Research Article

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The prevalence study of hydatid cyst in domesticated slaughtered animals in industrial abattoirs in Iran

Abstract

Hydatidosis is the most important zoonotic disease of global prevalence. It causes considerable public human health and economic losses throughout the world, including Iran. The objective of this study was to assess the prevalence of hydatid cyst in slaughtered animals in the industrial slaughtere house of Kohgilouyeh and Boyerahmad province. In this cross sectional study was investigated, 39394 head of animals, including; 24449 sheep, 2141 cattle, and 12804 goats. Their carcasses were inspected using macroscopic method and questionnaiire for hydatid cysts, in the slaughterehouse of Kohgilouyeh and Boyerahmad province (Boyrahmad (Yasuj), Ghachsaran, Dehdasht, Bahmaei, Dena areas) abattoirs (Jaunary 2013-July 2013). Data analysis was performed by descriptive tables and analyzed by $\chi 2$ statistical test and SPSS software (Version 19.0). The prevalence frequency of hydatid cyst was found 15-20%, 20-30%, 6.5%, and 4-5% in cow, sheep and goats respectively. Moreover, 56% infected livers, 12.5% infected lungs, 31.7% liver and lung simultaneously, 0.04% infected heart and 0.13% infected kidney were found respectively. Overall, prevalence of hydatid cyst in Kohgilouyeh and Boyerahmad province was 2300(7.8%) head of infected animals were in 1320(6.4%) Boyrahmad (Yasuj), 690(6.3%) Ghachsaran, 59(1.3%) Dehdasht, 87(5.6%) Basht, 37(104%) Bahmaei and 107(16.7%) Dena areas respectively. This study indicated that prevalence of hydatid cyst is relatively intermediate in the slaughtered animals in Kohgilouyeh and Boyerahmad province, which in addition to imposing high economic losses due to the deleting of infested organs of animals and decrease in livestock products, indicates the existence of conditions for health risks for residents which requires more inclusive and comprehensive sanitary and control measures due to this parasite's life cycle and transmission.

Keywords: hydatid cyst, echinococus granulosus, zoonoses, Kohgilouyeh, boyerahmad province

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Introduction

One of the most important groups of human nutrition is the proteins. In recent decades due to population growth, requires a better and healthier quality protein sources is greater than ever before. Meat and other animal protein products are afforded a special place in human nutrition.[1]

Hydatidosis or cystic disease of Echinococcusis is one of the most important zoonotic infectious diseases that happens by species larval stages of Echinococcus granulosus and Echinococcus Multilocularis in humans and herbivores animals.[2–4] Adult worms and parasites in the intestines of canine lives as final hosts and herbivores are main intermediate hosts. Human is an intermediate accidental host that has infected by contaminated water and vegetables with parasite's eggs or direct contact with infected dogs.[5,6]

This disease has a worldwide distribution and a large health and economic damage annually to countries such as Iran. This disease usually decreases animal products such as milk, meat and wool in livestock pollution Hydatidosis significantly and causes capture and dispose of the organs of infected animals in the slaughterhouse. In the idea of a group of researchers, the health implications of this disease for society and even the country are much more than economic importance. Although dogs in Iran (stray dogs, sheep dogs and pets dogs) have a very important role in the transmission of this illness, but wild carnivores such as wolves, jackals, hyenas, leopards and foxes retain the wild life cycle of the parasite in nature.[7–9]

Hydatidosis clinical symptoms in animals depend on the number, size and location of the cyst formation. In sheeps, the clinical symptoms are very limited because the economic life of the animal is short. Liver and lung hydatid cysts are usually asymptomatic and most of the contaminants are identified in the inspection after slaughter.[10,11] Hydatid cysts in humans usually affect liver and lungs and severity of clinical symptoms and pathology of disease depend on formation of cysts in the body, size and their locations.[8,12] Intensity of infection in different parts of the world are not the same and depends on some factors such as health status, economic, social and cultural properties.[13] Hydatid cysts have been reported from all ruminants in Iran, sheep with 88%, camel with 70% and cattle with 19% are the the most and least important considered intermediate hosts of *E. granulosus* in Iran.[14,15]

Slaughterhouses important centers for the collection of data that are obtained from daily inspections and collected information from Slaughterhouses can be used to estimate the prevalence of various diseases. In recent years due to health, particularly in developing cities, sensitivity to healt of meat has increased and thus fewer studies have been conducted in such areas such as Kohgiluyeh and Boyer-Ahmad Province. This study was took place to determine the prevalence of hydatid cysts in slaughtered animals (cattle, sheep and goats). There are problems caused by the cysts and accurate understanding of the epidemiology of the disease in domestic animals (cattle, sheep and goats) in all areas of the province to help authorities in adopting adequate mechanisms of control and planning. The

objective of this study was to assess the prevalence of hydatid cyst in slaughtered animals in the industrial slaughtere house of Kohgilouyeh and Boyerahmad province.

