability tests proved that fertile hydatid cysts were detected more frequently in lungs of sheep 15.8% and goats 15%, where as livers of cattle 37.7% and buffaloes 36.7% harbored more fertile hydatid cysts than lungs of the same animal species (Table 2).



Seasons

Chi square : $p \leq 0.01$

Figure 2: Prevalence Variation of hydatid cyst infection in ruminants according to the season

Table – 2 – Fertility rate of hydatid cysts according to the location of infection & species of the animals.

Animal spp	No . of Fertile cysts (%)		No .of sterile cysts (%)	
	Liver	Lung	Liver	Lung
Sheep	123 (11.2%)	174 (15.8%)	456 (41.5%)	347 (31.5%)
Goat	25 (12.5%)	30 (15%)	87 (43.5%)	58 (29%)
Cattle	110 (37.7%)	67 (22.9%)	54 (18.5%)	61 (20.9%)
Buffalo	29 (36.7%)	21 (26.6%)	13 (16.5%)	16 (20.2%)

DISCUSSION

Hydatidosis is apparently uniformly distributed throughout the central and southern areas of Iraq (4). Stray dogs which act as the definitive host of *Echinococcus granulosus* are common in most large cities , towns and villages of Iraq, and they usually gain access to the infected organs of the slaughtered animals.

E. granulosus shows considerable geographical variation. Factors which contribute to this variation in prevalence include difference in culture, social activities and attitude towards dogs (7).

A survey on the infection rate of hydatid cysts in sheep, cattle and camels in Iraq was conducted by Nubark (8). The infection rate of hydatid cysts in sheep, cattle and camel was 20.5%, 25% and 53.9% respectively. In another cross-sectional study carried out in north west of Iran, a total of 5381 slaughtered animals, namely 928 cattle, 243 buffaloes, 3765 sheep and 445 goats were inspected macroscopically for hydatid cysts with a prevalence values of 38.3%, 11.9%, 74.4% and 20% respectively were recorded (6).

The results of this study revealed that 2.41% of sheep, 2.16% of goats, 3.18% of cattle and 4.79% of buffaloes were infected with hydatid cysts. Although these rates of infection are less than those in other studies such as (2), (5), but they are consistent with prevalence rates reported by (9) with 1.17% in sheep, 0.32% in goats , 4.38% in adult cattle and 0.52% in calves which were examined in Kirkuk slaughterhouse. Similarly, another report from a neighboring country, for instance, Khashan city in Iran showed infection rates with 2.25% in sheep and 3.1% in goats (6).

In this study the highest percentage of infection (4.79) was found in buffaloes which is mainly attributed to the old age at which the animal was slaughtered and examined for the presence of hydatid cysts. The general trend of age prevalence was that , the infection rate increases as the age of animal increases. Buffaloes are raised in Iraq for producing milk while older aged females are slaughtered. It was found that aged animals may gain access of infection due to longer exposure than young ones. It was also described by (10) that , the number of infected eggs ingested by intermediate host is determined by the level of contamination and infectivity of the eggs. Furthermore, the number of eggs that develop into hydatid cysts is controlled by the immune system of the host.

On the other hand, the findings of this study revealed that non of the slaughtered camel was infected with hydatid cysts. The unique raising system and the feeding management of camel as well as the weak relationship between camel and stray dogs may explain these findings. It was found that the environmental conditions such as suitable condition for survival of the eggs of *E. granulosus* and the presence of large number of stray dogs around the raising area of animals are the main factors which governing the prevalence rate of hydatidosis in ruminants (11).

It is well known that among the organs involved, livers and lungs are the most commonly infected organs by hydatid cysts in all examined animal species. However, the present findings showed that the incidence rate of the infection was noticed more frequently in livers (53% sheep and buffaloes, 56% goats and cattle) than lungs of the examined animals. There was no significant difference between the rate of infection in liver and lung ($p \leq 0.05$). Similar results were obtained by various workers , the most common location of hydatid cysts in sheep and goats were reported in liver followed by the lung (11), (12); (13); (14); (15). It is indicated that livers and lungs are the most commonly affected organs with hydatid cysts due to the reason that they are the first large capillary fields encountered by the blood born Onchosphers (16).

