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Hydatidosis in human and slaughtered herbivores in Mazandaran province, northern Iran

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ABSTRACT

Objective: To determine the rate of hydatid cyst in hospitalized patients and slaughtered animals in Mazandaran province, northern Iran. **Methods:** In this descriptive study, files of 34 hospitalized patients who underwent surgery for hydatid cysts during 2003-2008 in Mazandaran province were analyzed. Also, 1 678 343 sheep, 815 635 goats, 451 743 cattle and 1 130 buffaloes were examined carefully for the presence of hydatid cysts in slaughterhouse of Mazandaran province, during 2003-2008. **Results:** In human, the highest rate of hydatidosis was related to 30-39 age group. Infection rate in females was higher than that in males (61.8% *vs* 31.2%). Cyst involvement of different organs was as follows: liver 76.5%, lung 13.5%, spleen 5.4%, gall bladder 2.7% and abdomen septum 2.9%. In slaughtered animals, overall, 6.38% had liver cyst and 12.70% had lung cyst. Involvement of liver and lung in sheep, goat, cattle and buffalo were 7.09% and 14.70%; 5.12% and 10.20%; 5.97% and 9.60%; and 14.90% and 13.18%, respectively. In sheep, goat and cattle the most infected organ was lung but in buffalo it was liver. **Conclusions:** The results show that in human, all age groups and both sexes are exposed to hydatidosis. In livestock it causes economic loss to veterinary industries. Therefore, appropriate control method is needed to prevent this zoonotic disease.

1. Introduction

Cystic echinococcosis or hydatidosis is one of the major zoonotic disease that causes considerable economic loss and public health problems worldwide. It is cosmopolitan and possesses the second rank in consideration of helminthic diseases significance[1].

The adult stage of *Echinococcus granulosus* (*E. granulosus*) is in carnivores, particularly dogs and other canines, as definitive hosts. Dogs play an important role in the spread of infection via contamination of environment. Humans and domestic herbivores may serve as intermediate hosts[1,2].

Hydatidosis is considered endemic in the entire Mediterranean zone including all countries from the Middle East[3]. Iran is also an endemic or hyperendemic area for *E. granulosus*. The prevalence of infection with hydatid cyst in sheep, goats, cattle and buffaloes in various regions of the country is high[4].

Human hydatidosis is responsible for approximately 1% of admission to surgical wards and the rate of human infection is 0.6-1.2[4].

Adequate information on the echinococcosis in hospitalized patients and also different slaughtered animals in every endemic area is necessary for prevention and treatment of this disease. Although hydatidosis is common among livestock in Mazandaran province, northern Iran, but there is not any precise study in this area during recent years. Therefore, this study was conducted to determine the rate of infection in hospitalized patients and slaughtered animals in this province.

2. Materials and methods

The study was carried out in Mazandaran province, northern Iran from January 2003 to December 2008. In this study, human cases of hydatidosis were analyzed based

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on medical documents of patients who were operated in hospitals of Mazandaran province, a temperate area in northern Iran. These patients were operated for different reasons. The records have not been computerized and had to be searched manually.

Profile of patients including age, sex, living area, location of the cyst and time of their surgery were recorded for each patient. The ratios between male and female cases and between cases with liver, lung and other organs involvement were calculated.

In addition, all internal organs of each herbivore slaughtered in Mazandaran province abattoir were examined by an expert veterinarian. Daily numbers of the slaughtered animals and their infected organs by hydatid cyst were recorded. Observed data were entered into a spreadsheet using Excel software (Microsoft, USA). Then, information on infectivity with hydatid cyst in these livestock, during 2003-2008 was recorded in SPSS 14 statistical software for further analysis, using statistical tests.

3. Results

Overall, 34 patients at hospitals of Mazandaran province had been operated for hydatidosis during 2003 to 2008. 61.8% (21 cases) of patients were female and 38.2% (13 cases) were male (Table 1).

The range of age was from 12 to 75 years old. The average age of patients was 38.8 years. The highest rate of infection was found among age group of 30-39 years old. However, statistically the difference between age groups and infectivity was not significant. Also, in all age groups, no significant difference was found between male and female and their infectivity with hydatid cyst (P=0.58, df=2, χ^2=1.09).

Table 1
Frequency of human hydatid cyst surgeries in Mazandaran province, northern Iran, according to organ involvement, sex and age of patients (2003-2008).

Age groups (year)	Male				Female				
	Liver	Lung	Other organs	Total	Liver	Lung	Other organs	Total	Total
0-9	0	0	0	0	0	0	0	0	0
10-19	1	2	0	3	2	0	0	2	5
20-29	2	0	0	2	3	1	0	4	6
30-39	4	1*	0	4	4	1	0	5	9
40-49	0	0	0	0	3	0	1 (abdomen septum)	4	4
50-59	1	0	0	1	4	0	0	4	5
60-69	2	0	0	2	1	0	0	1	3
70-79	0	0	1 (spleen and gall bladder)	1	1**	0	1** (spleen)	1	2
Total	10	3	1	13	18	2	2	21	34

*: Concomitant liver and lung involvement with hydatid cyst; **: Concomitant liver and spleen involvement with hydatid cyst.