Materials and methods

Samples collection

This study is a cross-sectional study. The survey of the population was slaughtered livestocks in slaughterhouses of Kohgiluyeh and Boyer-Ahmad Province, which includes this cities; Yasouj, Gachsaran, Dehdasht, Basht, Dena and Bahmai from March 2013 to August 2014. Sampling was done randomly. After coordination with the Veterinary Organization (I.V.O) and subsidiary offices in cities, daily going to slaughterhouses during the time of data collection, the samples were selected. Total number of slaughtered animals is summarized in Table 1 and Table 2. The average age of animals was about 1-1.5 years and they were selected in sexes for the slaughterhouse.

Table 1 Number of slaughtered animals

Slaughter house	Number of slaughtered animals
Yasuj	20767
Gachsaran	11032
Dehdasht	5066
Basht	1543
Dena	650
Bahmai	336
Total	39394

Table 2 Species of slaughtered animals

Species	Number
Sheep	24449
Goat	12804
Cattle	2141
Total	39394

Collecting data selected with going to the slaughterhouse at seting times with the help of one or two assistes at the slaughterhouse in each city after the slaughter of livestock, action to collect organs infected with hydatid cysts in animals slaughtered animals were infected with registration. For the first diagnosis of hydatid cysts in liver and lung, physical macroscopic examination and palpation of contaminated organs was done and if there was necessary, incision diagnosis was made. In the absence of definitive diagnosis, infected samples in containers with lids and contained 10% formalin solution for the necessary tests were sent to the laboratory. Informations of infected animals in during sample collecting in special forms that provided for this purpose were collected and recorded.

Statistical analysis

For analysis of data, program SPSS for Windows version 19 and descriptive statistics and chi-square test were used and significance level was 0.05.

Results

The number of slaughted animals that was infected with hydatid cyst in the province was 2,300 (8/7%) that in Yasuj 1320 (6.4%), Gachsaran 690 head (6.3%), Dehdasht 59 (1.3%), Basht 87 (5.6%), Dena 107 (16.7%) and Bahmai 37 (10.4%) were infected to hydatid cysts (Table 3) (Table 4).

Table 3 Statistics of slaughtered and infected animals

City	March		April		May		June		August	I
	S	I	S	I	S	I	S	I	S	541
Yasuj	4725	380	4041	23	3624	47	4019	330	4358	317
Gachsaran	1690	39	1972	133	1456	50	2233	151	3681	13
Dehdasht	484	8	819	14	769	12	1657	12	1337	15
Basht	117	7	265	16	307	20	409	29	445	26
Dena	40	7	87	22	37	6	297	46	189	7
Bahmai	35	8	29	8	94	9	90	5	88	919
Total	7019	449	7213	216	6287	144	8705	573	10098	

S, Slaughtered; I, Infected

Table 4 Determine contamination of different organs of slaughtered animals

City	March				April				May				June				August			
	I	Li	Lu	C	I	Li	Lu	C	I	Li	Lu	C	I	Li	Lu	C	I	Li	Lu	C
Yasuj	380	321	18	41	23	18	5	-	47	38	9	-	330	209	7	113	541	332	76	133
Gachsaran	39	29	-	10	133	36	29	68	50	20	3	27	151	40	19	92	317	99	61	157
Dehdasht	8	3	5	-	14	7	5	2	12	5	3	4	12	6	1	5	13	6	4	3
Basht	7	5	2	-	16	11	5	-	20	15	5	-	29	20	5	4	15	12	3	-
Dena	7	-	-	7	24	7	-	17	6	-	-	6	46	11	20	15	26	4	10	12
Bahmai	9	7	2	-	8	8	-	-	8	7	1	-	5	3	2	-	7	4	3	-
Total	828	365	17	58	218	87	44	87	143	85	21	37	573	289	54	229	919	457	157	305

I, Infected; Li, Liver; Lu, Lung; C, combined lung and liver

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In the number of infected livestock in the province (2,300), liver infection 1283 (56%), the lung infection 287 (12.5%), liver and lung infection (combined) 730 (31.7%), heart infection one case (0.04%) and kidney infection 3 (0.13%) were observed (Table 5) (Table 6).

