



## Human Cystic Echinococcosis in Zanzan Area, Northwest Iran: A Retrospective Hospital Based Survey between 2007 and 2013

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(Received 24 Jan 2015; accepted 14 May 2015)

### Abstract

**Background:** Hydatidosis is the most important zoonotic disease that causes significant economic losses and public health problems worldwide. This study was conducted to evaluate retrospectively 136 patients diagnosed with hydatid cyst disease at two university medical centers between 2007 and 2013 in Zanzan area, northwest Iran.

**Methods:** We surveyed medical records of infected patients with hydatid cyst who had been operated in two hospitals in Zanzan City, northwest, Iran. Several parameters were studied including age, sex, place of habitation, and the location of cysts.

**Results:** Of 136 cases, 54.4% were female with the mean age of 45 yr (4–86). The most affected age group was 21–40 yr old (36.02% of the cases). Cysts were localized in liver and lung in 64% and 23.5% of cases, respectively. Single organ involvement was seen in the majority of patients and 13 (9.5%) cases had multiple involvement. In 69.9% of cases, there was only one cyst, 8.1% had two cysts, 17.6% with three cysts, and 4.4% had four cysts or more. The distribution of residence of patients showed that 33 (24.3%) of them were urban residents.

**Conclusion:** The prevalence of hydatidosis is high in this city and further studies are required to determine the prevalence, economic impact and risk factors of the disease in the area.

**Keywords:** Cystic Echinococcosis, Medical records, Iran

### Introduction

Cystic echinococcosis (CE), a generally chronic endemic helminthic disease, is one of the most extensive helminth zoonotic diseases in human caused by infection with larval stage of the tapeworm, *Echinococcus granulosus*. It has been reported from all countries in the Arabic North Africa and Middle East especially Iran (1, 2). The life cycle of this parasite requires two mammalian hosts. The adult worm, which lives in the small intestine of dogs (definitive hosts), lays eggs expelled with the faeces of the infected animal, contaminating the surroundings. Humans can become infected by ingesting eggs that contaminate food or water, or from contact with infected dog faeces; the

consequence of a human infection is the growth of cysts in the liver, lungs, or other organs (3–5). Infection with *E. granulosus* results in the development of one or several unilocular hydatid cysts that in humans develop mainly in the liver (70%), but also lungs (20%); and 10% of cysts can occur almost somewhere in the body (6).

Cystic echinococcosis can cause momentous morbidity and mortality with extensive economic losses for both humans and livestock. Overall, 2083 new cases were reported in Iran in 2002 to 2007 and the prevalence of CE is estimated 1.18–3 per 100000 population (7, 8). In many parts of the world, despite new therapies, surgery remains

the treatment of choice for most individuals suffering from CE that annually imposes major financial losses in developing countries. In Iran, CE is responsible for approximately 1% of admissions to surgical wards (1). These financial burdens is mostly relate to treatment costs. The economic loss attributable to CE in humans and animals in Iran was estimated to be about US\$232.3 million annually (95% CI US\$103.1–397.8 million) and the cost of the disease was estimated to be about 0.03% of the country's gross domestic product (9).

In common with several neglected zoonoses, the current occurrence and burden of human hydatidosis in Zanjan either are not well known or are related to the past year's studies and the resulting absence of consciousness generates little interest for development of appropriate control programs. It is crucial to evaluate the extent of the problem through determination of disease frequency everywhere. Hydatid cyst is diagnosed by physical examination and radiological evaluation, and symptoms are related to size, location, rupture and infectivity of cysts. Therefore, data inferred from the hospital records are still considered the most dependable source of information on human hydatidosis.

The aim of this study was to compile data from hospital records of CE patients in Zanjan Province, as an attempt to characterize aspects of the disease.

## Materials and Methods

### Study area

Zanjan Province is located in the northwest of Iran. The neighbors are Ardabil and Gilan in the north, Qazvin in the northeast, Hamadan in the south, Kurdistan in the southwest, west Azerbaijan in the west and east Azerbaijan in the northwest. The province has an area of 22, 164 square km occupying 1.34% of the Iranian territory. The population of province is 1,015,734 and 62.5% of the population is in urban areas, 37.5% in rural

areas ([https://en.wikipedia.org/wiki/Zanjan\\_Province](https://en.wikipedia.org/wiki/Zanjan_Province)) (Fig.1).



Fig. 1: Location of Zanjan Province within Iran

### Hospitalized patients

This retrospective study was conducted by reviewing the records of patients surgically treated for hydatid cysts from 2007 to 2013 at two large university hospitals in Zanjan, northwest Iran, entitled Mousavi and Valiasr hospitals. People from different parts of the province are referred to these hospitals for surgery. Data such as age at the time of surgery, gender, occupation, place of residence, number of cyst and the anatomic location of cysts were recorded. The collected data were statistically analyzed using SPSS software (Chicago, IL, USA).

## Results

The total number of CE surgeries recorded was 136 cases. Age and gender distribution relating to 136 established cases of human CE and the male/female ratio by age groups are shown in Table 1. The youngest patient operated was 4 years and the oldest was 86 years old. Age group of 21–40 years had the highest infection rate and represented 36.02% of the total number of cases.

**Table 1:** Age and gender distribution of surgically confirmed cystic echinococcosis cases at two university Medical centers in Zanjan, Iran (2007-2013)

Age (yr)	Number and (%) of cases		
	Male	Female	Total
≤20	12(8.82)	15(11.02)	27(19.85)
21-40	24(17.64)	25(18.38)	49(36.02)
41-60	8(5.88)	17(12.50)	25(18.38)
≥61	18(13.23)	17(12.50)	35(25.73)
Total	62(45.58)	74(54.42)	136(100)

An overall analysis of gender and age of the CE cases revealed that the number of females infected was higher than males with a 0.83 male to female ratio (Table1). Cyst distribution in various anatomical sites is shown in Table 2.