Table 2 showed the number and percentage of patients according to organ involvement with hydatid cysts. Accordingly, 28 cases of the hydatid cyst (82.4%) have been found in liver, among those in 2 cases simultaneous involvements of either lung or spleen were present.

Table 2
Frequency and percent of hydatid cysts in hospitalized patients of Mazandaran province, northern Iran, according to organ involvement (2003-2008) [n (%)].

Organ	Frequency and percent of hydatid cysts
Liver	26 (76.5)
Lung	4 (11.8)
Liver and lung	1 (2.9)
Liver and spleen	1 (2.9)
Spleen and gall bladder	1 (2.9)
Abdomen septum	1 (2.9)

Table 3 showed the frequency distribution and percent of hydatid cysts in slaughtered animals in the province. According to this table, the highest percentage of pulmonary hydatid cyst was in sheep (14.70%) and the lowest was in cattle (9.60%). The highest liver involvement was related to buffalo (14.90%) and the lowest to goat (5.12%).

Statistically, there is a significant difference between different animals and organ involvement with hydatid cyst. In other words, in sheep, goats and cattle lung infection was higher than that of liver, while in buffalo liver infection was higher (P=0.00, df=3, χ^2=0.20).

Figure 1 showed the comparison of liver and lung involvement with hydatid cyst in different livestock. In cattle, sheep and goat, lung was more infected with hydatid cyst than liver; especially in sheep this was more prominent. However, in buffalo liver was more infected than lung.

Figure 2, 3, 4 and 5 showed the comparison of liver and lung involvement with hydatid cysts according to different years, in sheep, goat, cattle and buffalo, respectively. Accordingly, in sheep, goat and cattle in all years, during

Table 3
Frequency and percentage of hydatid cysts in livestock of Mazandaran province, northern Iran, according to organ involvement (2003-2008) [n (%)].

Livestock	Number of animals slaughtered	Number and percent of liver involvement	Number and percent of lung involvement
Sheep	1 678 343	119 159 (7.09)	246 981 (14.70)
Goat	815 635	41 775 (5.12)	83 805 (10.20)
Cattle	451 743	26 985 (5.97)	43 576 (9.60)
Buffalo	1 130	169 (14.90)	149 (13.18)
Total	2 946 851	188 088 (6.38)	374 511 (12.70)

2003 to 2008, lung involvement was higher than that of liver; while in buffalo in all years liver was more frequently infected than lung (Figure 5).

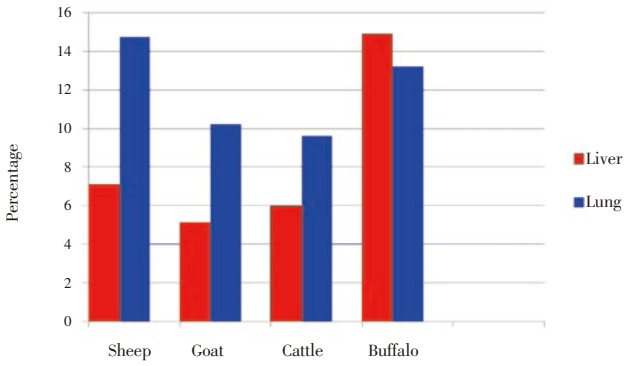

Figure 1. Comparison of percentages of liver and lung infectivity with hydatid cysts in different livestock of Mazandaran province, northern Iran, during 2003–2008.

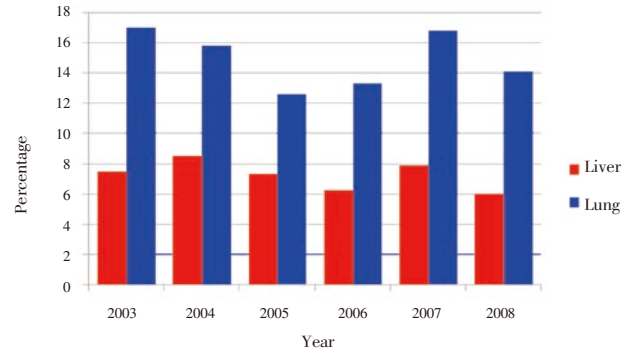

Figure 2. Percentages of liver and lung hydatidosis of sheep in Mazandaran province, northern Iran, during 2003–2008.

