

Short note

Human hydatidosis in Alborz Province: a 5-year retrospective epidemiological analysis of hospitalized cases (2014–2019)

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ABSTRACT. Hydatid cyst is a neglected zoonotic infection that is transmitted by the larval form of *Echinococcus granulosus*. It is widely distributed around the world and also it is endemic in many developing countries such as Iran. The aim of the current study is an assessment of the surgical cases in the general population of Alborz Province in Iran. The surgical cases of cystic echinococcosis were studied in the Educational and Therapeutic Centers or hospitals related to Alborz University of Medical Sciences from 2014 to 2019. Out of 26 records from patients with hydatid cyst surgery, 15 (57.7%) were female and 11 (42.3 %) were male. The age range was between 15–70 years old. The most infected organ was liver 21 (80.8%) followed by lungs 4 (15.4%) and one case of pelvic cyst 1 (3.8%). Based on residential status, 61.4% and 38.6% were living in rural and urban areas, respectively. The most and the least groups effected by hydatid cyst were housewives (38.46%) and employees (7.69%), accordingly. Twelve (46.15%) patients stated had a history of contact with dog. The prevalence of hydatid cyst in Alborz Province confirmed the importance of a proper protection plan against infection and it must be under control in main hosts. However, there is lack of data on status of parasitic infections in stray dogs in current region, as they play a key role in the transmission of the hydatid disease to humans.

Keywords: hydatidosis, neglected zoonoses, surgical cases, one health

Introduction

Approximately 43% of the zoonotic pathogens are naturally derived from carnivores specially dogs and cats [1,2]. Hydatidosis is a chronic, zoonotic disease of one health concern, which is caused by the larval stage of a dog tapeworm, *Echinococcus granulosus* (*E. granulosus*) [3]. It causes major

complications in both humans and livestock and many countries are suffering from economic losses and health problems [4]. The annual global rate of hydatidosis is ~1–200 per 100000 persons and it has been estimated that about 270 million people are at risk in some areas of Central Asia such as western China, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Afghanistan, Pakistan and

Iran [5]. According to the reports, hydatid disease is responsible for considerable economic losses in Iran (costs about 0.03% of the gross domestic product of the country) [5]. Apparently, the infection is more prevalent in developing countries due to the low sanitary level [6,7].

The life cycle of *E. granulosus* contains canids as definitive hosts and sheep and cattle as intermediate hosts [8,9]. Humans are the accidental host and they get infected while they ingest eggs via contaminated raw vegetables and water [10]. Larvae migrate through the portal vein of the intestine and it enters to the internal organs especially the liver, lungs, spleen, kidney, and brain, where they convert to the cystic stage [6,11,12]. Hydatid cyst develops in various locations, however, it mainly affects liver (~70%) and lungs (~20%) particularly as the target organs [5,13]. Although symptomatic cases of the disease usually require surgery, there are several cases of asymptomatic cases which never become diagnosed unless after increasing the size of the cyst [5]. Helminthic parasites stimulate the immune system in order to increase the Th2 responses and production of IL-4, IL-5, IL-9, IL-10, IL-13, eosinophils, and IgE [14,15]. Similarly, the release of *E. granulosus* antigens in case of rupture of a hydatid cyst, severe anaphylactic reactions occur due to the high levels of specific IgE and histamine [16]. The intensity of symptoms is related to the location of the cyst, meanwhile, eosinophilia, jaundice, and anaphylaxis are the main presentations following the rupture of the cyst in the host's body [5]. Different methods such as X-ray, CT-scan, and MRI as well as serological methods (such as ELISA and IFA) are employed for the diagnosis of the disease. The most effective therapy consists of surgery and pharmacological treatment such as Albendazole, Mebendazole and Benzimidazole [5]. Unfortunately, there is not a precise data on human hydatidosis in Alborz province and the aim of this study is to determine the prevalence of hydatid cyst among hospitalized patients underwent surgery.

Materials and Methods

Ethical considerations

The purpose and procedures of the study was explained to all participants. The study was approved by the Ethical Clearance Committees (ECC) of the Alborz University of Medical Sciences with assigned protocol number 1396-003.

Study area

Alborz Province (35°49'57", 50°59'29") with semi-highland climate and 5,833 km² and 2.413 million populations is situated in the southwest of Tehran, the capital of Iran [17].

Data collection

Eight-Educational and Therapeutic Centers or Hospitals related to Alborz University of Medical Sciences including Imam Ali, Kamali, Shahid Madani, Shahid Rajaei, Shariati, Imam Hassan, Kosar, and Imam Jafar Sadegh were checked for the records of hydatid cyst surgery. The records were obtained from the Surgery and Pathology Divisions of the hospitals during 2014 and 2019. All documents including age, gender, demographic information and the cyst location were considered.

Statistical analysis

Statistical analysis was done using SPSS software version 18 (IBM, Armonk, USA). Chi-square (χ^2) and Fisher's exact tests were used to evaluate associations of the variables. A *P*-value of less than 0.05 was considered statistically significant.

