

# Importance of cystic echinococcosis in slaughtered herbivores from Iran

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**Abstract** Cystic echinococcosis (CE) or hydatidosis is well-known as one of the zoonotic diseases in world-wide including Iran. Hydatidosis was considered as a disease that causes severe reduction in meat wool and milk in livestock animals which all of them indicating its importance. Thus, present study was designed to evaluate prevalence of CE in slaughtered animals from Delfan region in Lorestan province of Iran. The samples 6,885 animals were considered based on type of species in a slaughter from Lorestan province. The study performed from 3 April 2009 to 3 April 2012 and inspection carried out from 4,101 cattle, 2,150 sheep and 634 goat. The liver and lungs examined based on CE and showed the highest prevalence in cattle (25.7 %) and the lowest 3.8 % in goat, likewise, CE was more in the lung than to liver. There was significant difference between species of animals and infected organ ( $P < 0.001$ ). The highest prevalence was

seen in winter (32.8 % for cattle, 8.1 % for goat) while, it was 15.7 % for sheep in summer ( $P = 0.04$ ). Overall these data indicate the necessity of disease control strategy for reduction of CE.

**Keywords** Cystic echinococcosis · Slaughtered herbivores · Delfan · Iran

## Introduction

Inspection records of the slaughtered animals have been used as an useful source for evaluation of the epidemiological aspect of certain diseases in several countries including Iran (Ansari-Lari 2005; Daryani et al. 2009; Kara et al. 2009; Ziaei et al. 2011; Abebe et al. 2013). Cystic echinococcosis (CE) is a disease which causes considerable economic losses and public health problem (Singh et al. 2012). Hydatid cyst is the larval form of *Echinococcus granulosus* in intermediate hosts (Godara et al. 2012). CE or hydatidosis of livestock animals causes decreasing in production of meat, wool, and milk and thereby high economical losses. Furthermore, the infected organs of the slaughtered animals are being condemned. Because CE is a zoonotic disease, in many countries there are special programs to control and detect the disease (Oku et al. 2004). The previous reports have been shown that the incidence of CE in animals in Mediterranean and Middle East is high (Battelli et al. 2002; Sadjjadi 2006). Based on FAO report (Over et al. 1992), infection with *E. granulosus* are common in all herbivorous animals in south west Asia. Also there are several reports from Middle East countries including Iran which found sheep, cattle, goats, calves, buffaloes, and camels infected with hydatid cysts (Dajani 1978; Abo-Shehada 1993; Molan 1993; Dalimi et al. 2002). However, there are limited studies about the prevalence of

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CE in slaughtered animals in Delfan, Iran. Therefore, this study was undertaken to estimate the prevalence of CE in slaughtered animals in Delfan located at the southwest of Iran.

## Materials and methods

This cross-sectional study was carried out on 6,885 animals [2,150 sheep, 634 goats and 4,101 cattle (the young of the domestic cow)] in the big animals slaughterhouse in Delfan, Iran, between 3 April 2009 and 3 April 2012. During the study, slaughterhouse was visited daily for 2 years to examine the internal organs (liver and lungs) for the presence of cystic echinococcosis. A questionnaire contains kind of animal and infected organ was completed for every animal. The rate of total condemnation in different animals was calculated.

Animal cysts were grossly examined for degeneration and calcification. For determination of the difference between distribution of infection rate and season Chi square test was used.

