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PREVALENCE OF ECHINOCOCCUS GRANULOSUS IN DIFFERENT INTERMEDIATE HOSTS IN DUHOK PROVINCE, KURDISTAN REGION, IRAQ

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ABSTRACT:
This study was carried out in Duhok provinces, Kurdistan Region/ Iraq from August; 2014 to December 2015.The study focused on the prevalence of CE in slaughtered animals. The total prevalence was 5.25% (11753/223436), with a high rate in sheep (4.25%), and low rates in goats and cattle (0.64% and 0.37%, respectively). With respect to abattoirs involved in the study, the highest prevalence was detected in Akre abattoir (8.21%) and the lowest in Amedy abattoir (4.09%). Among the infected animals, sheep in Akre abattoir recorded the highest prevalence, while cattle in Duhok abattoir recorded the lowest prevalence (7.57 and 0.1%, respectively). Males of sheep, goats and cattle showed higher prevalence (70.51, 63.62, and 92.06%, respectively). Regarding organ involvements, malesand females of cattle showed high liver involvement (63.13 and 84.62%, respectively), while males and females of sheep (62.21 and 60.31%, respectively) and goats (60.59 and 54.51%, respectively) showed high lungs involvements.

KEYWORDS: Hydatidosis; Cystic Echinococcosis; Echinococcus Granulosus Senso Lato; Cyst Location; Organ Involvements; Kurdistan-Iraq.

1. INTRODUCTION

Cystic echinococcosis (CE) is caused by the larval stage of *Echinococcus granulosus* senso lato which adult stages inhabits the intestine of canids is one of the most important parasitic zoonoses of worldwide distribution, including Europe, Central Asia, China, Australia, Northern Africa, South America, Middle East, and Iran (Schmidt and Roberts, 2000) affecting domesticated, wild mammals and humans (Deplazes *et al*., 2017).

In Iraq, Hydatidosis has been reported since 1940 by Senekji and Beattie (1940) who undertook the first comprehensive study on echinococcosis on stray dogs from Baghdad. In addition, Babero *et al*. (1963) observed echinococcal cysts in sheep, cows, buffaloes and camels, and reported that stray dogs captured in Baghdad and other cities harbored adult worms. Baban (1990), during his study on human hydatidosis, recorded this disease in three governorates (Diala, Karkuk, and Thaiqar) with different prevalence rates. Al-Fatalawei (2002), in a study in Al-Qadisia governorate, revealed a prevalence of 20.59% in cattle, sheep and goats slaughtered at AL-Dewania abattoir. Al-Ani (2012), in a study on different regions of Baghdad recorded a prevalence of 9.9% in examined animals.

Regarding Kurdistan region, several studies reported variable prevalence rates of hydatidosis in domestic animals from Duhok province abattoir (Ghaffar, 2008;Abdullah, 2009;Meerkhan,2011;Meerkhan and Abdullah,2012;Meerkhan and Mero,2013). In Erbil, province (Molan and Saida, 1989; Al-Barwari *et al*., 1991; Saeed *et al*., 2000; Hassan *et al*., 2016) and Sulaimani province (Bajalan, 2006; Hama *et al*., 2015).

The present study aims at the identification of the CE prevalence and the its relation with gender and cyst location in unstudied areas of Duhok province such as, Duhok city, Zakho, Summel, Akre, Bardarash, Amedi and Shekhan, Duhok Province, Kurdistan Region of Iraq.

2. MATERIAL AND METHODS

From August; 2014 to December 2015. The official records of the Duhok Veterinary Directorate were checked for data from abattoirs of Duhok, Zakho, Akre, Bardarash and Amedy. Number of the slaughtered sheep, goats and cattle (the infected and un-infected animals) were counted, and the prevalence of the infection, was calculated for each of them and linked with the animal gender and cyst location.

