EPIDEMIOLOGICAL STUDY OF HYDATID CYST OF *ECHINOCOCCUS GRANULOSUS* ISOLATED FROM SHEEP AND GOATS IN DUHOK PROVINCE, KURDISTAN REGION OF IRAQ.

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ABSTRACT

This study included an epidemiological study on hydatidosis which included the examination of 63483 sheep and 13960 goats slaughtered at Duhok Abattoir during the period from Nov.2008 to Oct. 2009. It has been found that 12.3% of sheep and 5.17% of goats were infected with HCs. Among sheep 56.10% of HC were found in the lungs, 36.25% in the liver and 7.66% in both liver and lungs. Among goats 67.31% of the HCs found in the lungs, 25.5% in liver and 7.20% in both liver and lungs. The highest % of sheep occurred in summer (14.74%) and the lowest (9.9%) during spring, whereas, the highest % in goats (11.24%) was during spring and the lowest (2.47%) during winter.

INTRODUCTION

Hydatid disease (hydatidosis or Echinococcosis) is a silent cyclozoonotic infection of man and domestic animals, caused by the larval stage of *Echinococcus granulosus* (small dog tapeworm). Man and domestic animals become infected accidentally by ingesting food, drink or other materials contaminated with the egg of this parasite (Bhatia and Pathak, 1990). There are 4 known species of Echinococcus, namely: *Echinococcus granulosus*, *Echinococcus multilocularis*, *Echinococcus vogeli* and *Echinococcus oligarthrus.* (Morar and Feldman, 2003). Three of these species are of medical importance, *Echinococcus granulosus*, causing cystic echinococcosis (CE) which is the most prevalent species in all continents, causing a considerable public health problems in many regions of the world (WHO,2001). Furthermore, it is also common in Iraq (Al-nakeeb, 2004). *E. multilocularis*, causing alveolar Echinococcosis (AE) is more widely distributed in the northern hemisphere, and represents a considerable public health burden as it's the most virulent species and infection with it is lethal in most untreated patients. Finally *Echinococcus vogeli*, which causes polycystic Echinococcosis(PE), the most rare species, cases of this disease have been reported from central and South America (WHO,2001). The distribution of hydatid disease is normally associated with underdeveloped countries, especially in rural communities, where man maintains close contact with the dog, the definitive host and various domestic animals may act as intermediate hosts (Dueger *et al*., 1999). Hydatidosis is endemic in Iraq where many domestic animals including sheep, goat, camel, and cattle act as intermediate hosts, while dog and wolf act as final host (ALNakeeb, 2004). On the lights of these information present study was designed to evaluate the occurrence of hydatid disease in slaughtered animals at Duhok abattoir and it's correlation with seasonal variation and involvement of multiple organs of the host.

Materials and Methods

This study includes an epidemiological study, involving the examination of 77443 slaughtered animals (63483 sheep and 13960 goats). The samples were collected from the modern Duhok abattoir during the period between Nov. 2008 To Oct. 2009. Information about the number of infected animals, organ involved and source of animal were recorded and the data were tabulated.

Results and Discussion

1. Occurrence of hydatidosis in slaughtered Sheep and Goats in Duhok abattoir:-

The number of infected Sheep of both sexes with hydatidosis during the period from Nov. 2008 to Oct. 2009 is shown in Table (1). Out of 63483 Sheep slaughtered during this period, 12.3% found infected with hydatid cysts, but when the results were analyzed on monthly basis, variation of the rate of hydatidosis of infected sheep did not follow any distinct pattern.

Table(1). Monthly occurrence of Hydatidosis in Sheep.

Date In Months	No. of slaughtered Sheep	No. of Infected Sheep	Infection (%)
Nov. 08	11495	1389	12.08 %
Dec. 08	8108	1070	13.19 %
Jan. 09	7499	1119	14.92 %
Feb. 09	5288	472	8.92 %
Mar. 09	4100	507	12.36 %
Apr. 09	5611	457	8.14 %
May. 09	5332	526	9.86 %
Jun. 09	5045	620	12.28 %
Jul. 09	2957	674	22.79 %
Aug.09	3377	384	11.37 %
Sep. 09	2437	301	12.35 %
Oct. 09	2234	272	12.17 %
Total	63483	7791	12.3%

Since the highest percentage (22.8%) was observed during July, whereas, the lowest percentage (8.1%) was observed during April. The percentage of infection during the remaining months of the year varied from 8.9% to 14.9%. Table (2) shows seasonal variation in the percentage of infection, as it is obvious from this table, that the highest percentage (14.74%) of infection occurred during Summer months, whereas, the lowest percentage (9.9%) was observed during Spring months. The rate of infection during autumn and winter was 12.13% and 13.4%, respectively.