## Results

During the present study, 6,885 indigenous cattle ( $n = 4,101$ ), sheep ( $n = 2,150$ ) and goat ( $n = 634$ ), were examined and their organs (liver and lung) evaluated for the presence of cysts. The highest prevalence of infection was found in the cattle (25.7 %) and the lowest was seen in the goat (3.8 %). Cysts in cattle, sheep and goats were found mostly in lungs (15.1, 7.8 and 3.1 %, respectively), however, Co-infection of the liver and lungs was common in cattle (2.4 %) (Table 1). The frequency distributions of CE in different animals are shown in Table 2. Based on the Chi square test there was significant difference between species of animal and infected organ ( $P < 0.001$ ). In this regards infection of liver for cattle (8.2 %), sheep (4.2 %) and goat (0.5 %) was reported. Likewise, there was significant difference between infection prevalence in different organs of cattle in 2009 and 2010 years. While the difference was not significant for sheep ( $P = 0.269$ ). The highest prevalence was seen in winter (32.8 %) for cattle ( $P < 0.001$ ) and 8.1 % for goat ( $P = 0.014$ ). Whereas the highest prevalence was seen in summer (15.7 %) for sheep ( $P = 0.004$ ).

## Discussion

Hydatidosis causes considerable economic loss in livestock due to condemnation of many nutritional organs. Therefore, it is justifiable to find reliable data for monitoring

epidemiologic aspects of the disease and prepare a baseline data for future comparison. Although abattoir surveys have limitations, they are an economical way of gathering information on livestock diseases. It is suggested that an efficient meat inspection service should function as an important monitor of animal diseases, being particularly valuable in the field of chronic and ill-defined conditions which are not apparent to either the stockowner or his veterinary surgeon but which must be of considerable economic and animal health significance (Blamire, Goodhand et al. 1980). Likewise, a feedback from the slaughterhouse to the individual farm is of great value in the field of preventive medicine.

In the present study, the prevalence of hydatid disease in the region was relatively more than reports from neighboring countries in Middle East such as Iraq (Molan 1993), Jordan (Abo-Shehada 1993) and Syria (Dajani 1978). From Iran, based on abattoir surveys, the mean prevalence of hydatidosis of sheep in different parts of the country has been reported to be 8.1 % and corresponding feature for cattle and goats were 12 and 6.5 %, respectively (Dalimi et al. 2002).

The most prevalence of the disease was seen in cattle firstly and then sheep. The highest prevalence in sheep could be due to the dogs which are always in sheep flocks. As dogs are frequently used on sheep farms, oocyst shed by them could be a natural source of *E. granulosus* infection for sheep.

The least prevalence of hydatidosis in goats is probably due to the feed of goats. Goats naturally tend to graze on leaves and tall bushes in hilly or mountainous areas. This graze style secures a lesser contact with infective eggs and hence a lower risk of infection in goats compared to cattle and sheep (Ansari-Lari 2005).

In the present study, the prevalence of CE in lungs was higher than that in livers in all animal species. Many studies have evaluated the prevalence of CE in liver or lung of livestock (Elsami et al. 1981; Ansari-Lari 2005; Arbabi and Hooshyar 2006). Eslami et al. (1981) found that the infection was mostly spread in lungs in sheep. In contrast, the infection was spread predominantly in liver in cattle. In pigs, the infection was spread equally in lung and in liver. In a 5-year survey in Shiraz (Southern Iran), the condemnation of lung in cattle, sheep and goats (2, 2.5 and 1.5 %, respectively) was higher than the condemnation of liver in those animals (1.3, 1.3 and 0.4 %, respectively) (Ansari-Lari 2005). Arbabi and Hooshyar (2006) from Kashan (Central Iran) reported that the rate of lung infection in sheep and goats (2.8 and 3.9 %, respectively) was higher than the rate of liver infection in those animals (1.7 and 2.3 %, respectively). In cattle, in contrast, the infection rate in liver was higher than that in lung (4.4 % instead of 3.7 %). In a 5-year study in 28 Iranian provinces, the

**Table 1** Prevalence rate of hydatid cyst in different organs from slaughtered animals in Delfan, during 2009–2010 years

Years	Animals	Liver		Lungs		Co-infection of livers and lungs	
		N	%	N	%	N	%
2009	Cattle	83	4.6	164	9.1	31	1.7
	Sheep	39	4	71	7.2	6	0.6
	Goats	1	0.4	1	0.4	0	0
2010	Cattle	254	11.1	457	19.9	67	2.9
	Sheep	51	4.4	98	8.9	8	0.7
	Goats	2	0.5	19	5.2	1	0.3
Total	Cattle	337	8.2	621	15.1	98	2.9
	Sheep	90	4.2	169	7.8	14	0.6
	Goats	3	0.5	20	3.1	1	0.1