Results

The hydatid cyst surgeries conducted in the hospitals related to Alborz University of Medical Sciences during the 5-year study (2014 to 2019) was 26 cases in which 15 (57.7%) were female and 11 (42.3 %) were male (Table 1). The mean age of the patients was 37 (36.6 ± 18.9) and the most affected age group was 21–30 years (Table 2). Out of 26 patients, 61.4% and 38.6% were living in rural and urban areas, respectively (Table 2). The most and the least groups impacted by hydatid cyst were housewives (38.46%) and employees (7.69%), accordingly (Table 2). The most commonly involved organ was liver (80.8%). There were 4 (15.4%) cases of lung hydatid cyst and also one rare case of the pelvic cyst (3.8%) (Table 2). Most of the clinical presentations included abdominal pain (54.35%). Notably, 12 (46.15%) of patients stated that they had a history of contact with dog. Our results have specified that there was no statistically significant correlation between gender and involved organ. As well, the relationship between mean age and involved organ was not statistically significant (*P* > 0.05). Our analyses have illustrated that the relationship between involved organ and the age

Table 1. Frequency of human echinococcosis surgical cases per year according to the infected organ and gender, during 2014–2019 in Alborz Province, Iran

Year	Gender	Frequency
2014	M	1
2015	M	2
	F	1
2016	F	1
	F	1
2017	M	2
	F	5
2018	M	6
	F	6
2019	F	1
Total		26

M – Male; F – Female

group was significant ($P < 0.05$). Furthermore, we qualified the correlation between residential status

and infected organ was significant ($P < 0.05$). There was no statistically significant relationship between the occupational status and involved organ ($P > 0.05$).

Discussion

Helminthic infections have affected more than 25% of the global population and they are responsible for high rates of disabilities and/or diseases [18]. *E. granulosus* is a zoonotic helminth which is transmitted by canids same as dogs, the common stray carnivores in the human living environments [19]. Hydatidosis is caused by *E. granulosus* larvae, has been considered as a public health concern, greatly endemic in regions of the Middle East, China, North Africa, and South America [4,20]. Recent studies have determined the prevalence of hydatid cyst in humans in different parts of the Central Asia. As, 25–27 cases/100,000 in Uzbekistan and Tajikistan along with 5–30% seropositive individuals in western China [21]. In a sheep-and cattle-raising area same as Iran, where hydatidosis is endemic, there are many traditional slaughterhouses that can heighten the accessibility

Table 2. Frequency of human cystic echinococcosis surgical cases according to the age group, infected organ, residential status and occupational status in Alborz Province, Iran during a 5-year period (2014–2019)

Factor	Infected organs			Total	
	Liver	Lungs	Pelvic		
Age groups (year)	0–15	1	–	–	1
	16–20	2	1	–	3
	21–30	6	1	–	7
	31–40	2	2	–	4
	41–50	4	–	–	4
	51–60	2	–	1	3
	61–70	4	–	–	4
Residence	Rural	14	1	1	16
	Urban	7	3	–	10
Occupation	Housewife	7	2	1	10
	Farmer	5	1	–	6
	Worker	3	1	–	4
	Employee	2	–	–	2
	Student	4	–	–	4
Total	21 (80.8%)	4 (15.4%)	1 (3.8%)	26 (100%)	

of carcasses for dogs as the main host in the region [22,23]. The prevalence of hydatid disease is different in various surveys due to factors such as climatic, infection rate in main hosts and livestock, and the level of hygiene. Furthermore, the consumption of raw vegetables and the rising number of pet owners are the other reasons for high prevalence in some regions [9,24]. Based on the data of a meta-analysis study, the calculated pooled prevalence of hydatid disease in humans and livestock of Iran was 4.2% (95% CI=3.0–5.5%) and 15.6% (95% CI=14.2–17.1%), respectively. The highest infection rate is reported in the western and northern parts of the country (55% in Kermanshah and 32% in Mazandaran) [25]. However, the overall prevalence of *E. granulosus* infection in definitive hosts of Iran has been calculated to be 23.6% [26]. In the present study, the hydatid cyst was detected in 26 patients during a five-year period which is consistent with a 4-year analysis in Khorram Abad with 39 cases and a 10-year study in Mazandaran with 79 cases [3,5]. Based on a record in Ardabil province, the infection rate in urban areas was higher than in rural areas with a seroprevalence of 1.79 % [27]. The data of our results showed that the infection rate was higher in females (57.7 %) than males which is consistent with the results of surveys in Arak, Mazandaran, Tehran, and Kermanshah [4,5,28,29]. However, the results of some studies showed that the prevalence was predominant in males [30,31]. According to the published data, the prevalence of hydatid cyst is different among age groups in Iran. For instance, the highest rate of the infection was detected in 20–39 and 10–49 age groups in Hamadan and Arak, respectively [4,32]. Similar to the results of the studies in Yazd and Tehran, results of the current study showed that the infection was less prevalent in children [31,33]. However, they differ from the findings of the researches conducted in Khuzestan, Khorram Abad [3,34]. Hydatid cyst infects the intermediate host's viscera, frequently liver as the most affected organ followed by lungs, and less commonly spleen, kidneys, bone, brain, and other organs [35]. Our results showed that 21 (80.8%) and 4 (15.4 %) of 26 patients had cysts in the liver and lungs, respectively and the majority of patients had abdominal pain history as the main symptom. In addition, one case (3.8 %) of the pelvic cyst was found which is rare. Our data were parallel to studies carried out in Khuzestan, Kurdistan, and Isfahan as they reported that the prevalence was

higher in females than males and liver was the most affected organ [36–38]. The results of an investigation on parasitic infection of 131,668 slaughtered cattle in the current region found hydatid cyst in livers of 9.95% of cases, so, more surveillance on slaughterhouses is required in Alborz Province [17].

In conclusion, the prevalence of hydatid cyst has illustrated the importance of reliable clinical and control strategies in both humans and animals in Alborz province. The surveys on parasitic infections of canids as well as stray dogs are limited in this region. Regular deworming of dogs and livestock are necessary and we strongly recommend hospitals to consider a follow-up program, in order to evaluate how much treatment of hydatid cyst is effective and sufficient.

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