Table (2). Seasonal variation of Hydatidosis among slaughtered Sheep in Duhok Abattoir.

Season	Examined No.	Infected Sheep No.	Infection (%)
Winter	20895	2661	12.73 %
Spring	15043	1490	9.9 %
Summer	11379	1678	14.74 %
Autumn	16166	1962	12.13 %

The number of infected Goats of both sexes with hydatidosis is shown in Table (3). Out of 13960 Goats slaughtered during this period, 5.17% was infected with hydatid cysts. But when the results were analyzed on monthly basis, variation of the occurrence of hydatidosis of infected Goats did not follow any particular pattern, since the highest percentage (11.05%) was observed during October, whereas, the lowest percentage (2.53%) was observed during December. The percentage of infection during the remaining months of the year was varied from 3.16% to 9.71% (Table 3).

Table (3). Monthly occurrence of Hydatidosis in Goats.

Date In Months	No. of slaughtered Goats	No. of Infected Goats	Infection (%)
Nov. 08	1160	39	3.36 %
Dec. 08	3280	83	2.53 %
Jan. 09	2500	79	3.16 %
Feb. 09	350	34	9.71 %
Mar. 09	483	39	8.07 %
Apr. 09	512	43	8.39 %
May. 09	864	70	8.10 %
Jun. 09	1059	92	8.68 %
Jul. 09	1211	66	5.45 %
Aug.09	1067	51	4.77 %
Sep. 09	895	62	6.92 %
Oct. 09	579	64	11.05 %
Total	13960	722	5.2%

Table(4) shows the seasonal variation on the percentage of infection in Goats. As it is obvious from this table, that the highest percentage (11.24%) of infection occurred during Spring months, whereas, the lowest percentage (2.47%) was observed during Winter months. The rate of infection during summer and autumn was 4.94% and 7.44% respectively. The incidence of hydatidosis in Sheep (12.3%) reported in the present study is lower than that reported by Ghaffar, (2008) in Duhok, also in which he found 15.5% of the slaughtered Sheep were infected.

Table(4). Seasonal variation of Hydatidosis among slaughtered Goats in Duhok Abattoir.

Season	Examined No.	Infected Goats No.	Infection (%)
Winter	6130	152	2.47 %
Spring	1859	209	11.24 %
Summer	3337	165	4.94 %
Autumn	2634	196	7.44 %

Much higher rates than the rate reported in this study were recorded by other investigators

from different parts of Iraq, which ranged from 29.2 to 44% (Babero and Al- Dabagh, 1963; Baban, 1990; Al- Abbasy *et al*., 1980; Al-Fatalawei, 2002 and Ghaffar, 2008). On the other hand, much lower rates than the rate reported in the present study ranged from 0.27 to 7.3% were reported by many workers from different parts of Iraq (Al- Sultan *et al*., 1987; Yuhana *et al.,* 2000 and Bajalan, 2006). With respect to the occurrence of hydatidosis in Goats (5.17%) reported in the present study this rate is higher than that reported by Ghaffar, (2008) in Duhok, in which he found 1.4% of slaughtered Goats were infected. Much higher rates than the rate reported in this study were recorded by other investigators from different parts of Iraq and other countries which ranged from 6.2 to 18.2% (Wajdi and Nassir ,1983; MacPherson *et al.*,1985; Dawood *et al*., 1995 and Saeed *et al* .,2002). On the other hand, much lower rates than the rate reported in the present study ranged from 3.1 to 4.5% were reported by many workers from different parts of Iraq and other countries (Mahmoud, 1980; Njoroge *et al* ., 2002 and Arbabi and Hooshyar ,2006). It is obvious from these results that the rate of hydatidosis in sheep was higher than that of goats, this may be due to the management type and outdoor rearing of sheep which is in a wider scale than that of Goats and Torgerson *et al*., (1998) attributed the low prevalence of hydatidosis in goats to the feeding habit of this animals as they eat the upper part of herbage which is exposed to sunlight, and the further added that temperature can decrease the viability of *E. granulosus* eggs and Gemmell *et al*., (2001) stated that desiccation is lethal for *E. granulosus* eggs.