Table 5 Statistics on the number of slaughtered and infected with hydatid cyst in different cities of province

City	Slaughtered	Infected	Organs						
			Li	Lu	C	H	K	S	Percent
Yasuj	20767	1320	918	101	301	1	-	-	6.45%
Gachsaran	11032	690	224	112	354	-	3	-	6.30%
Dehdasht	5066	59	27	18	14	-	-	-	1.30%
Basht	1543	87	63	20	4	-	-	-	56%
Dena	650	109	22	30	57	-	-	-	16.70%
Bahmai	336	35	29	6	-	-	-	-	10.40%
Total	39394	2300	1283	287	730	1	3	-	7.80%

Li, Liver; Lu, Lung; C, Combined lung and liver; H, Heart; K, Kidney; S, Spleen

Table 6 Contamination percentage in different organs of slaughtered livestocks in slaughterhouses in Province

City	Liver	Lung	Combined lung and liver	Heart	Kidney	Spleen
Yasuj	4.4	0.48	1.45	0.004	-	-
Gachsaran	2.03	1.01	3.2	-	0.13	-
Dehdasht	0.53	0.35	0.27	-	-	-
Basht	4.08	1.3	0.26	-	-	-
Dena	3.38	4.6	8.76	-	-	-
Bahmai	8.6	1.78	-	-	-	-
Total	56	12.5	31.7	0.04	0.13	-

Discussion

Hydatid cyst disease is a common and very dangerous disease between humans and animals and it hasn't specific clinical symptoms in animals. Usually its diagnosis takes place autopsy or post-inspection after slaughter.[10,11] In this study, 39394 livestocks (cattle, sheep, goat) were inspected in slaughterhouses in the province that 2300 of them were infected and prevalence of disease was 7.8%. Regarding the areas surveyed, the lowest contamination was in the city Bahmaei in April (27.5%) and the highest rate related to the city Yasouj in July (57%). In this study, the prevalence of hydatid cysts in sheep, cattle and goat were 20-30%, 15-20% 4.5%, respectively.

Sheep average infection rate in Iran is about 10% (range 1% to 50%) and cattle about 12% (range 1% to 28%) that has been reported.[16] In this study, low rate of prevalence of hydatid cysts in goats could be 2 reasons; protective antibodies against the parasite and goat nutrition (eating twigs). The prevalence of hydatid cysts in Iran are different due to climatic Variation and the distribution of the parasite hosts. For example, the reports are mentioned in this context: prevalence of hydatid cyst in Fars in sheep, cattle and goat was 30.5%, 25.6% and 19.8%, respectively,[17] in Hamadan was 12.3% that in sheep, cattle and goat was 13.7%, 16.2%, 1.8%, respectively,[18] in Arak (Khomein) in sheep 1.73%, in cattle 2.94% and in goat 1.55%,[19] in Ahvaz in sheep 4.07%, cattle 9.49% and goat 7.43%,[20] in Tehran in sheep 6.93% and cattle 5.61%[21] and in Lorestan in sheep 25.29%, cattle 55.94% and goat 11.08%.[16] In the report of Tavakolli et al.[22] the average of prevalence of hydatid cyst in 28 provinces of the country was determined 6.37% and the highest to the lowest infection rates between the provinces have been reported in Khorasan 18.17%, Semnan 13.3%, Eastern Azarbaijan 12.62% Mazandaran 11.21%, Kerman 2.88%, Qazvin 2.71% and Yazd 2.4%.[22]

In other neighboring countries such as Turkey, contamination of hydatic cyst in sheep, cattle and goat was 30.6%, 25.9% and 12.7% and pollution in Iraq in sheep were 4.5%-44%, in goat 3.1%-26.64% and in cattle 4.3%-13.39, respectively.[23] Hydatic cyst contamination in Saudi Arabia, najran province in sheep and goat was 6.8% and 2.5%, respectively.[24] In other countries the contamination of this parasitic disease has reported; in Argantina, in sheep was 4 and in goat was 14.7%,[25] in Romania in sheep was 65.6% and in cattle was 40.1%,[26] in Greece in sheep was 30.4% and in goat was 14.7% at 2007[27] and that was in sheep 80% and in goat 24% at 2008[28] and in Italy in sheep was 92.8%.[29]