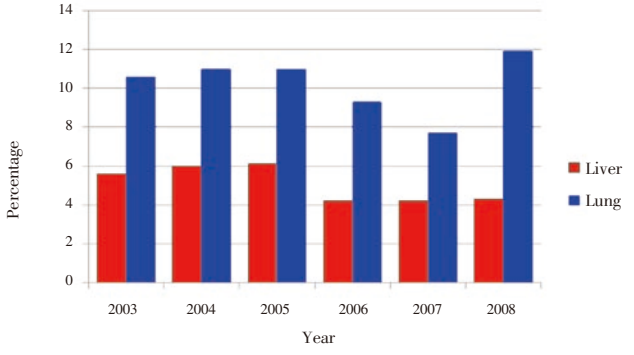

Figure 3. Percentages of liver and lung hydatidosis of goat in Mazandaran province, northern Iran, during 2003–2008.

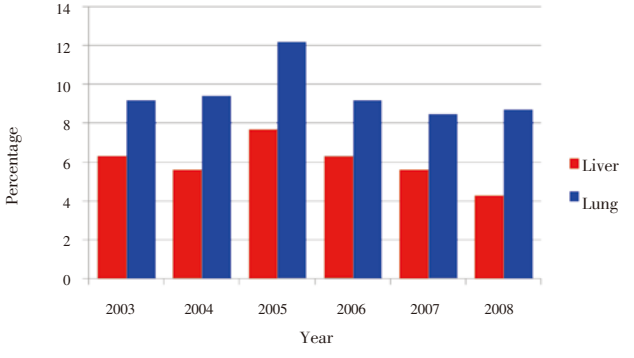

Figure 4. Percentages of liver and lung hydatidosis of cattle in Mazandaran province, northern Iran, during 2003–2008.

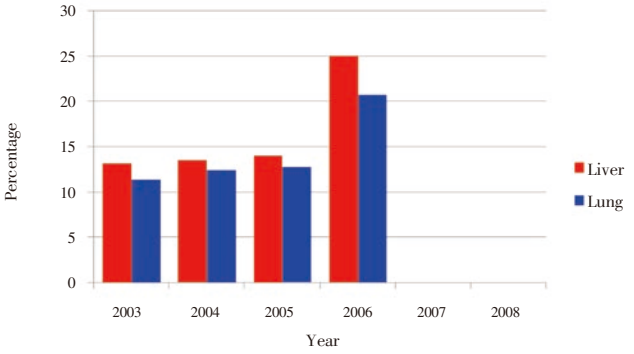

Figure 5. Percentages of liver and lung hydatidosis of buffalo in Mazandaran province, northern Iran, during 2003–2008.

4. Discussion

In Iran, hydatidosis is one of the major infectious zoonotic diseases, where sheep, cattle and goats are still slaughtered traditionally and carcass wastes are easily accessible to scavenging dogs and other wild carnivores[3,4]. Human hydatidosis is a public concern in different provinces. In this study, which was carried out in Mazandaran province, the highest rate of human infection was observed in the age group of 30–39 years old. Previous studies indicate that in different parts of the country the range of 20–40 years old is the age group with the highest cases[4]. Incubation period of hydatidosis is usually at least 5 years (might be 20 years) and so a wide range of different ages is obvious in infected patients[1,2,4].

Respect to the sex of patients, although it was not statistically significant, due to sample size, rate of infection in females was more than males. This coincides with most other studies in the world[5–15]. Depending on the culture and social criteria, women may have more contact with sources of infection such as soil, vegetables, and association with dogs.

Clinical manifestations of human hydatidosis depend on the number of cysts and organ involvement. Cysts can be seen in all parts of the human body[1,2]. In this study, the most infected organ was liver (76.5%), then lung (11.8%). This is might be due to low surgical facilities in Mazandaran province, especially for pulmonary cyst surgeries, leading patients to visit other centers, especially in capital city, Tehran. In most other similar studies in the world, liver has been reported as the most infected organ[6,8,9,16–18].

The results of the current study indicate that in sheep and cattle the most infected organ is lung. This is in accordance with the results of other similar studies[19–24].

The present study showed that in goat the lung was more frequently infected than the liver. This fact is in agreement with the results of other studies[22–26]. However, in buffalo the most infected organ is liver.

According to the results of molecular studies on *E. granulosus* genotype determination in Iran[27–30], the most common genotype among different herbivores is G1 (sheep strain), and sheep is highly sensitive to this genotype. The results of the present study confirm that sheep is a highly

sensitive host. In this host, most cysts are fertile; while hydatid cysts of cattle are mostly without protoscolex. Infected sheeps are potentially able to transfer the disease to dogs and other sensitive carnivores; whereas cattle dose not have so important role in the transmission of this infection. This point is extremely important in the epidemiology of hydatidosis in endemic areas in order to stop prominent role of dog as a major definitive host and control of infection in sensitive livestock like sheep.

Conflict of interest statement

We declare that we have no conflict of interest.

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