2 Organ specificity

Organ specificity was studied to find out tissue preference of the intermediate forms of *E. granulosus*. For this purpose, different organs of infected hosts (Sheep and Goats) were examined for the presence of cysts, and the results were tabulated in Tables (5and 6). Among **7791** infected Sheep, **4370** cases (**56.10%)** of hydatid cysts were found in lungs, **2824** cases (**36.25%)** found in liver and **597** cases (**7.66%)** of hydatid cyst were found in both lung and liver.

Table(5). Organ specificity of hydatidosis in Sheep at Duhok abattoirs.

Date In Months	Infected No.	Lung		Liver		Both lung and liver	
		No.	%	No.	%	No.	%
Nov. 08	1389	726	52.26%	566	40.74%	97	6.98%
Dec. 08	1070	550	51.40%	435	40.65%	85	7.94%
Jan. 09	1119	550	49.15%	475	42.44%	94	8.40%
Feb. 09	472	323	68.43%	113	23.94%	36	7.62%
Mar. 09	507	345	68.04%	123	24.26%	39	7.69%
Apr. 09	457	295	64.55%	125	27.35%	37	8.09%
May. 09	526	345	65.58%	140	26.61%	41	7.79%
Jun. 09	620	358	57.74%	214	34.51%	48	7.74%
Jul. 09	674	337	50.00%	286	42.43%	51	7.56%
Aug.09	384	210	54.68%	145	37.76%	29	7.55%
Sep. 09	301	180	59.80%	100	33.22%	21	6.97%
Oct. 09	272	151	55.51%	102	37.5%	19	6.98%
Total	7791	4370	56.10%	2824	36.25%	597	7.66%

With respect to Goats, also most of the cysts were located in lungs. Out of 722 infected Goats 486 of the cysts (**67.31%)** were found in lungs and **184** cases (**25.5%)** in the liver and **52** cases (**7.20%)** of hydatid cyst were found in both lung and liver. Obviously, the lungs found to be the most commonly infected organ with hydatidosis in both Sheep(56.1%) and Goats(67.31%), followed by liver in both Sheep(36.25%) and Goats(25.48%), and both the percentage of liver and lung involvement was found to be more or less the same (7.66% to 7.20% respectively) in infected Sheep and Goats.

Table(6). Organ specificity of Hydatidosis in Goats at Duhok abattoirs.

Date In Months	Infected No.	Lung		Liver		Both Lung and liver	
		No.	%	No.	%	No.	%
Nov. 08	39	30	76.92%	6	15.38%	3	7.69%
Dec. 08	83	42	50.60%	35	42.16%	6	7.22%
Jan. 09	79	40	50.63%	35	44.30%	4	5.06%
Feb. 09	34	23	67.64%	8	23.52%	3	8.82%
Mar. 09	39	20	51.28%	15	38.46%	4	10.25%
Apr. 09	43	30	69.76%	10	23.25%	3	6.97%
May. 09	70	45	64.28%	20	28.57%	5	7.14%
Jun. 09	92	66	71.73%	19	20.65%	7	7.60%
Jul. 09	66	55	83.33%	6	9.09%	5	7.57%
Aug.09	51	40	78.43%	8	15.68%	3	5.88%
Sep. 09	62	45	72.58%	12	19.35%	5	8.06%
Oct. 09	64	50	78.12%	10	15.62%	4	6.25%
Total	722	486	67.31%	184	25.5%	52	7.20%

The results indicates that if we compare between these two intermediate host the occurrence of pulmonary hydatidosis was higher in Goats (67.31%) as compared with Sheep (56.1%). On the other hand, the incidence of hepatic hydatidosis was higher in Sheep (36.25%) as compared with Goats (25.48%). The results of the present study revealed that the lungs were the common organ of infection by Echinococcosis followed by liver, which was in agreement with the results of several workers, namely MacPherson *et al.*, (1985), Al- Sultan *et al*., (1987), Pandey *et al.*, (1988), Mehrabani *et al*., (1999), Arbabi and Hooshyar, (2006) and Ghaffar, (2008). Pampiglione (1966) reported that there are two routs by which the infection is transferred to the lungs, the most common route is alimentary tract of intermediate host, when hatched oncosphere penetrate intestinal wall to enter blood vessels then transported to liver and lungs via blood, The second route, the larvae may be liberated from eggs during rumination which may gain direct access to the lungs through trachea. In the present study the second route of infection might have supplemented towards higher infection rate in the lungs. While Al- Sultan *et al*., (1987) attributed the high incidence of lung to the nature of the blood flow, for it is more stagnant in the lungs than in the liver.