The study comparing with previous studies in other areas of country shows that the prevalence of hydatid cysts in livestocks in this province is average. Kohgiluyeh and Boyer-Ahmad Province with 2.5-3million animal units of livestock is one of the most important poles of Iran. Every year about 674,000 livestocks (sheep, goats and cattle) and about 25,000 to 30,000 livestocks on illegal and unsanitary conditions are slaughtered in this province. There are 30,000–40,000 dogs (stray dogs, sheep dogs and pets dogs) in province (urban, rural and nomadic). Comparing the results of the studies showed that the

prevalence of hydatidosis in animals in Iran is like other countries with similar climatic, geographical and social conditions. The high incidence of infection in cattle could be as follows:

1. Medium egg-perfect weather survival
2. Vastness of traditional farm
3. Unhealthy killings in rural areas
4. There is no health control sheep dogs
5. Abundance of stray dogs

This shows the potential risk to the health of the community. This is important be performed strategies such as further development of animal husbandry and industrial slaughterhouses and more active approach in controlling Echinococcusis in dogs.

The prevalence of *E. granulosus* in stray dogs of Yasouj was reported 34.8% that indicates active transmission cycle of the parasite in the region, although the overall prevalence rate slightly decreased.[30] In this study, The prevalence of hydatid cyst in the liver is 56%, lung 12.5%, liver and lung combined 31.7%, heart 0.04% and Kidney 0.13% that are consistent with results of some studies.[22,31]

According to the entry and establishment of metacestode in the intermediate host, infection of liver is eventualite and in other studies, the lung infection is higher than the percentage of diseased livers that it is not consistent with our results.[18,19,21,32,33] Prevalence of Hydatidosis in Ilam province in humans have been reported 2.25% and in stray dogs 9%, and from of 81728 livestocks (sheep, cattle and goat), there was 2.94% infected liver and 2.34% infected lung.[34] In province of Hamedan, the prevalence of this disease in liver have been reported 36.45, in lung 41.2% and combined infection 22.2%.[18]

According to the results of our study, the highest rate of liver infection (8.6%) is in the Bahmaei and the lowest percentage of liver infection in the Dehdasht (0.53%). The highest rate of lung infection is in Dena (4.6%) and the lowest percentage of lung infection in the Dehdasht (0.35%). The highest rate of liver and lung (combined) infection is in Dena (8.67%) and the lowest percentage of combined infection of liver and lung is in Basht (0.26%). With regard to the areas examined in this study, the lowest contamination is in Bahmaei in April (27.5%) and the highest rate related to the Yasuj in July (57%). Most infections of hydatid cyst in Markazi province has been reported in summer and lowest contamination in autumn.[19]

The frequency of hydatid cysts in intermediate hosts depends on several factors. The pollution of environment affects on the severity of the disease among livestocks. Ambient temperature is effective at the power of life and parasite eggs so the infection rate in very low temperatures, the eggs survive some months but in the heat of summer, do not last more than three weeks. Failure to record the infected parts of slaughtered animals and properly disposed of animal waste made available to the carnivores and this causes to continue and increase the frequency of the parasite cycle.[35]

In this province because of dry and sunny days in tropical and subtropical regions (Dehdasht and Bahmaei) and cold and frost days in cold regions (Yasuj, Dena and Bahmaei) very large number of eggs of *E. granulosus* destroyed in nature. So the rate of hydatid cysts in animals is not high in comparison to other provinces.

Annually about 2013 numbers of liver and 1017 numbers lung and lots spleen, kidney, heart and other organs of the slaughtered animals destruction in the food chain of province people due to hydatid cyst infection. The economic losses caused by animal Hydatidosis over a year due to the removal of the infected limb consumption cycle were estimated about 25-30 billion rials, equivalent to 3.5-4tons of meat (liver, lung, kidney, spleen, heart and...). Tavakolli et al.[22] were estimated 76billion rials economic losses to livestock caused by infection with hydatid cyst in Iran during the years 2002-2007 due to the removal of the infected organs.[22]

Conclusion

Thus due to medical, public health and economic importance of this disease, it is necessary to having done epidemiological studies in humans and animals and having a regular program for prevention and control this disease in all of provinces of country.

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None.

Conflict of interest

The authors declared no conflict of interest.

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