3. RESULTS

During the study period, 223,436 animals (sheep, goats and cattle) were slaughtered in the five official abattoirs (Table1) recording 11,753(5.26%) CE cases in animals. The highest prevalence (8.21%) was recorded from Akri abattoir, while the lowest prevalence (4.09%)in Amedy abattoirs. Among the intermediate hosts, sheep had the highest infection rate while cattle had the lowest rate (4.25% and 0.37%, respectively) as shown in Table 2.

Table 1. The prevalence of cystic echinococcosis among slaughtered animals in different abattoirs

Abattoirs	Slaughtered	Infected	
		No.	%
Duhok	137,475	6,223	4.53 %
Zakho	33,076	1,668	5.04 %
Akre	31,780	2,608	8.21 %
Bardarash	12,039	883	7.33 %
Amedy	9,066	371	4.09 %
Total	223,436	11,753	5.26 %

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Table 2. The prevalence of cystic echinococcosis among slaughtered animals in different hosts

Abattoir	Total1	Infected Animals					
		Sheep		Goats		Cattle	
		No.	%	No.	%	No.	%
Duhok	137,475	5413	3.94	677	0.49	133	0.10
Zakho	33,076	1127	3.41	484	1.46	57	0.17
Akre	31,780	2407	7.57	131	0.41	70	0.22
Bardarash	12,039	342	2.84	15	0.12	526	4.37
Amedy	9,066	213	2.35	125	1.38	33	0.36
Total	223,436	9,502	4.25	1,432	0.64	819	0.37

Prevalence of CE infection of different intermediate hosts (Table.3) was 5.26%, with the highest prevalence (10.6 %) of sheep was in Akri abattoir, while the lowest prevalence (5.24 %) was in Duhok abattoir, the highest prevalence in goats (5.55%) was reported in Duhok abattoir and the lowest (2.74%) was in Akri abattoir. Regarding cattle, the highest prevalence (8.01%) was from Bardarash abattoir and the lowest (0.61%) in Duhok abattoir.

Table 3. The prevalence of cystic echinococcosis among slaughtered animals in different intermediate hosts

Abattoirs	Host	Slaughtered	Infected	
			No.	%
Duhok	Sheep	103374	5413	5.24 %
	Goats	12209	677	5.55 %
	Cattle	21892	133	0.61 %
Zakho	Sheep	20808	1127	5.42 %
	Goats	7608	484	6.36 %
	Cattle	4660	57	1.22 %
Akre	Sheep	22698	2407	10.6 %
	Goats	4776	131	2.74 %
	Cattle	4306	70	1.63 %
Bardarash	Sheep	5128	342	6.67 %
	Goats	347	15	4.32 %
	Cattle	6564	526	8.01 %
Amedy	Sheep	2894	213	7.36 %
	Goats	2043	125	6.12 %
	Cattle	4129	33	0.8 %
Total		223436	11753	5.26 %

Regarding the gender, male sheep, goats and cattle, showed higher prevalence (70.51%, 63.62% and 92.06%, respectively) (Table.4).

Table 4. The prevalence of cystic echinococcosis among slaughtered Animals according to gender.

Host	Slaughtered	Infected Animals					
		Total		Male		Female	
		No.	%	No.	%	No.	%
Sheep	154902	9502	6.13	6700	70.51	2802	29.49
Goats	26983	1432	5.31	911	63.62	521	36.38
Cattle	41551	819	1.97	754	92.06	65	7.94
Total	223436	11753	5.26	8365	71.17	3388	28.83

With respect to infected organs, lungs had a higher prevalence in both sheep and goats (61.65 and 58.38%, respectively), while in cattle; liver had the higher prevalence (64.84%). The lowest prevalence (0.17%) of infection was reported in kidneys of slaughtered animals with the highest (0.98%) being in cattle (Table. 5). Regarding the gender, both males and females of sheep and goats had high prevalence in lung and both sexes of cattle had high prevalence with liver involvements (Table.6).