3.3 Selected hosts subjected to thorough examination for the presence of hydatid cyst:-

During the period From Nov. 08 to Feb. 09, 1533 infected Sheep and 112 infected Goats were examined thoroughly for organ specificity and presence, the studied organs were lung, liver, spleen and kidney (Tables 7and 8). This study indicated the presence of 865 cases of cysts (56.42 %) in Sheep lung, 526 cases (34.31%) in liver, 118 cases (7.69 %) in both lung and liver and 24 cases of cysts (1.56 %) were found in Spleen , Kidney and Heart. On the other hand, 61 cases of hydatid cysts (54.46 %) were found in Goats lung, 42 cases (37.5 %) in liver, 7 cases (6.25 %) in both lung and liver and 2 cases of cysts (1.78 %) were found in Spleen, Kidney and Heart of Goats. From this study it is obvious that the percentage of infection in lung, liver, Spleen, Kidney and Heart in Sheep were higher as compared with that observed for

Goats. On the other hand, the mixed (lung and liver) of Goats was higher as compared with that of Sheep.

Table (7). Prevalence of hydatidosis according to organ in examined infected Sheep (1533).

Organ	Infected Sheep No.	Percentage of infection (%)
Lung	865	56.42 %
Liver	526	34.31 %
Both liver and lung	118	7.69 %
Spleen, Kidney and Heart	24	1.56 %

Table (8). Prevalence of hydatidosis according to organ in examined infected Goats (112).

Organ	Infected Goats No.	Percentage of infection (%)
Lung	61	54.46 %
Liver	42	37.5 %
Both liver and lung	7	6.25 %
Spleen , Kidney and Heart	2	1.78 %

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الخلاصة

تضمنت هذه الدراسة، دراسة وبائية للأكياس المائية المعزولة من الكبد و الرئة للأغنام و الماعز في محافظة دهوك- إقليم كردستان العراق. أجريت هذه الدراسة خلال الفترة من تشرين الثاني 2008 و لغاية تشرين الأول 2009. أثناء هذه الفترة تم فحص 63483 رأساً من الأغنام و 13960 رأسا من الماعز التي ذبحت في مجزرة دهوك للتحري عن الأكياس المائية. تبين بأن 12.3% من الأغنام و 5.17% من الماعز كانت مصابة بالأكياس المائية و توزعت هذه الأكياس على النحو الأتي. 56.1% في الرئة و 36.25% في الكبد و 7.66% في كل من الكبد و الرئة في الأغنام، أما بالنسبة للماعز فوجدت 67.31% في الرئة و 25.5% في الكبد و 7.2% في كل من الكبد و الرئة. بالنسبة لفصول السنة، حدثت أعلى نسبة إصابة للأغنام في الصيف (14.74%) و أقلها في الربيع (9.9%)، بينما كانت أعلى نسبة إصابة للماعز في الربيع (11.24%) و أقلها في الشتاء (2.47%).

پوختە

ئەڤ ڤەکۆلینە هاتیە ئەنجام دان لسەر بەربەلاڤ بونا نەخوشیا کیسکێت ئافێ(Hydatid cyst) تایبەت ژ جورێ (*Ecchinococcus granulosus*) ئەوێت هاتینە وەرگرتن ژ ئەندامێت پەز و بزنا (سیە و جگەر) ل کوشتارگەها دهوکێ هەر ژ چریا دووێ 2008 هەتا چریا ئێکێ 2009. ل ڤی ماوەی دا 63483 پەز و 13960 بزن ل کوشتارگەهێ هاتنە سەرژێکرن. هاتە دیار کرن ریژا 12.3٪ ژ پەز و 5.17٪ ژ بزنا تۆشی نەخوشیا کیسکێت ئافێ بون. ریژا 56.1٪ کیسکێت ئافێ لسەر سیە و ریژا 36.25٪ لسەر جگەر و ریژا 7.66٪ کیسکێت ئافێ لسەر هەردو ئەنداما (سیە و جگەر) ل پەزێت تۆشی بووی هاتنە دیتن، هەروەسا ریژا 67.31٪ کیسکێت ئافێ لسەر سیە و ریژا 25.5٪ لسەر جگەر و ریژا 7.20٪ کیسکێت ئافێ لسەر هەردو ئەنداما (سیە و جگەر) ل بزنێت تۆش بووی هاتنە دیتن. لدویف ڤێ ڤەکولینێ زورترین ریژا تۆش بونا پەزا (14.7٪) ل هافینێ و کێمترین ریژە (9.9٪) ل بهارێ و زورترین ریژا تۆش بونا بزنا(11.24٪) ل بهارێ و کێمترین ریژە (2.47٪) ل زڤستانێ هاتنە تومار کرن.