The results of this study revealed that livers are the most commonly affected organ which might be due to the reflection of the route of parasite entry and seem to support the hypothesis of hepatic portal distribution of Onchosphers leading firstly to liver infection (16).

Little information exists about seasonal prevalence of hydatidosis in ruminants. Accordingly, the temporal distribution of the disease in Iraq is unclear. Nevertheless , it was found by (9) that there was seasonal fluctuation in the prevalence rate of hydatid cysts among ruminants slaughtered in Kirkuk slaughterhouse. Hydatid cysts in sheep and cattle were highest in autumn (1.97% and 8.33%) respectively, in goats it was highest in winter (1.01%), while in calves was highest in spring (1.24%), followed by winter (0.84%). The present study and results of other workers in the same region such as (6), (15) and (17) have shown that the incidence rate of hydatid cysts is higher in humid and rainy season (winter) than that seen in other seasons. Results of the current study revealed that the highest incidence rate of hydatid cysts in sheep 2.9%, goats 2.37%, cattle 4.25% and buffaloes 8.33% was recorded during cold weather (winter season). The rate of infection was significantly higher ($p < 0.01$) in winter season when compared with the rates of infection in other seasons. Existence of infected dogs in grasslands and ruminant feeding by infected pasture might be

two main factors behind high infection rates during winter in the governorate of Kerbala. Similarly, it was also found by (6) that the incidence rate of hydatid cysts in sheep slaughtered in Iran during cold season (autumn and winter) was higher than that in spring and summer (76.8 and 77%, respectively).

Results of this study indicated that fertile cysts were found more frequently in livers of cattle 37.7% and buffaloes 36.7% , while lungs of the same species harbor 22.9% and 26.6% of fertile cysts respectively. However, results of this study also revealed that fertile cysts were detected in 15.8% lungs of sheep and 15 % goat- lungs, while livers of the same species were less infected by fertile hydatid cysts (11.2% , 12.5% of sheep and goat respectively).

As far as this study is concerned, the results of fertility are similar to that obtained by (18), the frequency occurrence of fertile cysts was higher in the lungs than in the livers both in goats and sheep. This is also similar with the results of other workers (11 , 12) and it has been also stated that the relatively softer consistency of lung in these animal species allows easier development due to the pressure of cysts.

Variation in fertility could be attributed to strain differences in traits such as host and organ preference, development rate, infectivity, pathogenesis and antigenicity and drug resistance. It might be useful to mention that ovine strain of *E. granulosus* imposes severe effect on public health and the presence of fertile cysts on cattle of an apparent ovine strain may constitute an additional public health hazard (10).

The results of this study indicate that hydatidosis is of great public health and economic significance in the governorate of Holy Kerbala. Detection of large number of hydatid cysts in the slaughtered ruminants in kerbala abattoirs and its improper disposal will act as a source of infection to final host (mainly dog) and transmission to human beings. Accordingly, conducting public campaign is urgently required to control this disease through destruction of stray dogs, prohibiting illegal slaughter of animals outside abattoirs, proper disposal of infected organs, fencing of slaughterhouses and increase awareness of the people on the epidemiology of the disease.

Acknowledgement:

Author is grateful to the Veterinary Hospital and Services in Holy Kerbala Governorate , namely, Dr. Hameed Jarallah for cooperation and help to conduct this study.