Table 5. The prevalence of cystic echinococcosis among slaughtered animals according to organ involvement

Host	Total	Infected Animals					
		Liver		Lungs		Kidneys	
		No.	%	No.	%	No.	%
Sheep	9502	3634	38.24	5858	61.65	10	0.11
Goats	1432	594	41.48	836	58.38	2	0.14
Cattle	819	531	64.84	280	34.19	8	0.98
Total	11753	4759	40.49	6974	59.34	20	0.17

Table 6. The prevalence of cystic echinococcosis in different organs among slaughtered animals and their relation to hosts gender

Host	Gender	Total	Infected Animals					
			Liver		Lungs		Kidneys	
			No.	%	No.	%	No.	%
Sheep	Male	6700	2525	37.69	4168	62.21	7	0.10
	Female	2802	1109	39.58	1690	60.31	3	0.11
Goats	Male	911	358	39.3	552	60.59	1	0.11
	Female	521	236	45.3	284	54.51	1	0.19
Cattle	Male	754	476	63.13	270	35.81	8	1.06
	Female	65	55	84.62	10	15.38	0	0
Total		11753	4759	40.4	6974	59.34	20	0.17

4. DISCUSSION

Cystic echinococcosis is endemic in many parts of world and is the cause of serious health concern. The incidence differs according to the host, the infected organ, the gender and the geographic regions (Al-Fatalawi, 2002; Tashani *et al*., 2002; Eckert and Deplazes, 2004; Mohsen *et al*., 2009; Meerkhan and Abdullah, 2012). In Kurdistan Region, several factors contribute to the transmission of the infection, including cultural, educational, socioeconomical conditions.

The highest prevalence of CE was in sheep, this is in agreement with the results of Saida and Nouraddin (2011), Al-Berwari (2012); Meerkhan and Abdullah (2012); Hama (2013) and Al-Bosely (2014). In all these studies the highest prevalence of infection was in sheep although the prevalence rate was fluctuating. Such results indicate the high susceptibility of sheep to this parasite. In addition the molecular studies performed in Kurdistan proved that the sheep strain (G1 genotype) is the most prevalent in this area (Ahmad *et al*., 2013 and Hama *et al*., 2013).

The low prevalence of CE in goats and cattle are in accordance to the findings of Bajalan (2006) in Kalar, Kadir and Rasheed (2008) in Kurkuk and Mero *et al*. (2014) in Sulaimani. All these authors attributed the low prevalence to the feeding habit of goats, as they eat the higher parts of herbage that are exposed to the sunlight which decrease the viability of the parasite eggs, in addition it is difficult for dogs to uphill to these area for the defecation. The low prevalence in cattle may be due to rearing them in cowshed with better care which relatively contact with dogs (Thompson and McManus, 2002).

Regarding the gender, male sheep, goats and cattle, showed higher prevalence (70.51%, 63.62% and 92.06% respectively) than females, in this aspect the present results contradict with other studies involving the same intermediate host, as most of them reported higher prevalence in females (Daryani *et al*., 2007, in Iran; Kamhawi *et al*., 2009 in Jordan; Hama, 2013, and Sargali and Mero, 2013, in Iraq). While Mero *et al*. (2014) in Sulaimani province, found that the sex of the slaughtered animals has no significant effect on the distribution of CE, as the prevalence in males and females sheep, goats and cattle were very closed. In the present study, the highest prevalence of infection in males might be due to either the high number of slaughtered males of each species(Table.6) which was almost the twice of females, or they may be older in age.

Highest prevalence of CE was in the liver and the lungs, this is in agreement with the results of Ibrahim (2010), Hama (2013), Sargali and Mero (2013), AL-Bosely (2014), Mero *et al*.

(2014). This is because the liver act as the first filter for larval infection and the lungs as the second filter, and the oncosphere adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved (Kebede *et al*., 2009; Khalf *et al*., 2014; Mero *et al*., 2014; and Temam *et al*., 2016).

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