N number of animals examined

**Table 2** Seasonal prevalence rate of hydatid cyst in animals slaughtered in Delfan, during 2009–2010 years

Years	Animals	Spring		Summer		Autumn		Winter		Total	
		N	Inf (%)	N	Inf (%)	N	Inf (%)	N	Inf (%)	N	Inf (%)
2009	Cattle	498	60 (12)	484	59 (12.2)	407	84 (20.6)	416	75 (18)	1805	278 (15.4)
	Sheep	360	33 (9.2)	130	26 (20)	216	31 (14.3)	280	26 (9.3)	986	116 (11.8)
	Goats	61	0 (0)	68	1 (1.5)	78	1 (1.3)	61	0 (0)	268	2 (0.7)
2010	Cattle	433	109 (25.2)	586	145 (24.7)	617	246 (39.9)	660	278 (42.1)	2296	778 (33.9)
	Sheep	304	39 (12.8)	302	42 (13.9)	257	38 (14.8)	301	45 (15)	1164	157 (13.5)
	Goats	77	2 (2.6)	78	1 (1.3)	87	4 (4.6)	124	15 (12.1)	366	22 (6)
Total	Cattle	931	169 (18.1)	1070	204 (19.1)	1024	330 (32.3)	1076	353 (32.8)	4101	1056 (25.7)
	Sheep	664	72 (10.9)	432	68 (15.7)	473	69 (14.6)	581	71 (12.2)	2150	273 (12.7)
	Goats	138	2 (1.5)	146	2 (1.3)	165	5 (3)	185	15 (8.1)	634	24 (3.8)

N number of animals examined *Inf* infected animals

average rate of infection in lung in cattle, sheep and goats was 1.8 times greater than that in liver from those animals (Tavakoli et al. 2008). Likewise, because of the high affinity of the parasite to infect lung and due to its lower price, this organ were condemned more than liver.

Based on distribution of CE in various seasons, all animals showed a significant variation ( $P < 0.001$ ), except sheep. Most prevalence of hydatidosis was observed in autumn and winter. The sources of slaughtered animals might be epidemiologic reason of this finding. Because in near the end of autumn and in the early of winter, usually greater portion of the sheep slaughtered belonged to majority tribal people. It is reported that the prevalence of hydatidosis is relatively higher in animals belonging to this portion (Parsaei et al. 2012). During spring and summer, the sheep move suburb of Delfan and in the middle of autumn return to stalls. In this time, old sheep were sent to abattoir, because these animals are usually thinner and low efficacy and probably infected with CE. Therefore, CE accumulation in autumn and winter was higher than other seasons. While, in our study there was not this migration

situation in training cattle and goat. Since these animals are kept in house and are stable. A previous study by Ansari-Lari (2005) in Fars province indicated significant seasonal effects on the condemnation of livers and lungs. The highest prevalence rate of the infection in livers and lungs was found in spring and summer and in summer, respectively.

In conclusion, this study has evaluated the prevalence of hydatidosis in slaughtered livestock in west of Iran from 2009 to 2011. Although data collected from slaughterhouses may not be highly accurate due to technical problems, the direct inspection method still seems to be the best approach to estimate the prevalence of hydatidosis in livestock. In general, data from the current study showed an increase in the prevalence of hydatidosis. Therefore, more action is suggested to control the disease in this region of Iran. To reach this goal, a stronger monitor of slaughtering process is highly recommended as well as the treatment of stray dogs. It appears that sheep have more important role in the continuation of *E. granulosus* life cycle in this region. Overall these data indicate the

necessity of disease control strategy for reduction of CE. Therefore we believe that efforts should be made to control transmission of cysts from slaughtered house by safe disposal of infected offal.

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**Conflict of interest** None declared.

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