Anatomical sites involved included liver, lungs, spleen, and others (kidney and pelvis). The liver was the most frequently infected organ, followed by the lung, kidney, spleen and pelvis. Females

had more hepatic cysts than males. Multiple organ cysts involvement included liver and lung (5.9%), liver and spleen (0.7%), liver and pelvis (0.7%), liver and kidney (2.2%). Single organ cases were more common in females than in males. Higher number of multiple organ infections was also recorded in females. 95 cases had only one cyst, and 6 cases had four cysts or more (Table 3).

**Table 2:** Location of Hydatid cyst with single and multiple organ involvement at two universities medical centers in Zanjan, Iran (2007-2013)

Cyst location	Male n (%)	Female n (%)	Total n (%)
Single-organ involvement			
Liver	29(21.8)	58(42.6)	87(64)
Lung	26(19.1)	6(4.4)	32(23.5)
Kidney	1(.7)	-	1(.7)
Spleen	-	2(1.5)	2(1.5)
Pelvis	1(.7)	-	2(1.5)
Multiple- organ involvement			
Liver + lung	3(2.2)	5(3.7)	8(5.9)
Liver + spleen	-	1(.7)	1(.7)
Liver + pelvis	1(.7)	-	1(.7)
Liver + kidney	1(.7)	2(1.5)	3(2.2)
Overall	62(45.6)	74(54.4)	136(100)

**Table 3:** The number of cysts among 190 cystic echinococcosis cases at two university medical centers in Zanjan, Iran (2007-2013)

Number Of cysts	Male n (%)	Female n (%)	Total n (%)
One	44 (32.4)	51 (37.5)	95 (69.9)
Two	2 (1.5)	9 (6.9)	11 (8.1)
Three	13 (9.6)	11 (8.1)	24 (17.6)
Four and more	3 (2.2)	3 (2/2)	6(4.4)

## Discussion

Cystic echinococcosis is a zoonotic infection that occurs worldwide. Iran is one of the endemic areas of hydatidosis. The young infected children with hydatidosis and the new cases recorded every year show that the disease is being actively transmitted in the country. Currently, WHO has formulated a new strategy to ensure cost-effective, ethical and sustainable control towards elimination or eradication of several Neglected Tropical Diseases (NTDs) such as cystic echinococcosis. WHO advises that the impact of zoonotic infections should be evaluated before carrying out any control measure (10, 11).

In the absence of statistically sound epidemiologic records, retrospective analysis of hydatidosis based on medical registers in local hospitals may prove useful and provides a suitable indication of infection expressed as annual rate of hospital cases.

Accordingly, our study presented 136 patients surgically treated for CE at two university medical centers in Zanjan, with 94 (69.1%) and 42 cases (30.9%), respectively. In line with a study conducted by Norian et al, 54.4% of patients of this study were female (12). During studies carried out in different provinces of Iran (Tehran, Isfahan, Kurdistan, Khuzestan) women had more hydatid surgeries than men (13-16). This rate has been reported as 52.5% in Turkey, 55.7% in Portugal, 59.0% in Jordan and 59.1% in Tanzania (17-20). The reason for this is not clear but genetic differences between two genders, cooking behaviors like tasting possibly infected raw vegetables (mainly contaminated with *E. granulosus* eggs) or food stuff before cooking and females' wish to geophagy during pregnancy or seeking more medical counsels than males by women can be responsible for this difference (1, 21).

The age of the cases ranged from 4 to 84 years and peak age group in both males and females was 21–40 years (Table 1). Moreover, maximum patients in Kerman (28.3%) were 21–30 yr age group (22). In China and Ethiopia however young adult CE cases (aged 21-30 years) were

more common than in the younger or older age-groups (23, 24). Since the cystic echinococcosis is a chronic disease and develops very slowly in humans, it takes years (1). Therefore, it might explain the reason for the high rate of operations of CE in people who are in the age group 21-40 years old.

Our study on cyst locations revealed that different organs were involved with CE but liver was the most commonly affected organ in both genders (Table 2). The high rate of hepatic infection is attributed to the fact that liver acts as a crucial filter in the human body. In Iran and in Kyrgyzstan, the hepatic hydatid disease was more commonly diagnosed and operated in children and young people (21, 25). In our study, most of patients (91.1%) had single organ involvement and harbored a single cyst. A similar percentage of the CE cases were reported (26, 27). Abdominal sonography was performed in 36 (26.5%), CT scan in 51 (37.5%) and both method in 49 (36%) patients. Our study showed that 75.7% patients were from rural areas, possibly because of the features of parasite's transmission cycle, which contains domestic herbivorous animals (sheep, cattle, etc.) and dogs. Almost all cattle owners, shepherds and rural inhabitants keep at least one dog to protect their possessions from wild predators and thieves. Similarly, most patients in West Azerbaijan (63.1%) were from rural areas (28). These and other socioeconomic realities in the areas studied are considered conducive to the maintenance and further reproduction of hydatid disease.

## Conclusion

Results of the present study, in comparison with reports from other provinces of Iran emphasize a specific consideration to cystic hydatidosis as a very significant zoonotic disease in Zanjan Province. Furthermore, successful programs need to be applied for controlling and reducing the dis-

ease in livestock, carnivores especially dogs and humans in the province.

### Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

### Acknowledgment

This study was supported by Zanjan University of Medical Sciences (Project No. A-11-153 4). We sincerely thank Esmail Yarmohammady who analyzed data. The authors declare that there is no conflict of interests.

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