REFERENCES:

1. Macpherson C.N.L, French CM, Stevenson P, Karstad L , Arundel J.H (1985). Hydatid disease in the Turkana District of Kenya. The prevalence of Echinococcus granulosus infections in dogs and observations on the role of the dog in the life style of the Turkana. *Ann. Trop. Med. Parasitol.* , 79: 51-61.
2. Baban, M.R. : Hydatidosis in man and some meat animals and the role of stray dogs in its dissemination. A thesis submitted to the College of Education , University of Salahddin (1990).
3. Molan A.L (1993): Epidemiology of hydatidosis and Echinococcosis in Theqar Province South Iraq. *Jpn.JMD. Sci. Biol.*, 46 : 29-35.
4. Babero B.B. and Kaisi A. (1965) : The zoonosis of animal parasites in Iraq. A case of hydatid cyst of the spleen *Rev. Biol.Trop.* , 13 (1) : 135-138.
5. Al-Nassir, H.S., Al-Abbassy, S.N ; Kawan, M.H ; Jarwean, A.F. (1992). Bovine Hydatidosis in the governorate of Babylon. *J. IBN Al-Haitham Pure and App. Sci.* , vol.3 (1), pp.13-21.
6. Daryani A., Alaei R.; Arab R. ; Sharif M ; Dehghan M.H. ; Ziaei H. (2006) : Prevalence of hydatid cyst in slaughtered animals in northwestern Iran. *J Anim. Vet. Adv*, 5 (4): 330-334.
7. Arene F.O.I (1985): Prevalence of hydatid cysts in domestic livestock in the Niger Delts, *Trop. Anim. Health Prod.*, 17 (1): 3-4.
8. Nubark, S.K. (1978) : Epidemiological and Serological studies of hydatid cyst – Echinococcus granulosus in sheep, cattle and camels. MSc. Thesis , College of Veterinary Medicine, University of Baghdad.
9. Kadir, M.A. and Rasheed S.A. (2008). Prevalence of some parasitic helminthes among slaughtered ruminants in Kirkuk slaughterhouse, Kirkuk, Iraq. *Iraqi Journal of Veterinary Sciences*, Vol.22, No.2, pp 81-85.
10. Thompson R.C.A., Lymbery A.J.(1988). The nature , extent and significance of variation within the genus Echinococcus. *Advances in Parasitology*, 27: 210-258.
11. Abiyot J., Beyene, D., Abunna F. (2011). Prevalence of hydatidosis in small ruminants and its economic significance in Modjo Modern Export Abattoir, Ethiopia. *Journal of Public Health and Epidemiology* Vol. 3 (10), pp.454-461.
12. Al-Yaman F.M., Assaf L.;Hailat N. and Abdel Hafez, S.K.(1985): Prevalence of hydatidosis in slaughtered animals from North Jordan. *Ann. Trop. Med. Parasitol.* , 79 ; (5), 501-506.
13. Abo-Shebada M.N. (1993): Some Observations on Hydatidosis in Jordan. *J. Helminthol.* 67 : 284-252.
14. Kamahawi S., Hijjawi N, Abu-Ghazalah A, Abbas M. (1995). Prevalence of hydatid cysts in livestock from five regions in Jordan. *Ann. Trop. Med. Hyg.*, 89: 621-629.
15. Lotfi A. , Yusefkhani, M. ; Samavatian H.Y. ; Gengiz, Z.T. and Valilon M. (2010); Prevalence of cystic Echinococcosis in slaughtered sheep and goats in Ahar abattoir, Northwest part of Iran. *Kafkas Univ. Vet. Fak. Derg*, 16 (3): 515-518.
16. Schwabe C.W. (1986). Current status of hydatid disease: a zoonosis of increasing importance ; in: the biology of Echinococcus and hydatid disease. (Edited by: Thompson , R.C.A.) London ; UK; George Allen and Univ. pp.81-113.
17. Ansari-Lari M. (2005): A retrospective survey of hydatidosis in livestock in Shiraz, Iran, based on abattoir data during 1999-2004. *Vet. Parasitol.* , 133, 119-123.
18. Jobre R. (1994). Preliminary study of the Economic and Public Health Significance of Echinococcosis in Debre Zeit Abattoir, Ethiopia. 3rd Student Scientific Journal (SSJ).